# ST-JEAN STREET – MONTÉE POUPART

## MUNICIPAL CLASS ENVIRONMENTAL ASSESSSEMENT

## APPENDICES



Presented to:

**Mr. Richard Campeau**
Manager, Capital Projects
Infrastructure and Planning

**City of Clarence-Rockland**
1560 rue Laurier Street,
Rockland, Ontario,
K4K 1P7

Castleglenn Consultants
Engineers, Project Managers & Planners

March 25th, 2024

Project No. 7307

# APPENDICES

# APPENDIX "A"

## Study Commencement Notice Contacts

| Federal Departments and Agencies | |
|---|---|
| **Environment Canada - Ontario Region**<br>Fontaine Building 12th floor<br>200 Sacré-Coeur Blvd<br>Gatineau QC K1A 0H3<br>1-800-668-6767<br>enviroinfo@ec.gc.ca | **Canadian Transportation Agency**<br>60 Laval Street, Unit 01, Gatineau, QC<br>J8X 3G9<br>1-888-222-2592<br>info@otc-cta.gc.ca |
| **Canadian Environmental Protection Agency**<br>55 York Street, 6th Floor<br>Toronto, ON M5J 1R7<br>416-952-1576<br>ontarioregion-regiondontario@iaac-aeic.gc.ca | **Canadian Heritage - Parks Canada**<br>Parks Canada National Office<br>30 Victoria Street<br>Gatineau, Quebec J8X 0B3<br>1-888-773-8888<br>information@pc.gc.ca |
| **First Nations & Métis** | |
| Indigenous and Northern Affairs Canada: Will be contacted to confirm that the following First Nations and Metis organizations have been identified and included in the consultation process.<br>eacoordination_on@aadnc-aandc.gc.ca | |
| **Southern Ontario Treaties (Aamjiwnaang)**<br>978 Tashmoo Avenue<br>Sarnia, Ontario<br>N7T 7H5<br>519-336-8410<br>Mr. Christopher Todd Plain (Chief) | **Algonquin Anishinabeg Nation (Tribal Council)**<br>81 Kichi Mikan<br>Maniwaki<br>J9E3C3 |
| **Algonquins of Ontario**<br>31 Riverside Drive<br>Pembroke, Ontario<br>K8A 8R6<br>1-855-735-3759 | **Kitigan Zibi Anishinabeg First Nation**<br>1, Paganakomin Mikan Street, P.O. Box 309<br>Maniwaki, Quebec J9E 3C9<br>819-449-5170<br>Mr. Dylan Whiteduck (Chief) |
| **Metis Groups in Ontario**<br>Suite 1100 – 66 Slater Street<br>Ottawa, Ontario<br>K1P 5H1<br>613-798-1488<br>mno@metisnation.org | |
| **Provincial Ministries and Agencies** | |
| **Ministry of the Attorney General**<br>McMurtry-Scott Bldg 11th Flr, 720 Bay St, Toronto, ON M7A 2S9<br>416-326-2220<br>www.attorneygeneral.jus.gov.on.ca | **Infrastructure Ontario**<br>1 Dundas St. West Suite 2000<br>Toronto, ON M5G 1Z3<br>rita.kelly@infrastructureontario.ca |
| **Ministry of Agriculture, Food and Rural Affairs**<br>Ontario Government Bldg, 1 Stone Rd W, Guelph, ON N1G 4Y2<br>519-826-3100<br>www.omafra.gov.on.ca | **Ministry of Tourism, Culture and Sport**<br>6th Floor, 438 University Ave, Toronto, ON M7A 1N3<br>416-326-9326<br>https://www.ontario.ca/page/ministry-tourism-culture-sport<br>401 Bay Street, Suite 1700<br>Toronto ON M7A 0A7<br>416-314-7120<br>karla.barboza@ontario.ca |

| | |
|---|---|
| **Ministry of Community and Social Services**<br>347 Preston Street, 3rd floor<br>Ottawa, Ontario<br>K1S 3H8<br>613-234-1188 | **Ministry of Transportation (District Office)**<br>1-800-268-4686<br>5th Flr, 777 Bay St, Toronto, ON M7A 1Z8<br>www.mto.gov.on.ca<br>Mr. Stephen Kapusta<br>613-545-4834<br>Stephen.Kapusta@ontario.ca |
| **Ministry of Economic Development and Trade**<br>College Park 18th Floor<br>777 Bay St,<br>Toronto, Ontario M7A 1S5<br>416-326-8475<br>www.ontario.ca/economy | **Ministry of Health**<br>**(Local Medical Officer of Health)**<br>College Park 5th Floor, 777 Bay St,<br>Toronto, Ontario, M7A 2J3<br>416-327-4327<br>www.health.gov.on.ca |
| **Ministry of Environment, Conservation and Parks**<br>College Park 5th Floor, 777 Bay St, Toronto, ON M7A 2J3<br>416-325-4000<br>www.ontario.ca/environment<br>jon.orpana@ontario.ca<br>Brenda.Beaudoin@ontario.ca | **Ministry of Natural Resources (District Office)**<br>Whitney Block 6th Floor Room 6630,<br>99 Wellesley Street West, Toronto, ON M7A 1W3<br>1-800-667-1940<br>www.ontario.ca/mnrf<br>scott.lee@ontario.ca |
| **Ministry of Municipal Affairs and Housing**<br>College Park, 777 Bay Street<br>Toronto, Ontario M7A 2J3<br>416-585-7041<br>ontario.ca/municipalaffairsandhousing<br>613-545-2132<br>michael.elms@ontario.ca | |
| **Ontario Municipal Water Association**<br>30 Spence Ave<br>Midhurst, Ontario<br>L9X 0P2<br>mmortimer@ocwa.com | **Ontario Clean Water Agency**<br>20 Bennett Drive Suite 200<br>Carleton Place, Ontario<br>K7C 4J9<br>ATrader@ocwa.com |
| **Other Agencies** | |
| **City of Ottawa**<br>Chelsea Williams<br>Transportation Services Department<br>Tel: 613-580-2424 ext. 52992<br>www.octranspo.com<br>Connelly, Colleen, Colleen.Connelly@ottawa.ca<br>Wolstenholme, Matthew,<br>Matthew.Wolstenholme@ottawa.ca<br>Washnuk, Derek Derek.Washnuk@ottawa.ca<br>Guganesan.Mailvaganam@transpo.ottawa.on.ca | **Upper Canada District School Board**<br>1-800-267-7131<br>inquiries@ucdsb.on.ca<br><br>225 Central Avenue West<br>Brockville Ontario<br>K6V 5X1<br>613-342-0371<br>peter.bosch@ucdsb.on.ca |
| **Leduc Bus Lines Ltd (Transit)**<br>8467 County Rd 17<br>Rockland, Ontario<br>K4K 1K7<br>(613) 446-0606<br>https://www.leducbus.com<br>leducbus@leducbus.com | **Eastern Ontario Public School Board**<br>2755 Highway 43,<br>Kemptville, Ontario<br>K0G 1J0<br>613.258.7757<br>mail@cdsbeo.on.ca |
| **PR Transpo**<br>(Prescott-Russell on-demand service)<br>613-675-4382<br>prtranspo@prescott-russell.on.ca | **United Counties of Prescott and Russell**<br>**Catholic District School Board of Eastern Ontario**<br>613-258-7757<br>mail@cbsbeo.on.ca |

| | |
|---|---|
| **Clarence-Rockland Fire Department (CRFD)**<br>1560 Laurier Street, Rockland, K4K 1P7.<br>(613) 446-6022<br>infofire@clarence-rockland.com | **Hydro-One**<br>(Electricity)<br>linda.vivian@HydroOne.com<br>Daniel.King-Costa@hydroone.com |
| | **Ontario Provincial Police (OPP) Russell** County (Rockland) Detachment 626 de la Baie<br>Rockland, Ontario, K4K 1K6 (613 446-5124) |
| **Developers** | |
| **EQ Homes**<br>mlalonde@eqhomes.ca<br>pjury@eqhomes.ca | **Brigil Construction**<br>brigil@brigil.com<br>jlrivard@brigil.com |
| **CH Clement Construction**<br>cclement@chclement.ca | **Longwood Builders**<br>newhomes@longwoodbuilders.com |
| **Bernard Sanscartier Construction LTD**<br>luc@bscl.ca<br>bernard@bscl.ca | **Potvin Construction**<br>ypotvin@potvinconst.com |
| **Woodfield Homes Inc**<br>info@woodfieldhomesinc.com | **Minto**<br>jbrisson@minto.com |
| **Space Builders**<br>bgeerts@spacebuildersottawa.com<br>ysimoneau@spacebuildersottawa.com<br>jpeloquin@spacebuildersottawa.com | |

Study Commencement Letter e-mailed and mailed to Agencies (Feb 3rd, 2023)

**CORPORATION**
**de la Cité de / of the City of**
**CLARENCE-ROCKLAND**

Clarence-Rockland

February 2nd, 2023

To: «First_Name»,«Last_Name»«Next Record»
«Department_or_Title»
«Agency»
«StreetSuite»
«City»,«Prov»
«PostCode»
[«No»:«email__address»]

**Re: NOTICE OF STUDY COMMENCEMENT**
**Proposed Montée Poupart Widening Project, City of Clarence-Rockland**
**Phase 3 and 4 of Municipal Class Environmental Assessment (MCEA)**

The City of Clarence-Rockland is initiating a Municipal Class Environmental Assessment to address the future requirements of the St. Jean Street-Montée Poupart corridor. The corridor presently serves as a primary route that accommodates both local and regional community traffic.

The City of Clarence-Rockland completed a Multi-Modal Transportation Master Plan (MMTMP) that was accepted by Council's Committee of the Whole in March, 2020. The transportation masterplan was designed to, and has followed, the requirements of Phase 1 and 2 of the MCEA process for the recommended initiatives as approved under Ontario's Environmental Assessment Act. Hence, the need and justification for this infrastructure project have been addressed.

The environmental assessment (EA) process requires Phase 3 and 4 to be completed. The assessment will determine the long-term mobility requirements along the St. Jean Street-Montée Poupart corridor. Please see the attached illustration. The infrastructure improvement would include:

- The widening of the corridor to accommodate 4 travel lanes;

- The upgrade and/or addition of 4 roundabouts or traffic signal-controlled intersections; and
- The addition of pedestrian and cycling facilities along the corridor.

The EA will examine a range of alternative solutions and identify and address the various technical, environmental, land use and constructability challenges.

This purpose of this letter being forwarded is to inform all interested parties of the study commencement and to identify and confirm the appropriate contacts, stakeholders and parties within the various identified organizations that may wish to be informed of the study as it progresses. This environmental assessment will provide an opportunity for public input and consultation which would include a public open house venue and various meetings.

We encourage your organizations involvement and will invite feedback throughout the EA process. The City of Clarence- Rockland wishes to ensure that all who may be interested be kept informed about the progress of this EA study.

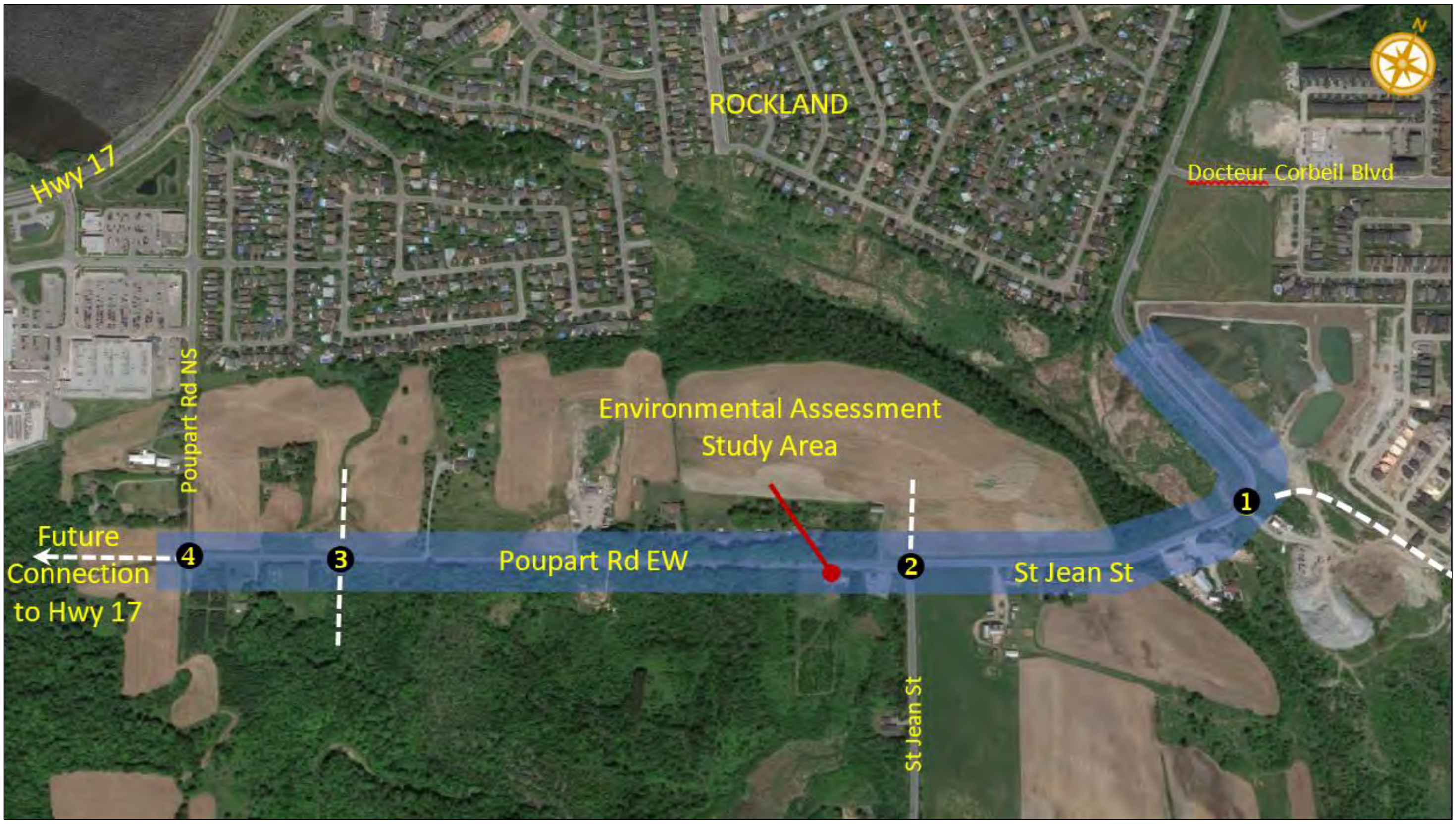
Should you wish to receive updates on this project, please respond by way of e-mail back to:

- Mr. Konstantin Joulanov kjoulanov@castleglenn.ca leaving your contact information. Castleglenn Consultants Inc. has been selected to undertake this environmental Assessment on behalf of the municipality.
- Should you have any additional questions, concerns or comments, feel free to add them to your email response.

Regards

Richard Campeau

Gestionnaire, Projets en capital / Manager, Capital Projects
Infrastructures et Aménagement du territoire / Infrastructure and Planning
Cité de / City of Clarence-Rockland
1560 rue Laurier Street, Rockland, On. K4K 1P7
tél.: (613) 446-6022 #2239
rcampeau@clarence-rockland.com




**St. Jean Street-Poupart Road Corridor**

Appendix “A-6”

Study Commencement Letter and Flyer mailed to Public (Feb 4th, 2023)

# CORPORATION
## de la Cité de / of the City of CLARENCE-ROCKLAND

Clarence-Rockland

February 2nd, 2023

**Re: NOTICE OF STUDY COMMENCEMENT**
**Proposed Poupart Road Widening Project, City of Clarence-Rockland**
**Phase 3 and 4 of Municipal Class Environmental Assessment (MCEA)**

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The environmental assessment (EA) process requires Phase 3 and 4 to be completed. The assessment will determine the long-term mobility requirements along the St. Jean Street-Poupart Road corridor. Please see the attached illustration. The infrastructure improvement would include:

- The widening of the corridor to accommodate 4 travel lanes;
- The upgrade and/or addition of 4 roundabouts or traffic signal-controlled intersections; and
- The addition of pedestrian and cycling facilities along the corridor.

The EA will examine a range of alternative solutions and identify and address the various technical, environmental, land use and constructability challenges.

This purpose of this letter being forwarded is to inform all interested parties and property owners of the study commencement and to identify and confirm the appropriate contacts, stakeholders and parties who may wish to be informed of the study as it progresses. This environmental assessment will provide an opportunity for public input and consultation which would include a public open house venue and various meetings.



We encourage your involvement and will invite feedback throughout the EA process.

The City of Clarence- Rockland wishes to ensure that all who may be interested be kept informed about the progress of this EA study.

Should you wish to receive updates on this project, please respond by way of e-mail back to:

- Mr. Konstantin Joulanov kjoulanov@castleglenn.ca leaving your contact information. Castleglenn Consultants Inc. has been selected to undertake this environmental Assessment on behalf of the municipality.
- Should you have any additional questions, concerns or comments, feel free to add them to your email response.

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Richard Campeau

Gestionnaire, Projets en capital / Manager, Capital Projects
Infrastructures et Aménagement du territoire / Infrastructure and Planning
Cité de / City of Clarence-Rockland
1560 rue Laurier Street, Rockland, On. K4K 1P7
tél.: (613) 446-6022 #2239
rcampeau@clarence-rockland.com

1560 RUE LAURIER STREET, ROCKLAND, ONTARIO K4K 1P7 · TEL. (613) 446-6022 · FAX (613) 446-1497
www.clarence-rockland.com

Clarence-Rockland

# Notice of EA Commencement

The City of Clarence-Rockland is initiating a Municipal Class Environmental Assessment to address the future requirements of the St. Jean Street-Poupart Road corridor. The corridor presently serves as a primary route that accommodates both local and regional community traffic.

The study will:

- conform with the Municipal Class Environmental Assessment (MCEA) process identified under the Ontario Environmental Assessment Act requirements for a Schedule “C” project
- address Phase 3 [design alternatives leading to a preferred design option(s)] and Phase 4 (Production of the Environmental Study Report (ESR) document, notification of results and review) of the MCEA process.

The City of Clarence-Rockland’s Multi-Modal Transportation Master Plan (MMTMP) that was completed in March, 2020 has addressed Phase 1 and 2 of the MCEA process, hence, the need and justification for this infrastructure project has already been addressed.

The environmental assessment will determine the long-term mobility requirements along the St. Jean Street-Poupart Road corridor. The proposed infrastructure improvement is to include:

- The widening of the corridor to accommodate 4 travel lanes;
- The upgrade and/or addition of 4 roundabouts or traffic signal-controlled intersections; and
- The addition of pedestrian and cycling facilities along the corridor.

The EA will examine a range of alternative solutions and identify and address the various technical, environmental, land use and constructability challenges.

**Your input is important to the success of our study!**

We look forward to engaging with you to develop design plans that would be tailored to the requirements of the City of Clarence-Rockland. This environmental assessment will provide an opportunity for public input and consultation which would include a public open house venue and various meetings.

Should you have any questions, concerns or wish to receive updates by being added to the study mailing list, please contact:

**Richard Campeau**
Gestionnaire, Projets en capital / Manager, Capital Projects
Infrastructures et Aménagement du territoire / Infrastructure and Planning
Cité de / City of Clarence-Rockland
1560 rue Laurier Street, Rockland, Ontario, K4K 1P7
tél.: (613) 446-6022 #2239
E-mail: abeaulieu@clarence-rockland.com

**Arthur Gordon**
Consultant Project Manager
Castleglenn Consultants Inc.
2460 Lancaster Road, Suite 200
Ottawa, Ontario, K1B 4S5
Phone: (613) 731-4052 / Fax: (613) 731-0253
E-mail: Konstantin Joulanov <kjoulanov@castleglenn.ca>

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# Notice of an Environment Assessment Commencement

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Posted on Friday, March 10, 2023

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The City of Clarence-Rockland is initiating a Municipal Class Environmental Assessment to address the future requirements of the St. Jean Street-Poupart Road corridor. The corridor presently serves as a primary route that accommodates both local and regional traffic.

The study will:

- conform with the Municipal Class Environmental Assessment (MCEA) process identified under the Ontario Environmental Assessment Act for a Schedule "C" project.
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The City of Clarence-Rockland's Multi-Modal Transportation Master Plan (MMTMP) that was completed in March 2020 has addressed Phase 1 and 2 of the MCEA process, hence, the need and justification for this infrastructure project have been addressed.

The environmental assessment will determine the long-term mobility requirements along the St. Jean Street-Poupart Road corridor. The proposed infrastructure improvement is to include:

- Widening of the corridor to accommodate 4 travel lanes;
- Upgrade and/or addition of 4 roundabouts or traffic signal-controlled intersections; and
- Addition of pedestrian and cycling lanes along the corridor.

The EA will examine a range of alternative solutions and identify and address the various technical, environmental, land use and constructability challenges.

Your input is important to the success of the study.

We look forward to engaging with you to develop plans tailored to the requirements of the City of Clarence-Rockland. This environmental assessment is an opportunity for public input and consultation; it will include a public open house and several meetings.

Should you have any questions or concerns or wish to receive updates by being added to the study's mailing list, please contact:

**Richard Campeau** Manager, Capital Projects Infrastructure and Planning City of Clarence-Rockland

1560, Laurier Street, Rockland, Ontario, K4K 1P7 Phone: (613) 446-6022 #2239

Email: rcampeau@clarence-rockland.com

**Arthur Gordon** Consultant Project Manager Castleglenn Consultants Inc.

2460 Lancaster Road, Suite 200 Ottawa, Ontario, K1B 4S5

Phone: (613) 731-4052 / Fax: (613) 731-0253

Email: kjoulanov@castleglenn.ca

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- Committees
- Council
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- Contact Us
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- Meetings and Minutes
- Municipal Calendar
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## Contact Us

**City of Clarence-Rockland**
1560 Laurier Street,
Rockland, ON K4K 1P7

Telephone: (613) 446-6022
Toll Free: (613) 237-7000
Fax: (613) 446-1497
Submit a Concern

**City Web Site: Notice of Commencement**
(Launched: March 10th, 2023)

# APPENDIX "B"

## Public Consultation Centre No. 1: Notice Contacts

# St-Jean - Poupart Reconstruction



Here is the presentation that was communicated to the people present during the open house. Do not hesitate to fill the comment form and give us your opinion on the project.

There is still time to send us your comments and concerns following the Open House on June 15.

Questionnaire

+ October 25 - 2023 - Notice of Public Consultation Centre

– June 15 - 2023 - Notice of EA Public Consultation Centre

> Public Consultation information
> Date: Thursday June 15, 2023
> Time: 5:00 p.m. to 9:00 p.m.
> Location: Optimist Hall, 1535 Du Parc Avenue, Rockland, ON K4K 1C3

The City of Clarence-Rockland is continuing its work on the environmental assessment needed to address the future requirements of the St-Jean Street/Poupart Road corridor. The corridor presently serves as a primary route that accommodates both local and regional community traffic.

St. Jean Street-Poupart Road Corridor

The Public Consultation Centre will present the various alternatives being considered to upgrade the corridor that include corridor widening, roundabout and traffic signal-controlled intersections, roadway alignment and adjacent pedestrian and multi-use pathways. The alternative solutions would then be subject to further review by various technical, environmental, land use and constructability experts.

The study is intended to:

- conform with the Municipal Class Environmental Assessment (MCEA) process identified under the Ontario Environmental Assessment Act requirements for a Schedule "C" project.
- address Phase 3 (design alternatives leading to a preferred design option(s)) and Phase 4 (Production of the Environmental Study Report (ESR) document, notification of results and review) of the MCEA process.

The Public Consultation Centre event is intended to generate an exchange of ideas that will broaden the information base leading to better decision making. The public review will be used to further evaluate and refine the alternatives and assist in the selection of the preferred design for a chosen solution. Comments are invited for incorporation into the planning and design of this project and will be received until Friday July 7th, 2023.

The environmental assessment (EA) process will determine the long-term mobility requirements along the St-Jean Street/Poupart Road corridor.

Your input is important to the success of our study!

We look forward to engaging with you to develop design plans that would be tailored to the requirements of the City of Clarence-Rockland.

## APPENDIX "C"

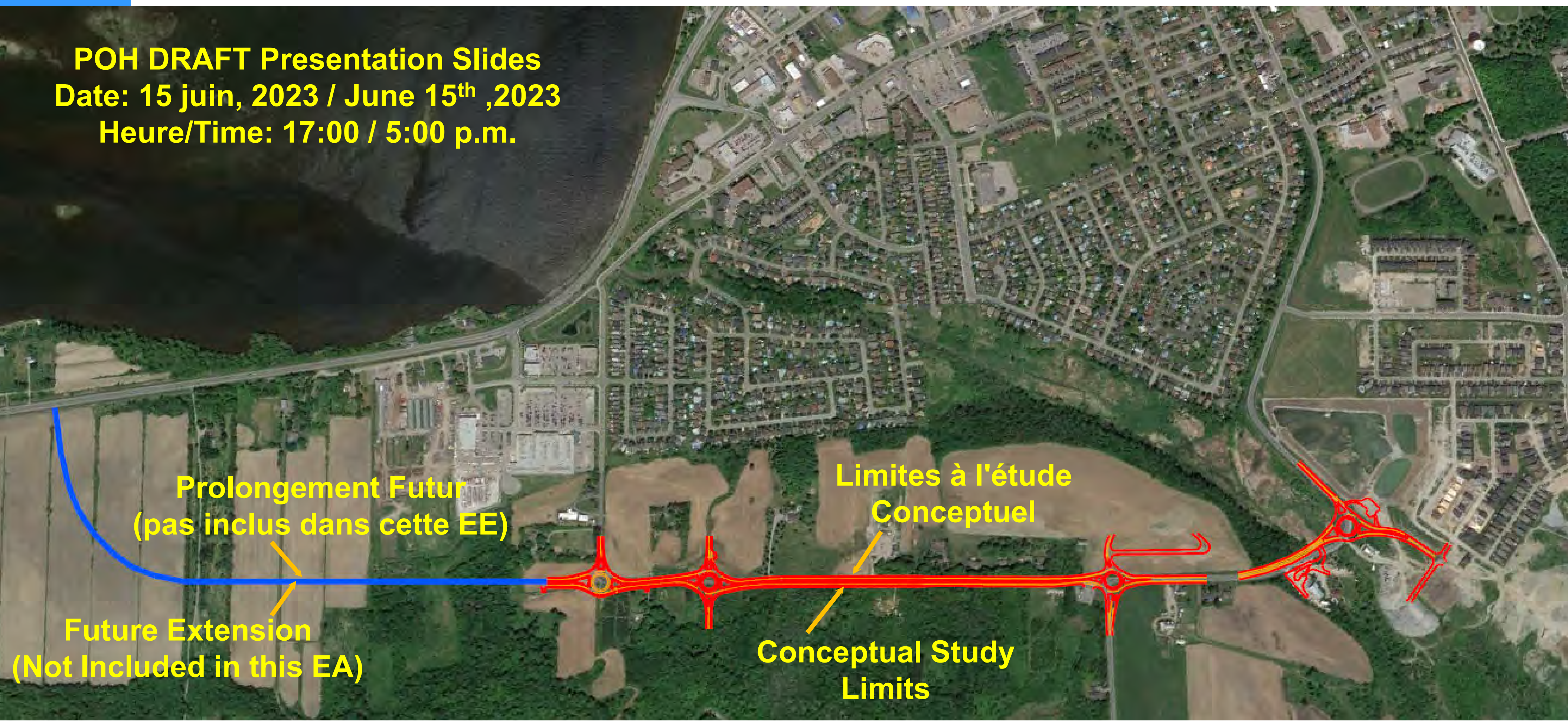
## Public Consultation Centre No. 1: Presentation Materials

CORPORATION de la Cité de / of the City of CLARENCE-ROCKLAND

Castleglenn Consultants
Engineers, Project Managers & Planners

# rue St-Jean Street – chemin Poupart Road
## Étude environnementale municipal
## Municipal Environmental Assessment

***Bienvenue au Centre de Consultation Publique #1***
***Welcome to the Public Consultation Centre #1***



# You will have a chance to Review


**Study Purpose and Overview**

**Multi-Modal Transportation Master Plan, Vision and Guiding Principles**

**Improvement Alternatives and the Evaluation Process**


**Next Steps**

- Representatives from the City of Clarence-Rockland & Castleglenn Consultants are available to discuss the project with you.
- Please ask questions and share your opinions with us.
- If you have accessibility requirements in order to participate in this project, please contact a Project Team member.
- Please complete a comment sheet at today’s PIC, or by
- We encourage you to sign in.
- Your input is appreciated.

# Vous pourrez examiner


**Objectif de l’étude et vue d’ensemble**

**Plan directeur des transports multimodaux, vision et principes directeurs**

**Solutions d’amélioration et processus d’évaluation**


**Prochaines étapes**

- Des représentants de la Cité de Clarence-Rockland et de Castleglenn Consultants sont disponibles pour discuter du projet avec vous.
- N’hésitez pas à poser des questions et à nous faire part de vos opinions.
- Si vous avez des exigences en matière d’accessibilité pour participer à ce projet, veuillez communiquer avec un membre de l’équipe de projet.
- Veuillez remplir une feuille de commentaires au processus de consultation d’aujourd’hui.
- Nous vous encourageons à vous inscrire.
- Votre contribution est appréciée.

# Introduction

- The purpose of this study is to address the functional planning, environmental assessment and municipal approval processes for the St-Jean Street Poupart Road corridor.
- The objectives of this study include:
  - conforming to the Provincial Municipal Class Environmental Assessment (MCEA) process identified under the Ontario Environmental Assessment Act requirements for a Class “C” project. This requires that an Environmental Study Report (ESR) be prepared and filed for review by provincial public and review agencies;
  - Identifying St. Jean Street – Poupart Road 15 Intersection improvements to meet interim and long-term transportation needs;
  - Completing an access review of commercial entrances and intersections to the corridors to ensure safe and efficient traffic operations and to support ongoing and proposed development of surrounding lands; and
  - Considering all road users including active transportation and recreational trail users.

# Introduction

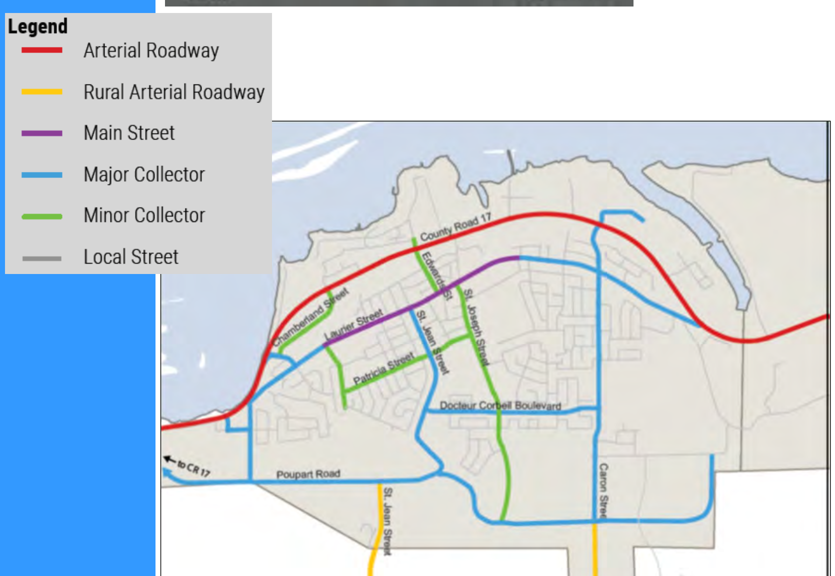
- Cette étude a pour objet d'examiner les processus de planification fonctionnelle, d'évaluation environnementale et d'approbation municipale pour le corridor de la rue St-Jean et du chemin Poupart.
- Objectifs de l'étude :
  - se conformer à la procédure provinciale d'évaluation environnementale municipale de portée générale (EEMPG) définie par les exigences de la *Loi sur les évaluations environnementales de l'Ontario* pour un projet de catégorie C. Ce processus exige qu'un rapport d'étude environnementale (REE) soit préparé et déposé aux fins d'examen par les organismes publics provinciaux et les organismes d'examen;
  - identifier les améliorations à apporter à l'intersection de la rue St. Jean et du chemin Poupart 15 pour répondre aux besoins de transport à court et à long terme;
  - réaliser un examen de l'accès aux entrées commerciales et aux intersections des corridors afin de garantir des opérations de circulation sûres et efficaces et de soutenir le développement en cours et proposé des terrains environnants; et
  - prendre en compte tous les usagers de la route, y compris les usagers des transports actifs et des sentiers récréatifs.

CORPORATION
de la Cité de / of the City of
CLARENCE-ROCKLAND

Castleglenn Consultants
Engineers, Project Managers & Planners

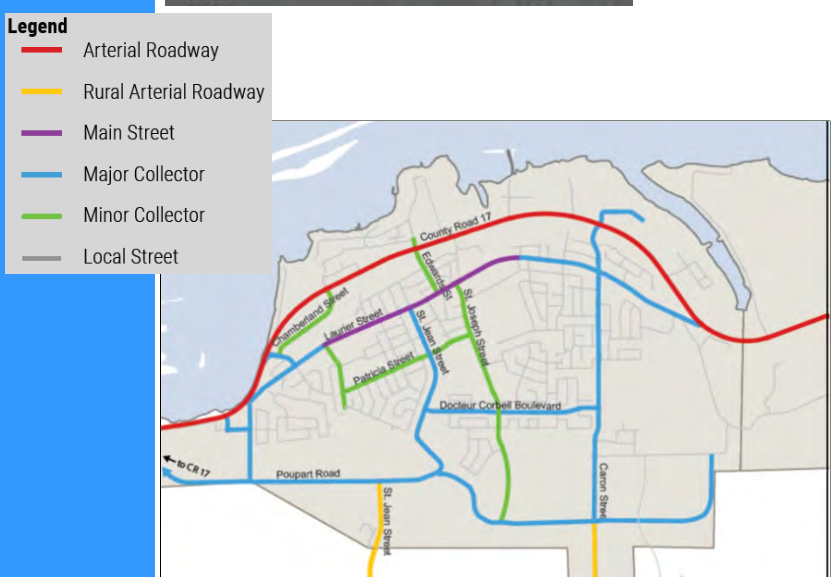
# Introduction


- The City of Clarence Rockland completed its "*Multi-modal Transportation Master Plan*" (MMTMP) in 2019.
- The Province has acknowledged that the City's MMTMP satisfies the first two phases of the five-phase EA process.
- The St-Jean Street-Poupart Road corridor was classified as a "major collector" roadway intended to service the existing and future communities planned for Clarence-Rockland. Major Collector roadways should …
    - connect to Arterial and Rural Arterial Roadways.
    - accommodate pedestrian sidewalks on both sides of the street where needed
    - have opportunities to accommodate active transportation through the implementation of multi-use paths.
    - have a typical right-of-way width of 18m-to-24m depending on the configuration.



# Introduction


- La Cité de Clarence Rockland a terminé son Plan directeur des transports multimodaux (PDTM) en 2019.
- La province a reconnu que le PDTM de la Cité satisfait aux deux premières phases du processus d'évaluation environnementale en cinq phases.
- Le corridor de la rue St-Jean et du chemin Poupart a été classé comme une « route collectrice principale » destinée à desservir les communautés existantes et futures prévues pour Clarence-Rockland. Les routes collectrices principales devraient…
  - être reliées aux artères et aux routes rurales.
  - comporter des trottoirs pour les piétons des deux côtés de la rue, si possible.
  - offrir des possibilités de transport actif grâce à la mise en place de sentiers polyvalents.
  - avoir une largeur d'emprise typique de 18 à 24 mètres selon la configuration.

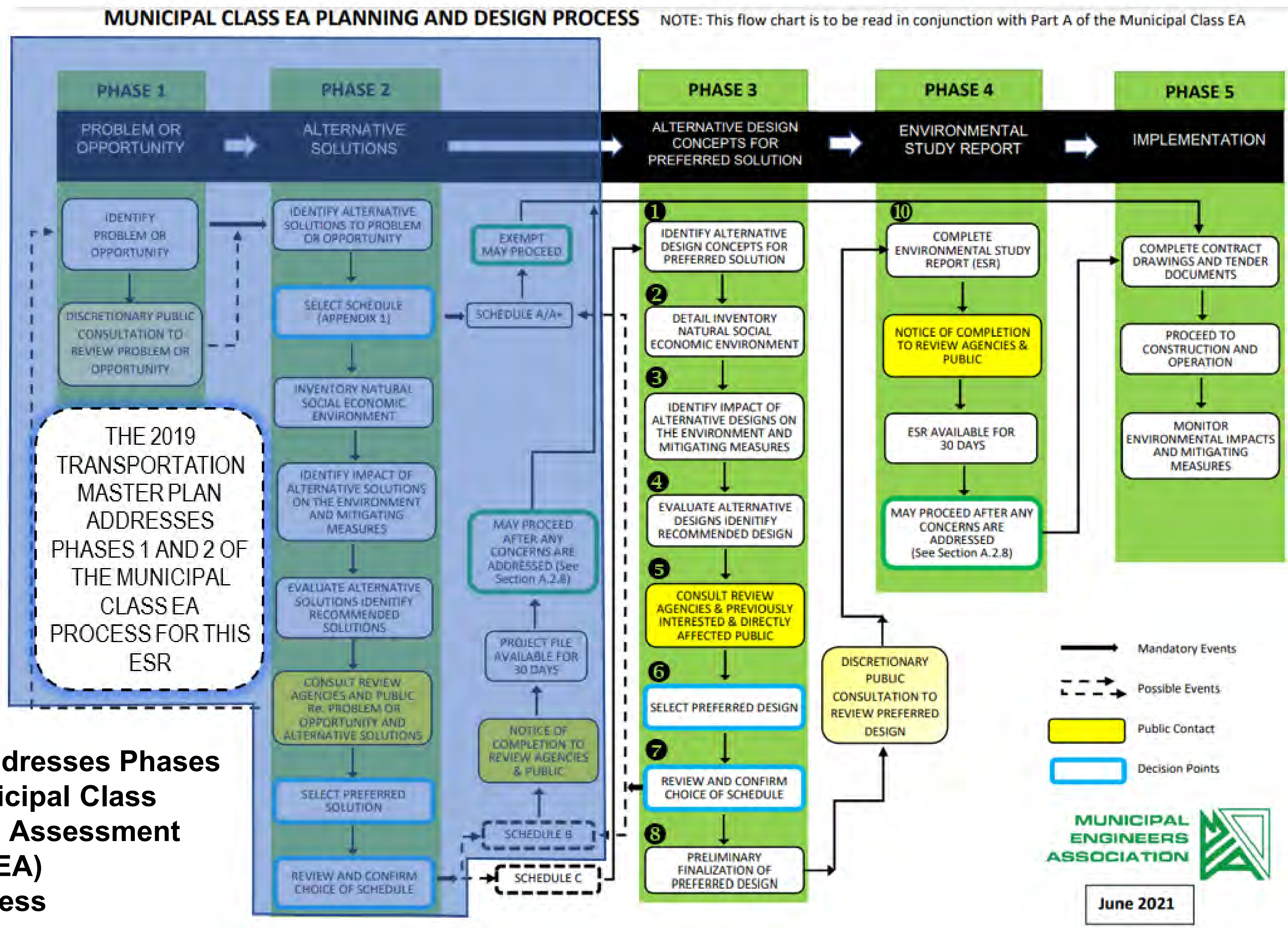


CORPORATION de la Cité de / of the City of CLARENCE-ROCKLAND

Castleglenn Consultants
Engineers, Project Managers & Planners

# MEA Process (Phases 3-thru-5)

**Municipal Class Environmental Assessment (MCEA) Process**




**City's MMTMP Addresses Phases 1 & 2 of Municipal Class Environmental Assessment (MCEA) Process**

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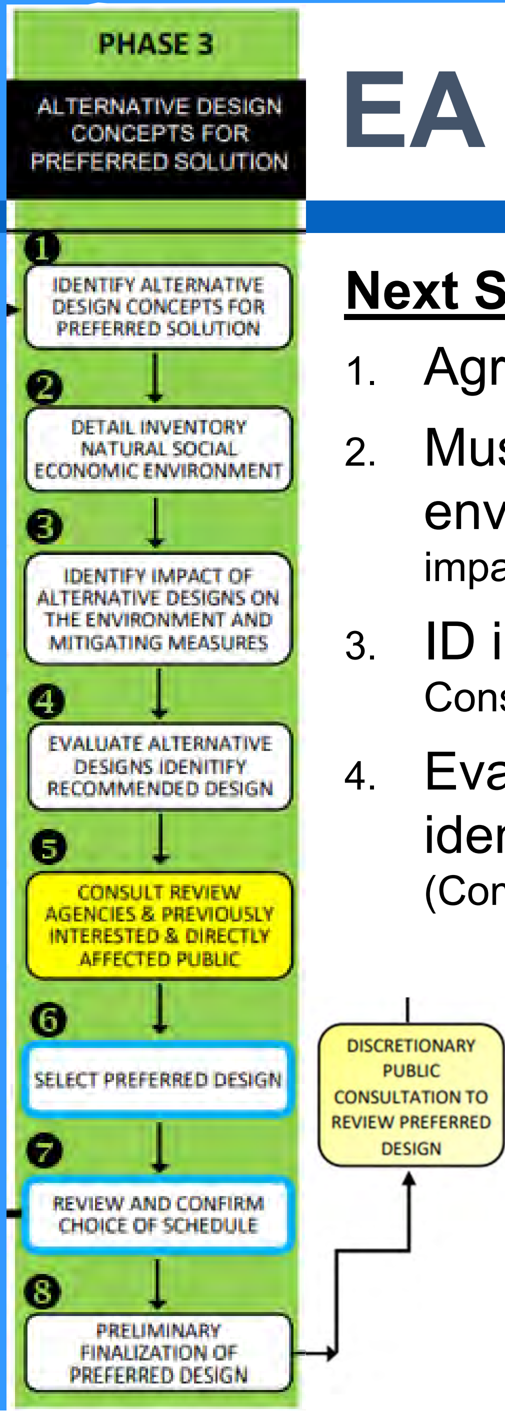
# EA Process Phase 3




## Next Steps:

1. Agreement needed on ID of design concepts.
2. Must create inventory of natural, social, economic and environmental impacts. (Sub-Consultant Involvement i.e. Water/well impacts, climate change etc.)
3. ID impacts on the environment and mitigation measures. (Sub-Consultant Involvement)
4. Evaluation of alternatives consultation after completing identification and evaluation of all alternative designs. (Comparative costing, property impacts, traffic operations etc.)

Suggest Council Involvement

5. Consultation with agencies, previously interested & directly affected parties.
6. Select the preferred design(s)/concept(s).
7. Re-confirm this as project as an MEA Class “C” project.
8. Undertake refinements to finalize the preferred design.
9. Discretionary Public Consultation: The preferred design.

# Planned and On-going Developments

## (as per 2019 MMTMP)

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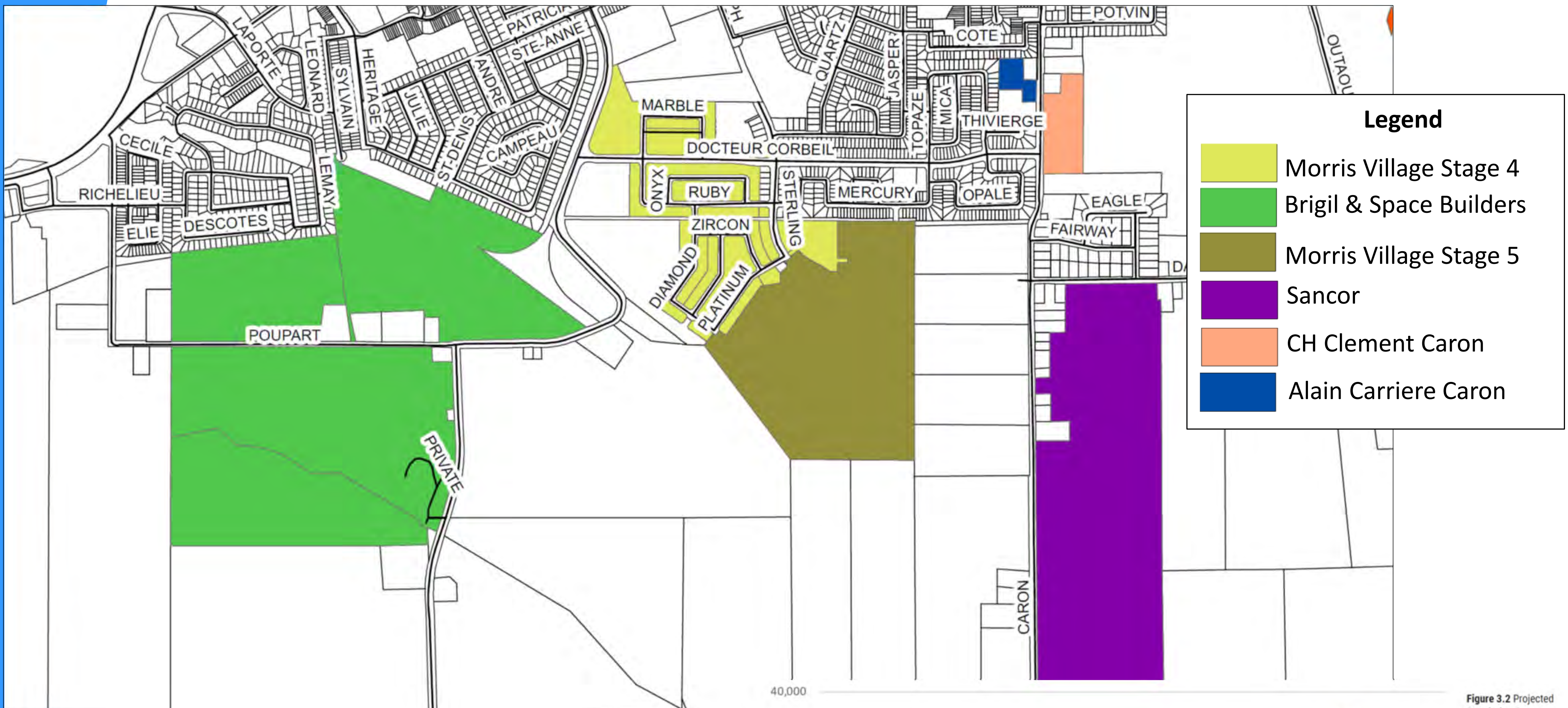
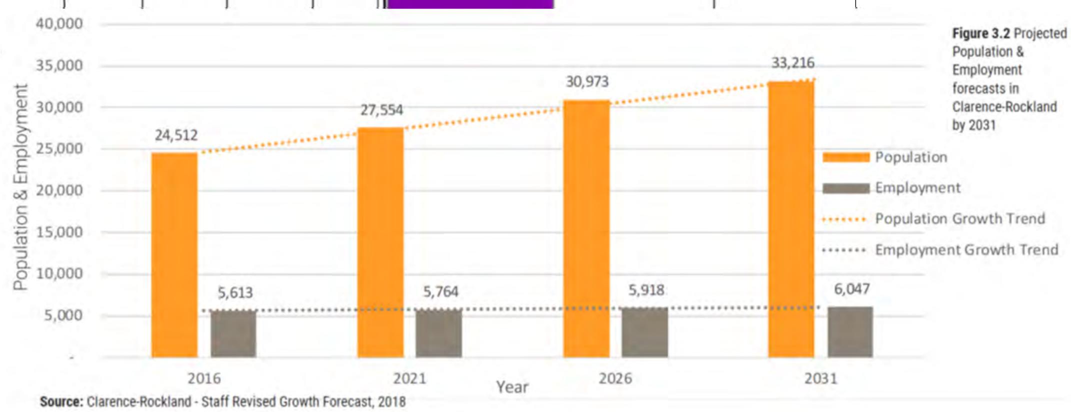



Future growth (2031) forecasts identify that Clarence Rockland was forecast to grow by 8.700 persons in the 15 years between 2016 and 2031. [MMTMP, Pg. 27]



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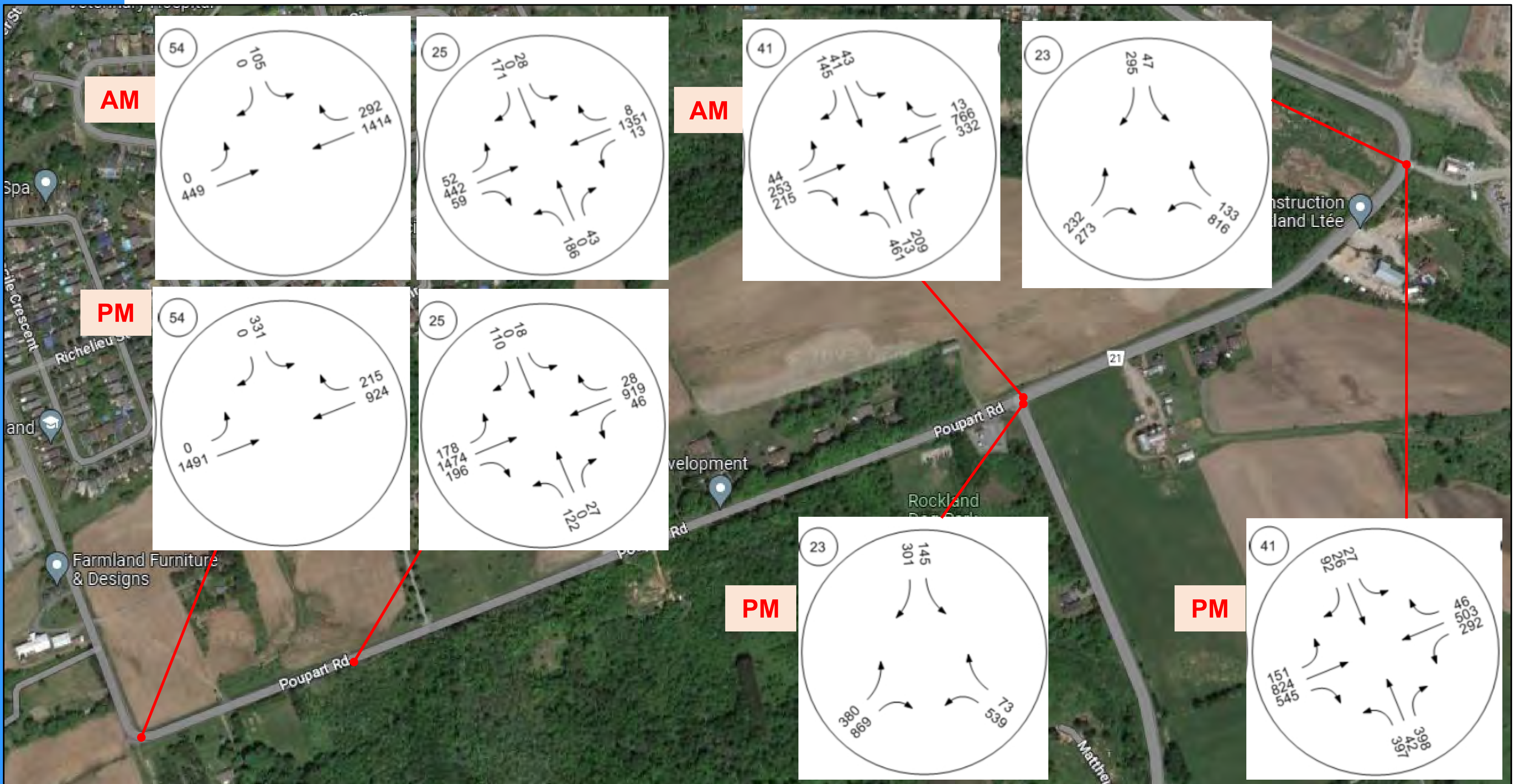
# Future Transportation Conditions

## (Vehicles per Hour)




Without improvements, the future 2031 peak hour forecasts identify significant deteriorated intersection operations along Poupart Road which is a key corridors for both internal and external travel needed to sustain future residential growth. [MMTMP, Pg. 27]

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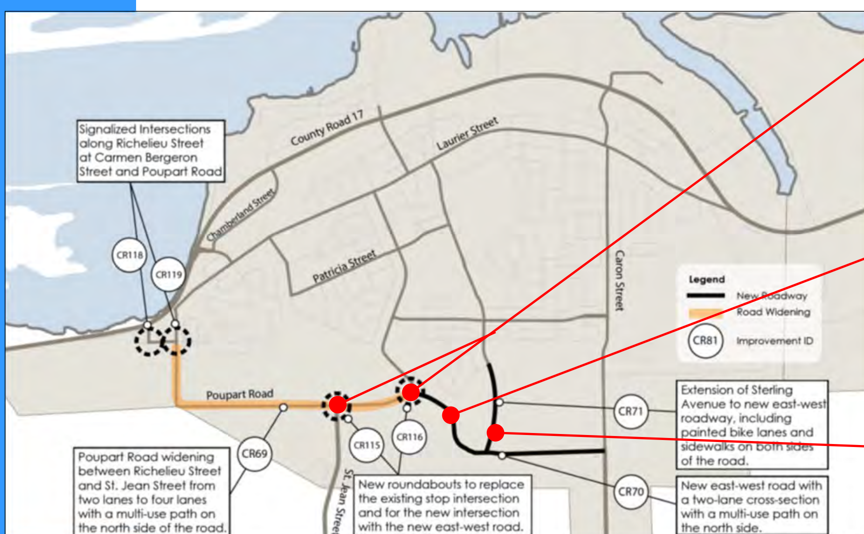
# Master Transportation Plan Conclusions

- **Poupart Road Widening:** *"Road widening from two lanes to four between Richelieu Street and the New East-West Roadway. Will include a multi-use pathway on the north side of the roadway."*



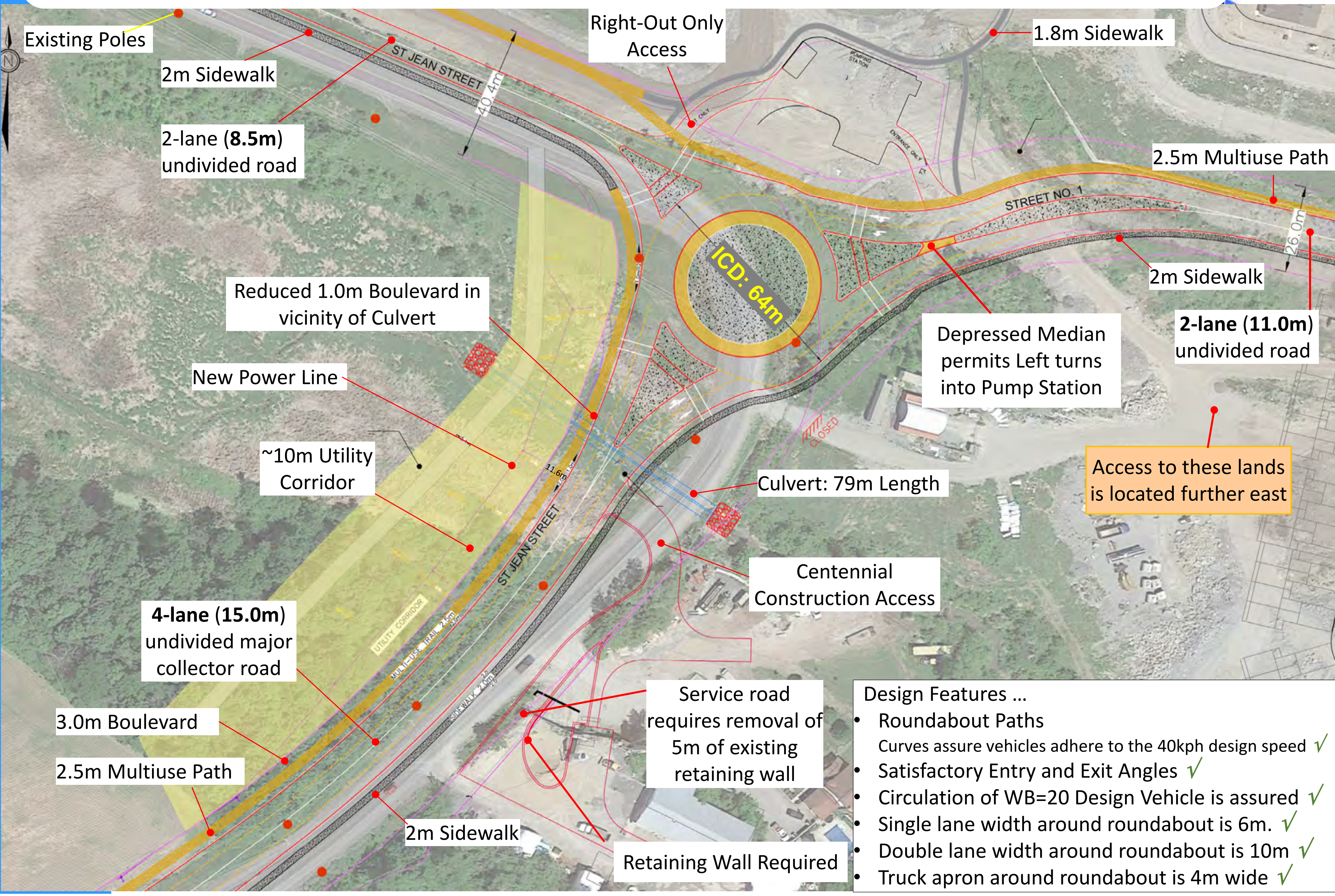

- **Roundabouts:** *"New roundabouts to replace the existing STOP controlled intersections and for the new intersection with the new east west road."*
- **New East-West Road:** *"A new east-west road with a 2-lane cross-section with a multi-use path"* connecting to St. Jean Street.
- **Sterling Ave. Extension:** *"Extension of Sterling Avenue to new east-west roadway, including painted bike lanes and sidewalks on both sides of the road."*

# Intersection #1 Improvement Alternatives

## (ST. JEAN STREET / STREET #1)

# Int #1: Roundabout Option (Layout)

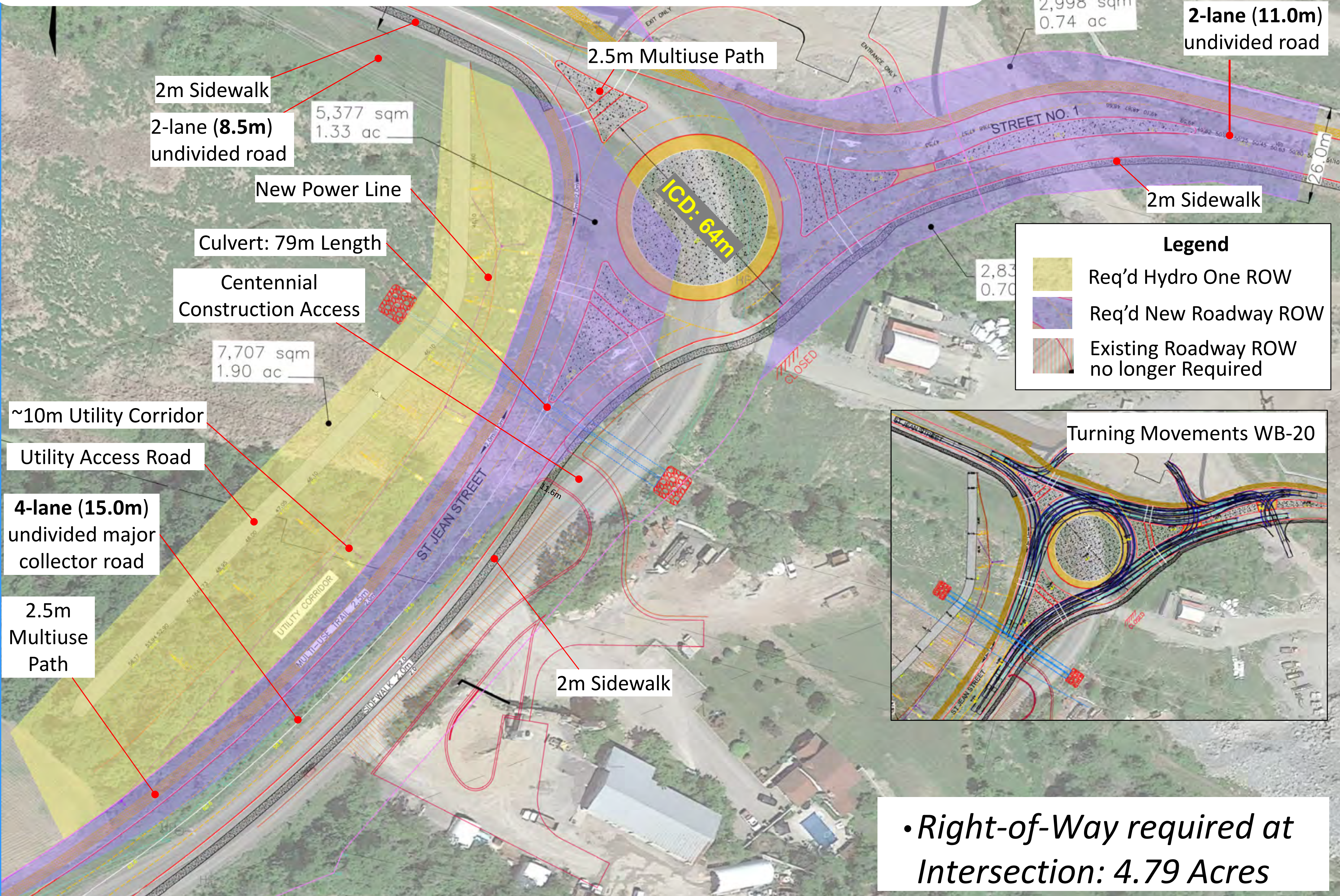





Design Features …

- Roundabout Paths
  Curves assure vehicles adhere to the 40kph design speed √
- Satisfactory Entry and Exit Angles √
- Circulation of WB=20 Design Vehicle is assured √
- Single lane width around roundabout is 6m. √
- Double lane width around roundabout is 10m √
- Truck apron around roundabout is 4m wide √

# Int #1: Roundabout Option (Property)




- *Right-of-Way required at Intersection: 4.79 Acres*

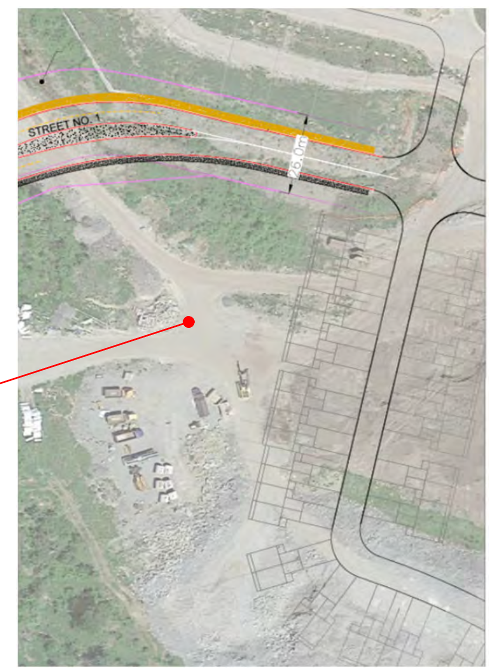
# Intersection #1: Roundabout Option

- *Utility Corridor:* 79m long culvert was determined to be a fixed constraint. A 10m wide swath beyond the north sidewalk (3m) boulevard was designated for use by HydroOne. This was not feasible in the vicinity of the planned culvert. To address this need the boulevard was reduced to ~1m leaving a shared utility/boulevard corridor approximately 11.6m in width. [Allocated as 9m for the utility corridor and 2.6m for the boulevard.]
- Other utility impacts remain to be identified.
- *Traffic Operations:* EB traffic coming down 8% grade would be required to decelerate from 60kph (posted 50kph) to 30kph approaching the roundabout.

# Intersection #1: Roundabout Option

- *Centennial Construction Impacts:* The new service road arrangement requires a new retaining wall and removal of approximately 7m of a retaining wall on the north side of the loading bay (5m) and parallel to Poupart (2m).

- *Inscribed Circle Diameter:* 64m ICD required for multi-lane configuration due to entry angles & fastest path design criteria and WB-20 turning movements (Case 2). (Standards call for WB20 to be 50m-to-67m)




- *Accesses:* Entry-Exit Accesses are provided to the Storm Water Management pond in the north-east portion of the roundabout.

- *Accesses:* An access to the lands south-east of the roundabout is to be provided from the intersection further to the east of the roundabout as part of site planning.

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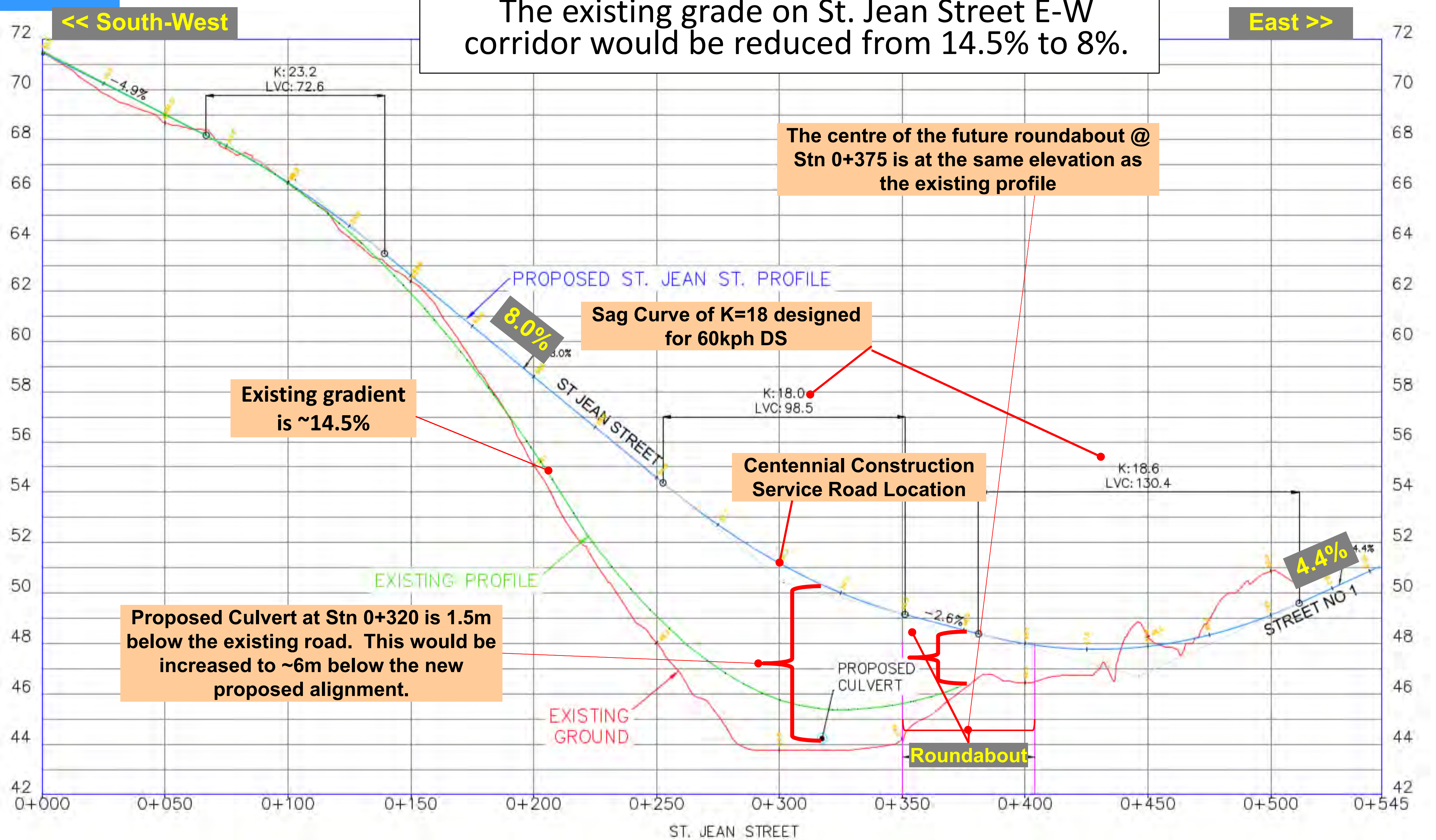
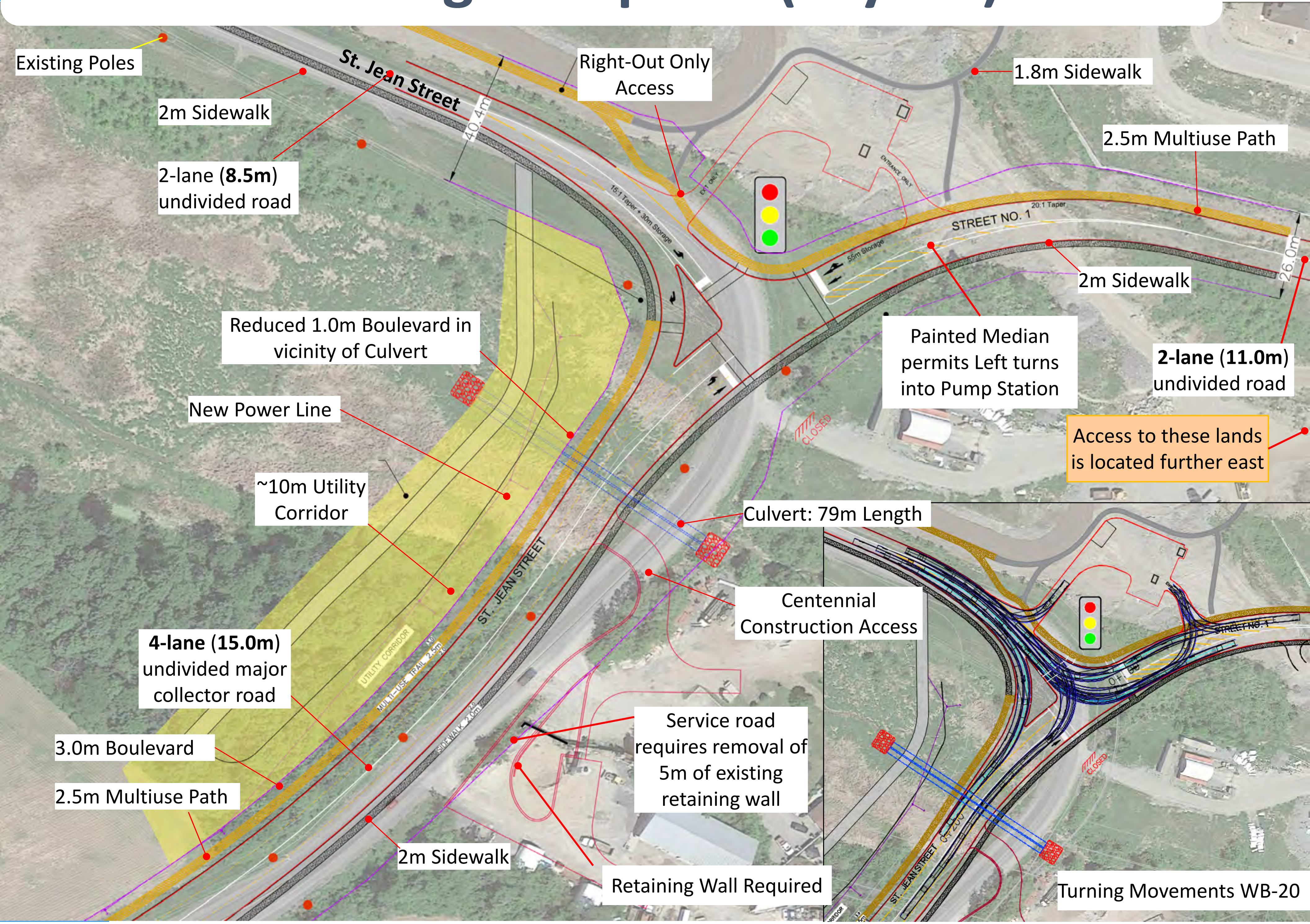
# Intersection #1: Roundabout Profile

The existing grade on St. Jean Street E-W corridor would be reduced from 14.5% to 8%.

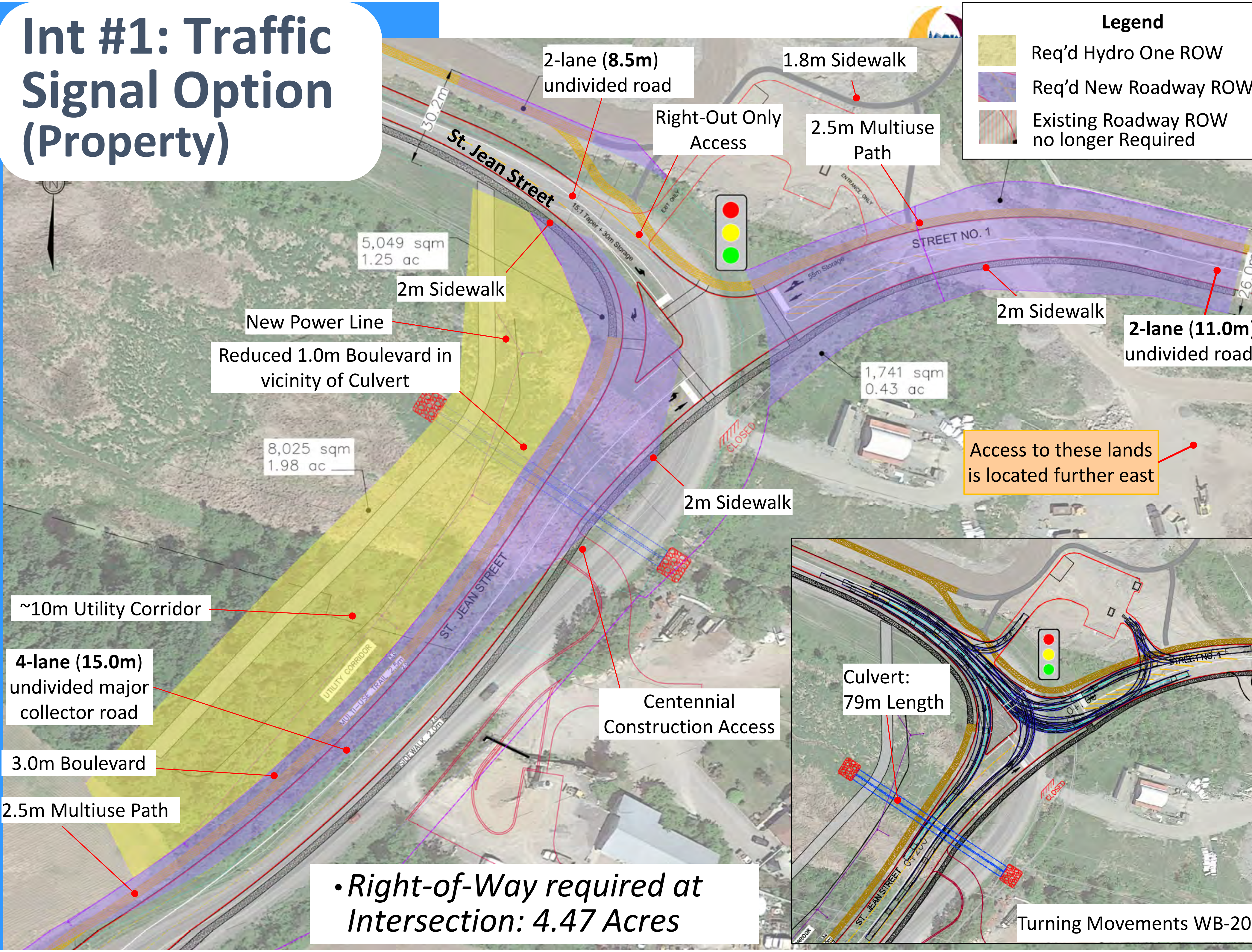


# Int #1: Traffic Signal Option (Layout)





# Int #1: Traffic Signal Option (Property)




- *Right-of-Way required at Intersection: 4.47 Acres*

# Intersection #1: Traffic Signal Option

- *Design:* Maintains Access to Centennial Construction by way of new service roadway network.
- *Land Use: Property protection of the* utility corridor represents a significant component of the right-of-way acquisition (~1.8 acres). The roundabout requires more land/property than the traffic signal concept.
- *Effect on Culvert*: The culvert remains essentially the same length at 79m.
- *Accesses*: The driveways to the storm water management site are extended with the traffic signal concept.
- *Cost:* The signalized intersection is likely cheaper than the roundabout.
- *Maintenance*: Annual costs are likely higher for the maintenance of the traffic signal
- *Operations*: Eastbound motorists travelling down the 8% grade may race to catch the green light at the intersection.

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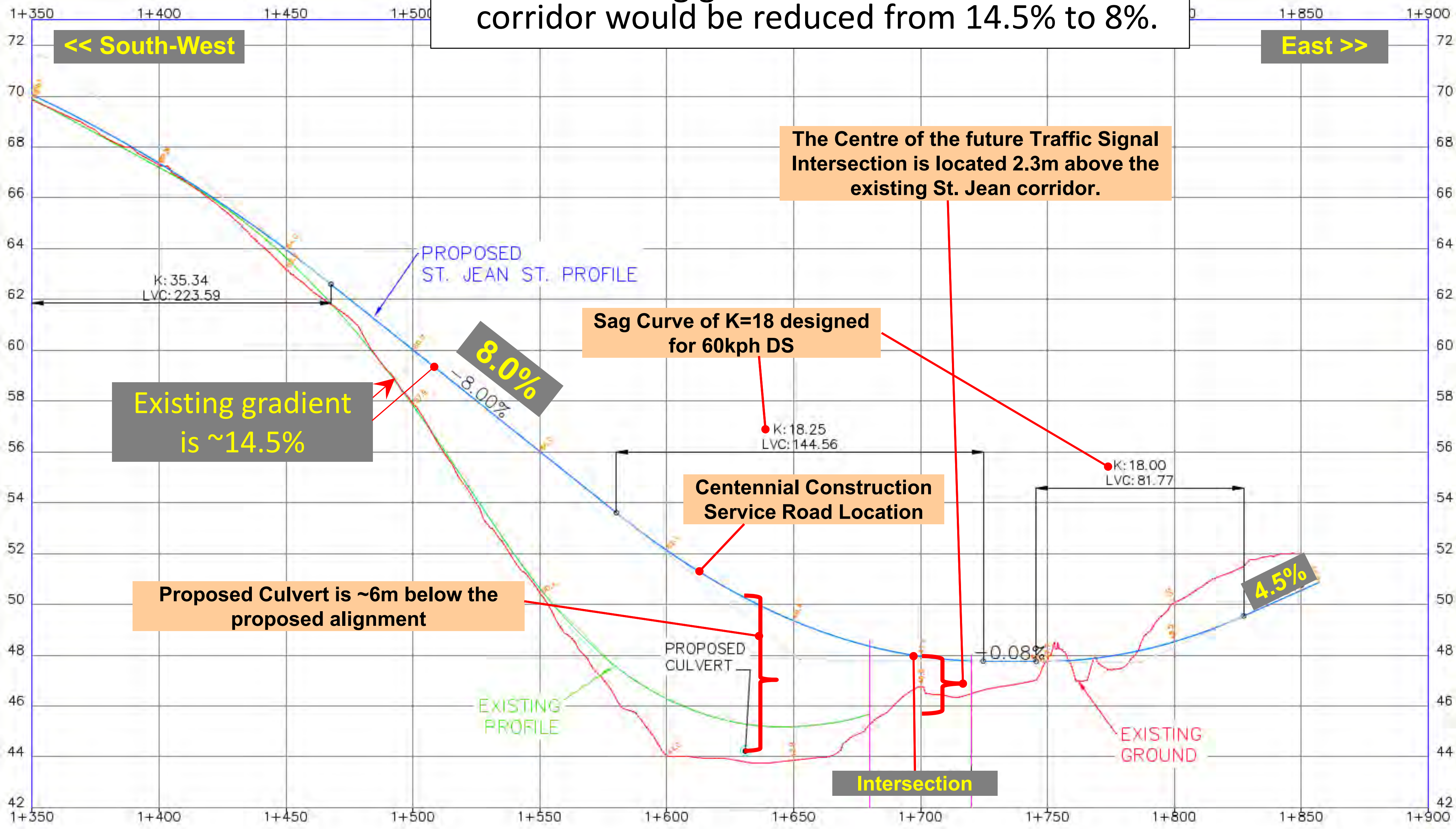
# Intersection #1: Traffic Signal Profile

The existing grade on St. Jean Street E-W corridor would be reduced from 14.5% to 8%.



# Intersection #2 Improvement Alternatives

## (POUPART ROAD / ST. JEAN STREET)

# Int #2: Roundabout Option (Layout)

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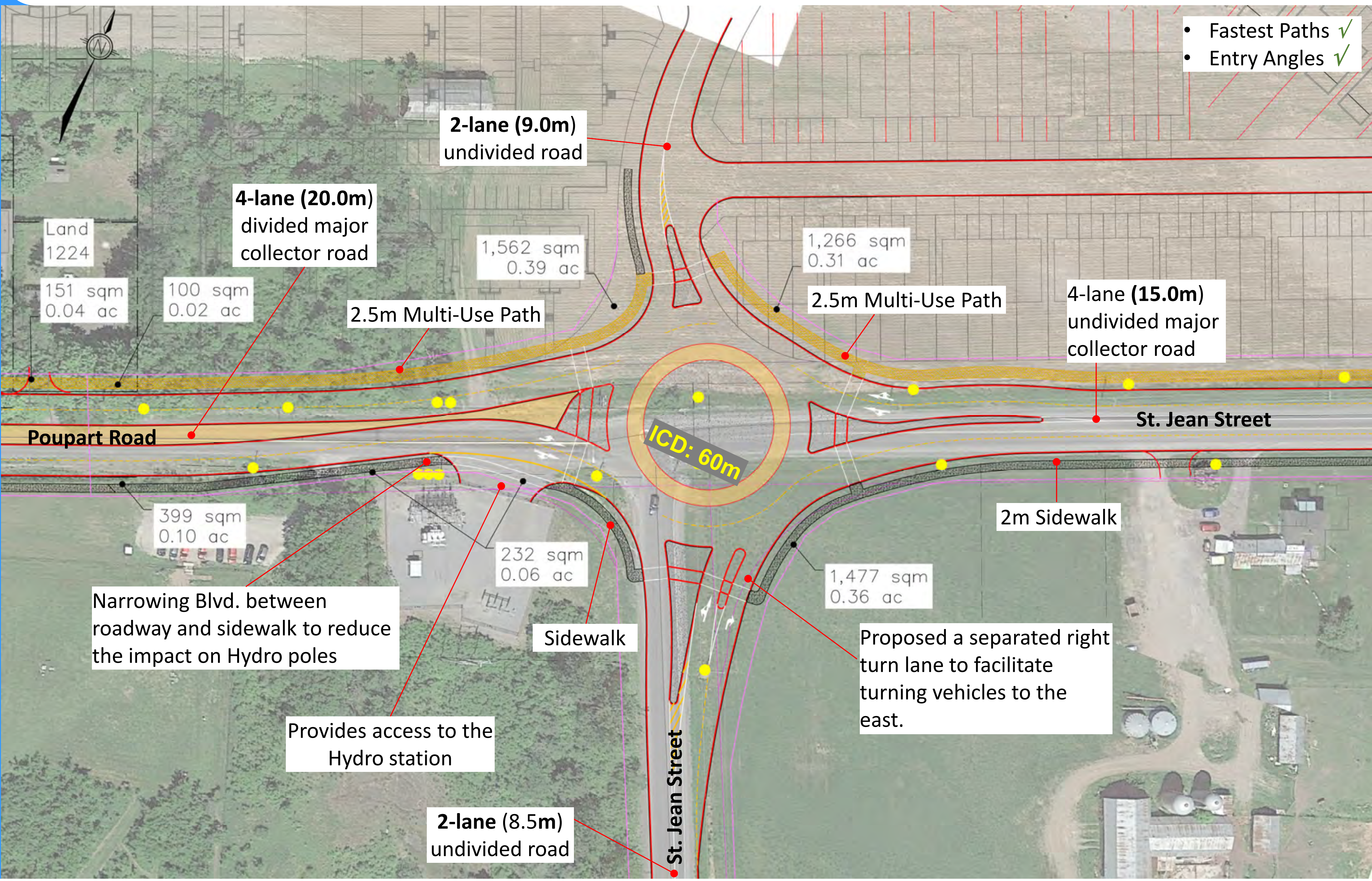

# Int #2: Roundabout Option (Property)



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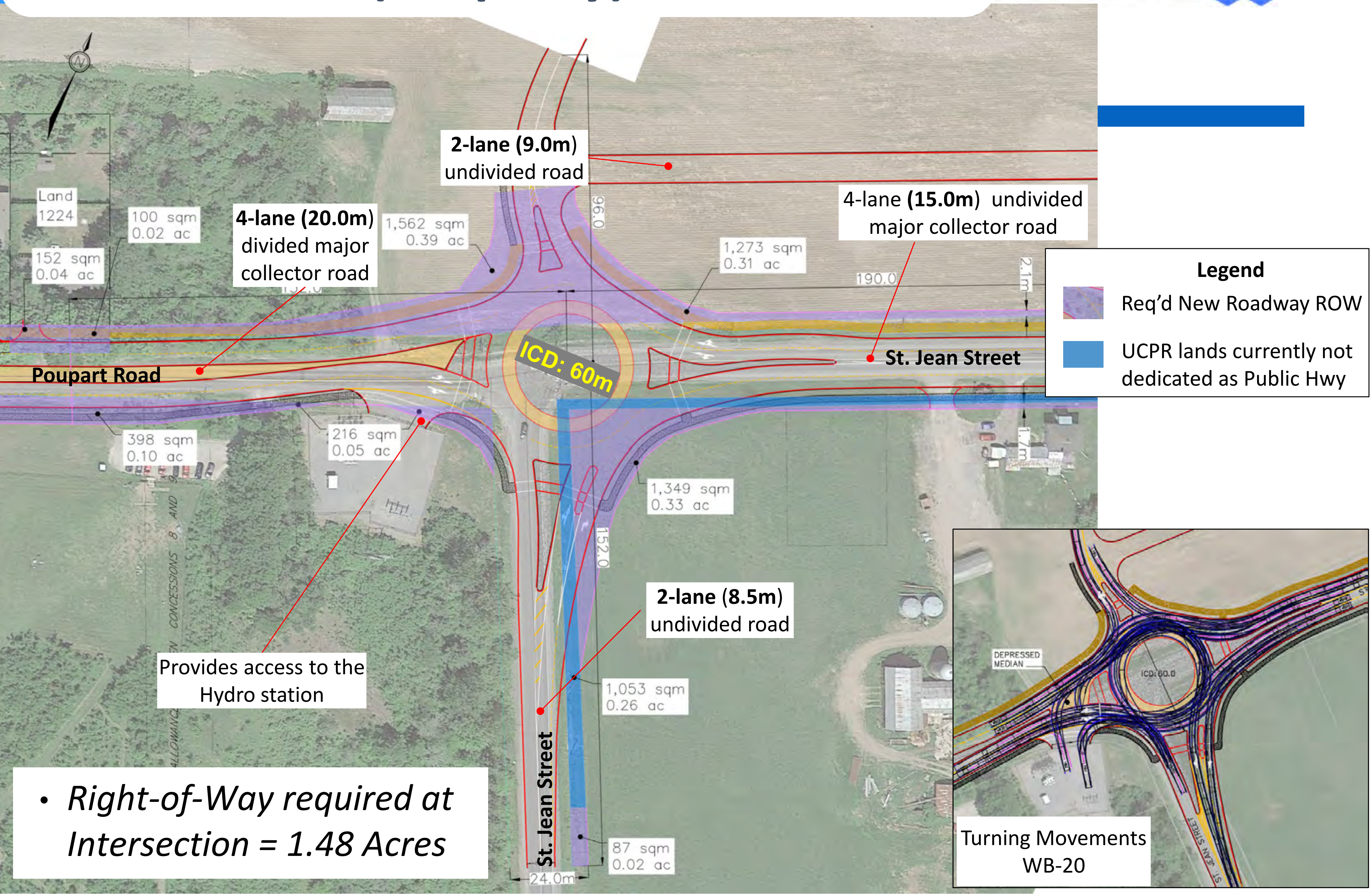


- *Right-of-Way required at Intersection = 1.48 Acres*

# Int #2: Traffic Signal Option (Layout)

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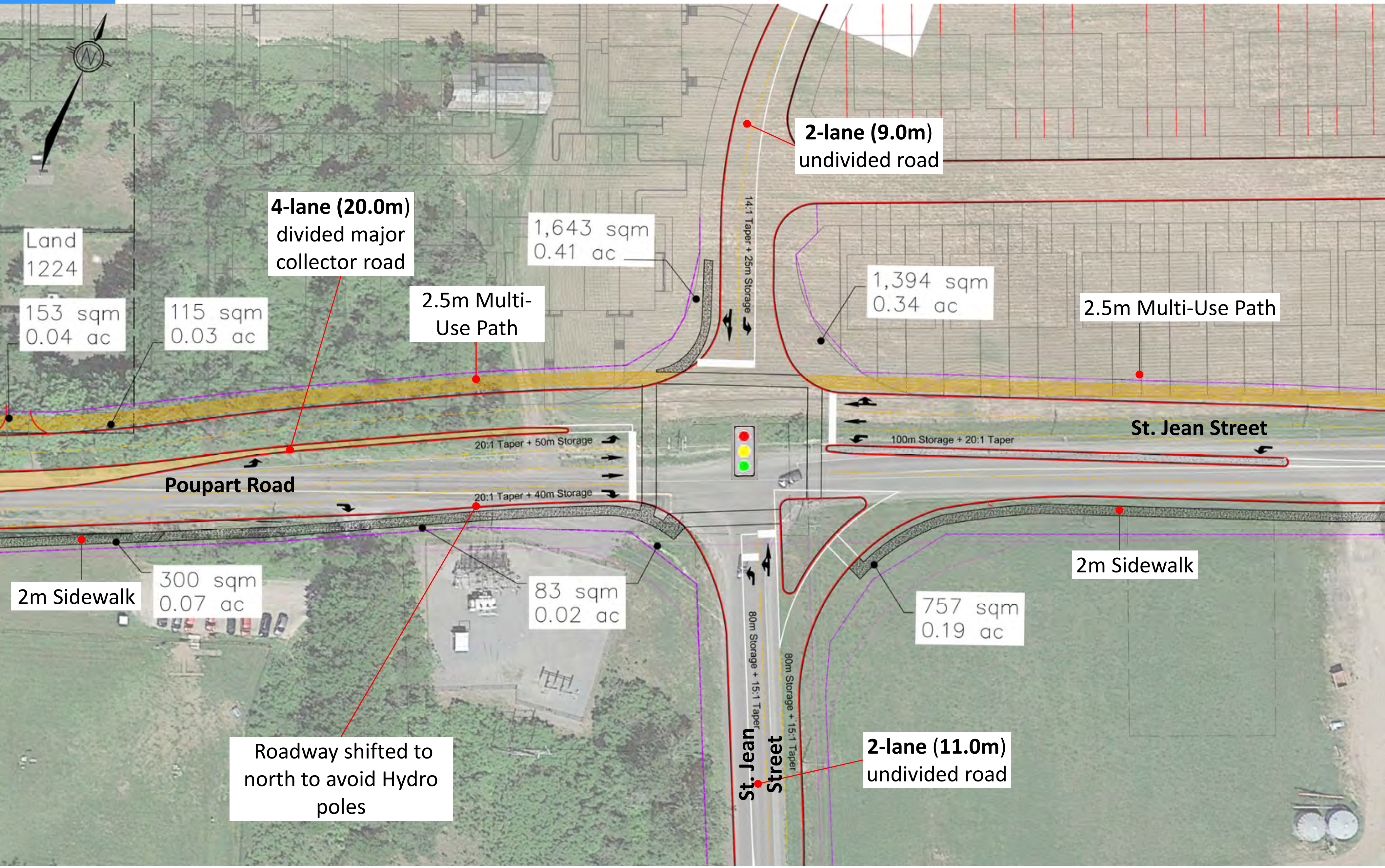
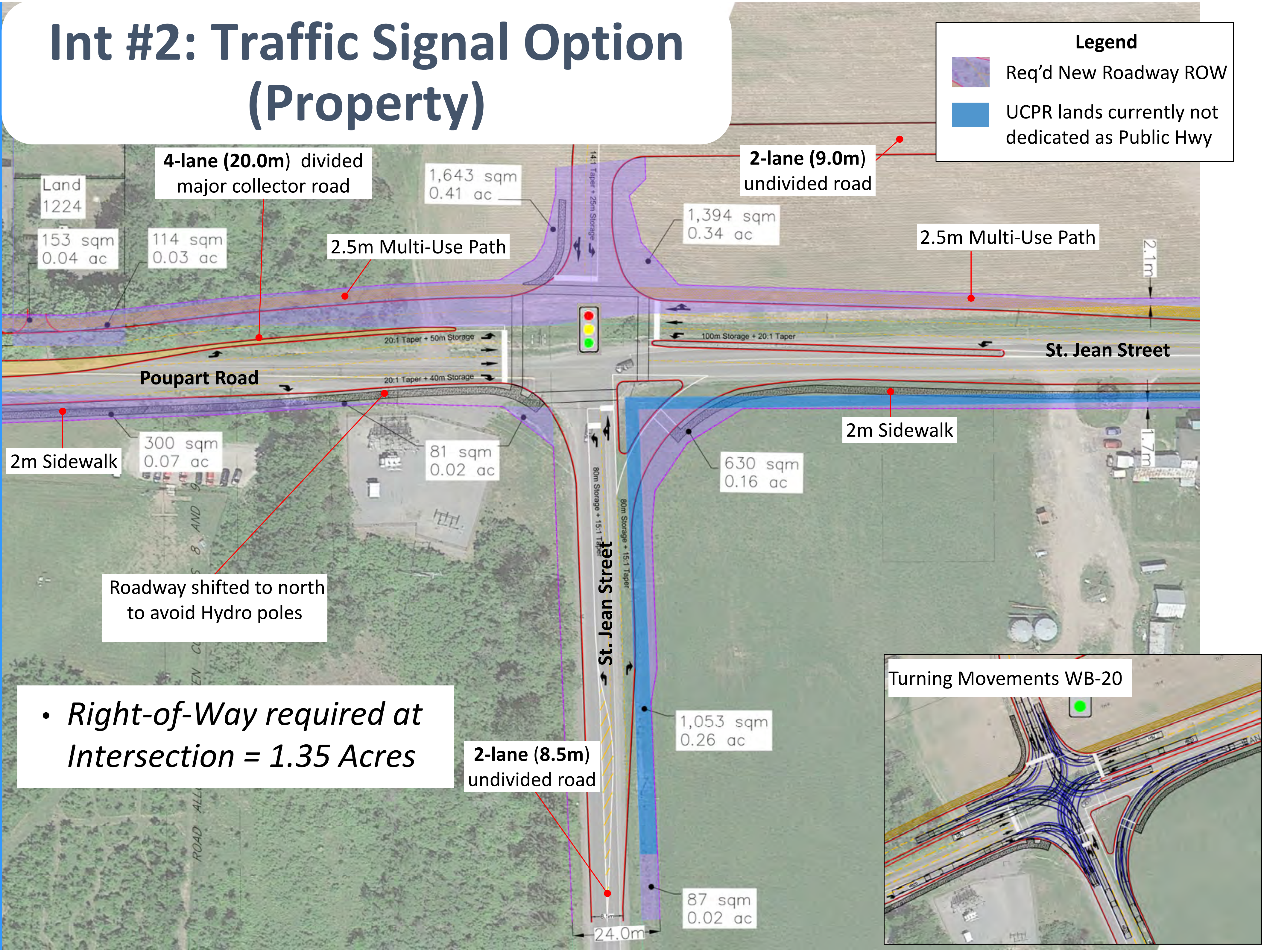


# Int #2: Traffic Signal Option (Property)




- *Right-of-Way required at Intersection = 1.35 Acres*

# Intersection #3 and #4 Improvement Alternatives

## (INT#3: POUPART EW / STEWART VILLAGE 1st)

## (INT#4: POUPART ROAD NS / EW)

# Int #3 & #4: Roundabout Option (Layout)

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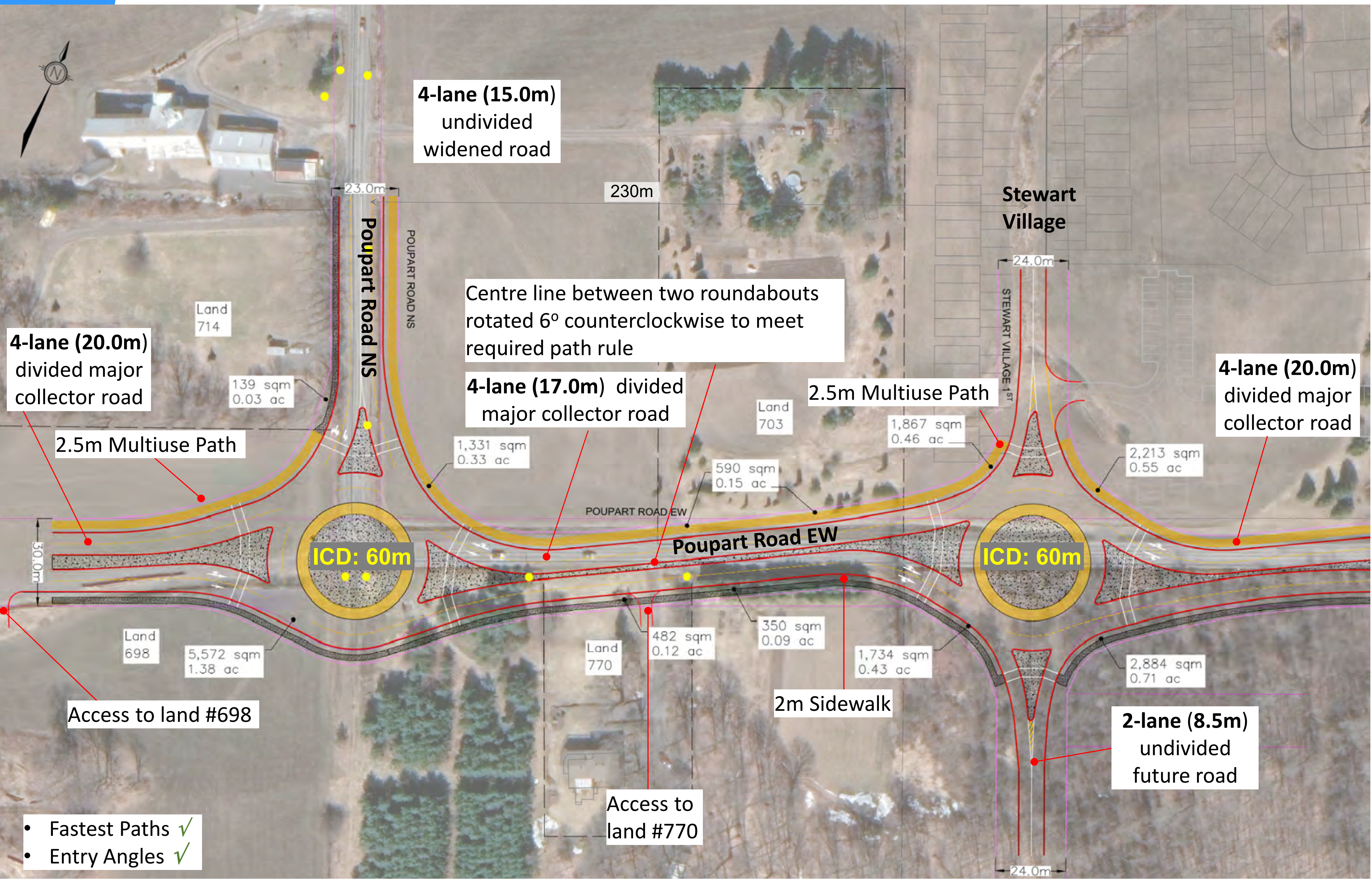

# Int #3 & #4: Roundabout Option (Property)

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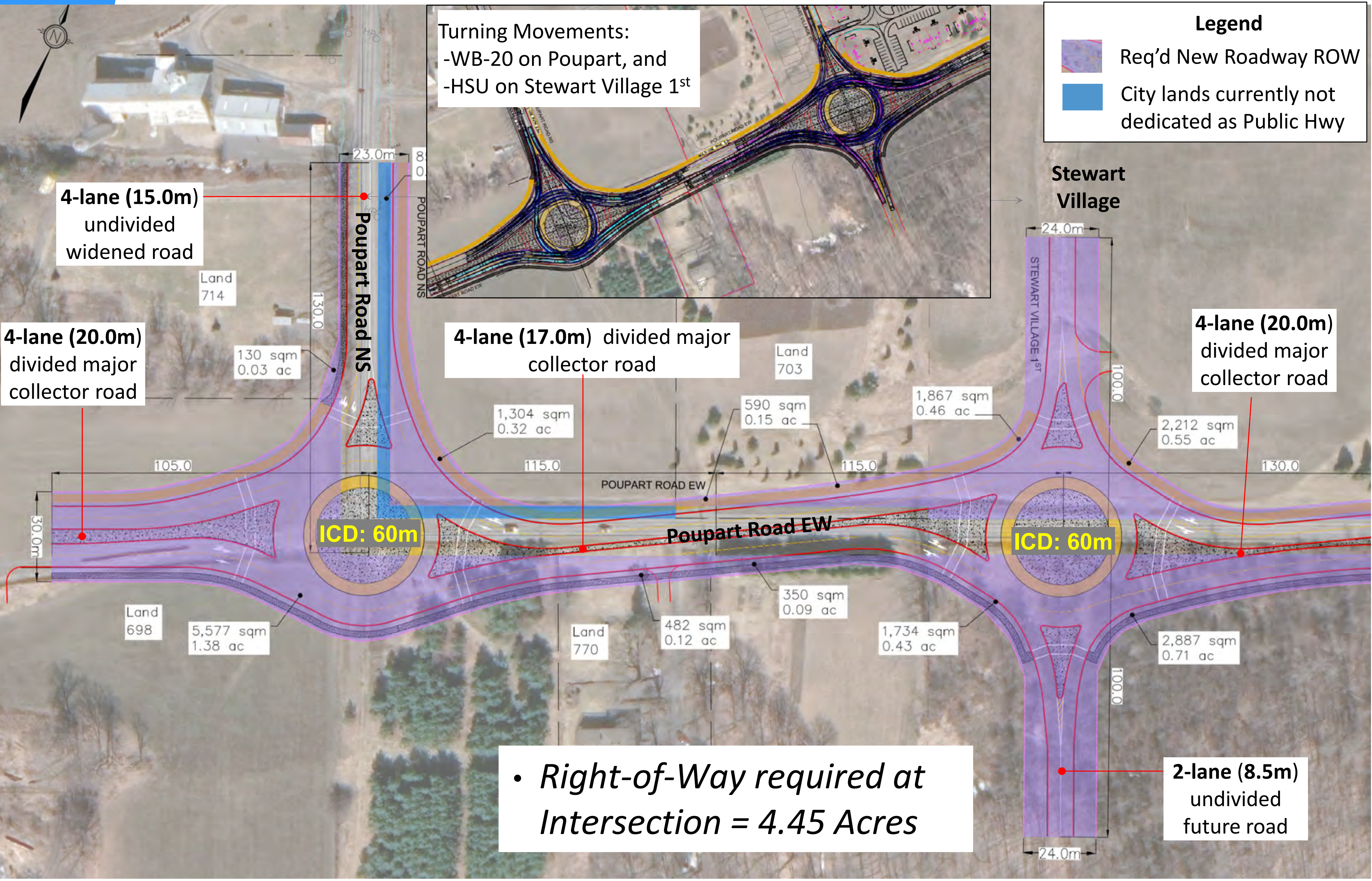


- *Right-of-Way required at Intersection = 4.45 Acres*

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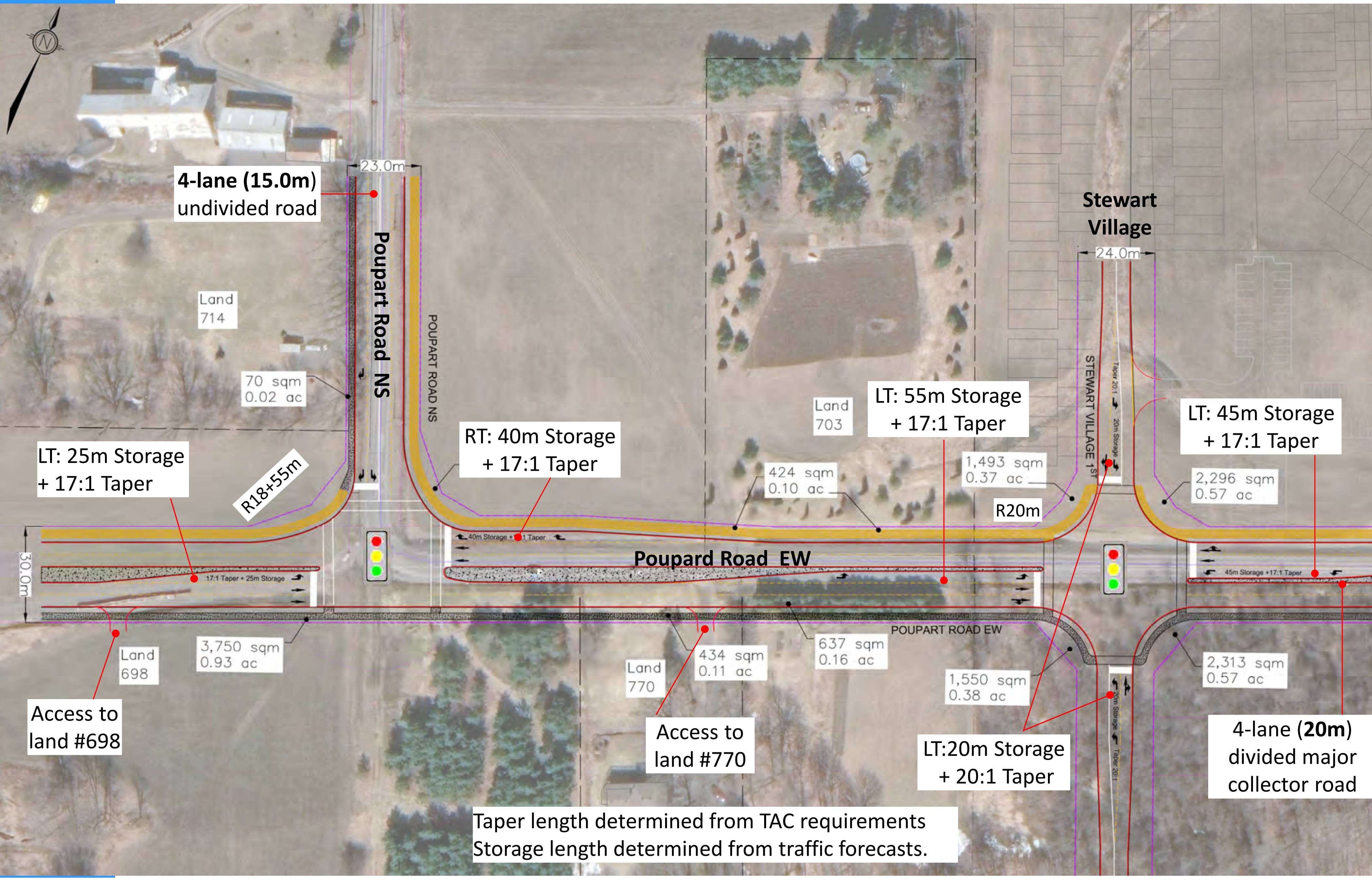
# Int #3 & #4: Traffic Signal (Layout)



# Int #3 & #4: Signal Option (Property)

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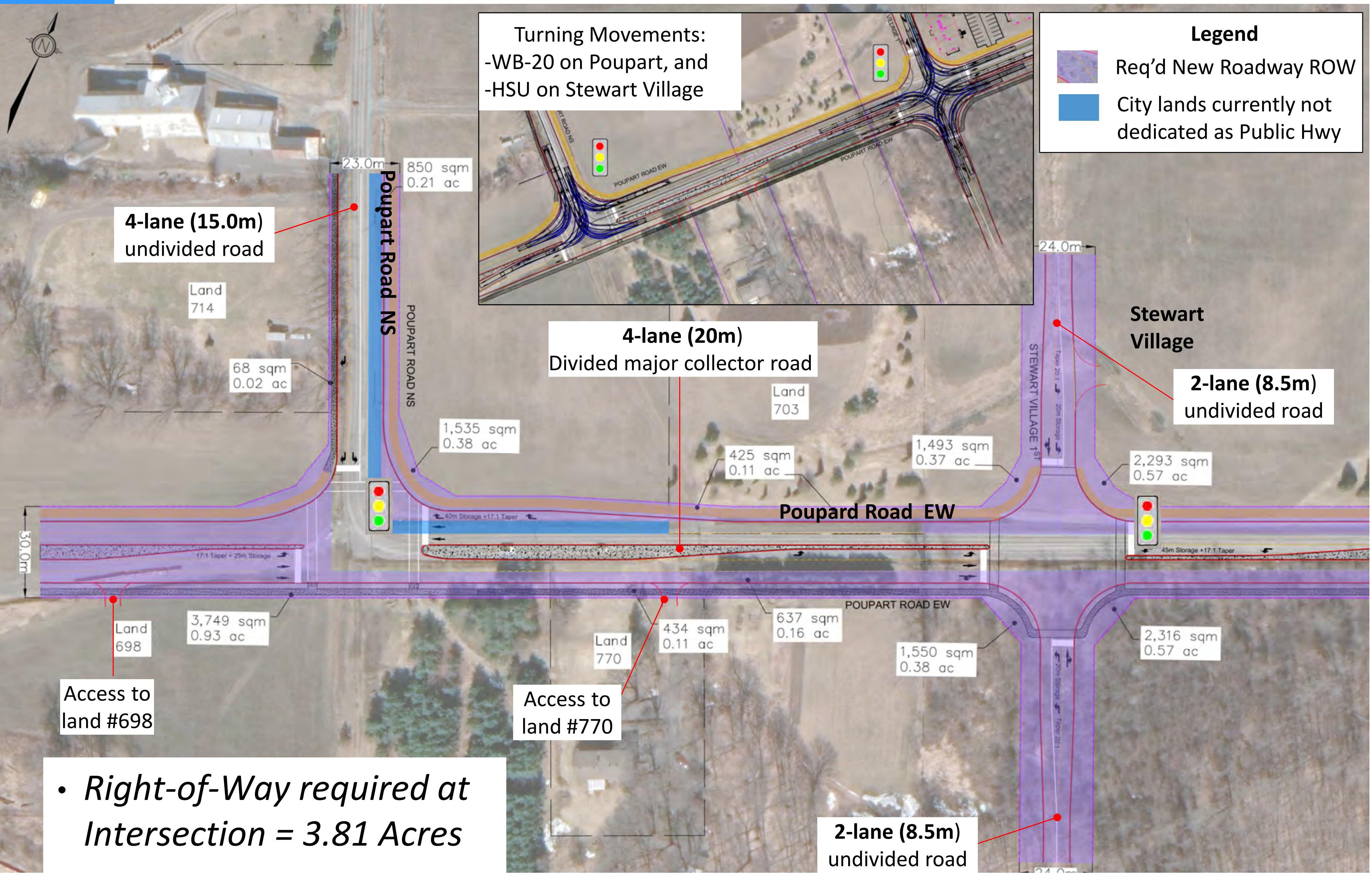


- *Right-of-Way required at Intersection = 3.81 Acres*

# Roadway Corridors between the Intersections

# Between Int #1 & #2: Roundabout

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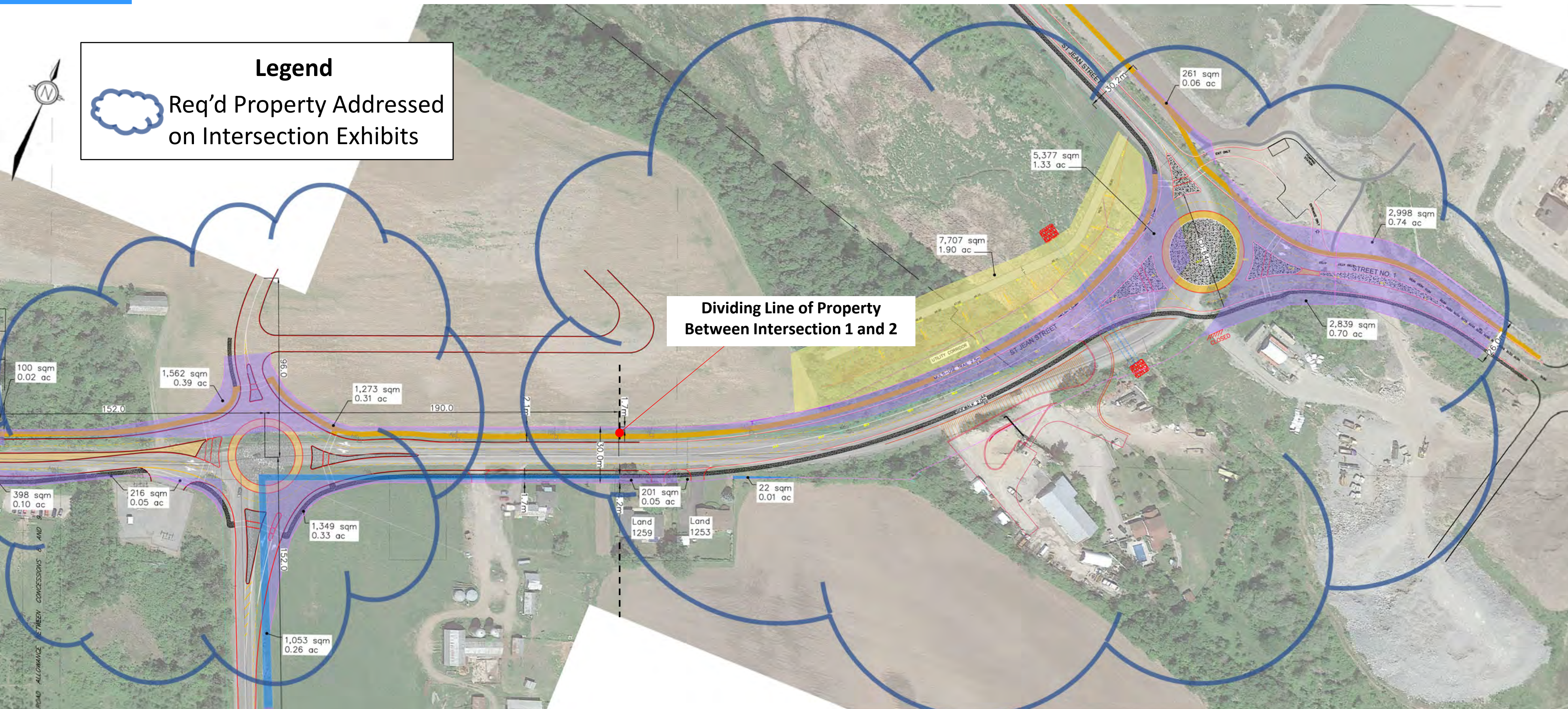


- ~ 2m of additional property *(Magenta Coloured Line)* required on each side of corridor.
- *Total Property required for Intersection 1 = 4.79 acres*
- *Total Property required for Intersection 2 = 1.48 acres*
- *Total Property of both Intersections 1 & 2 = 6.27 acres*

# Between Int #1 & #2: Traffic Signals

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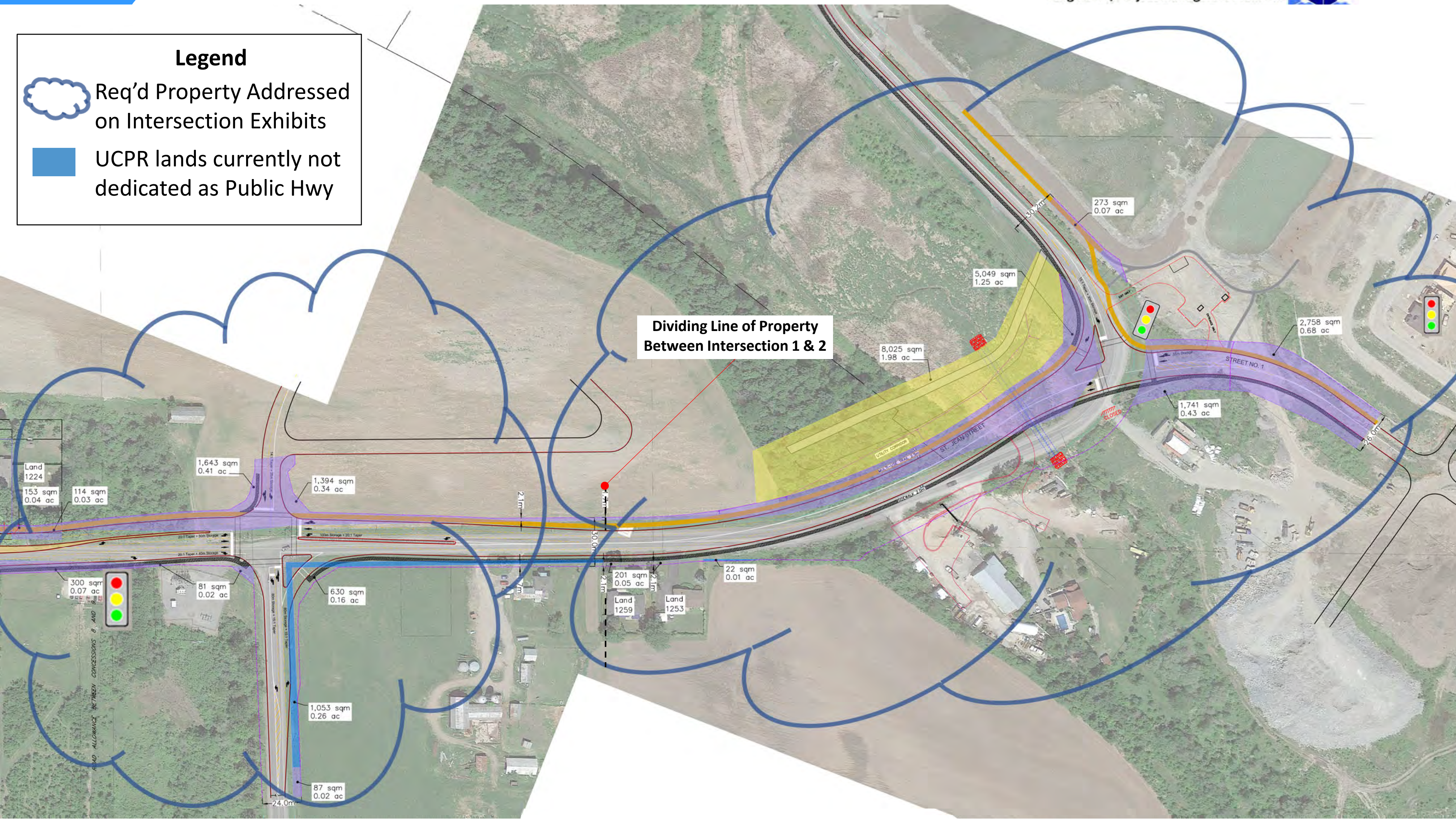


- ~ 2m of additional property *(Magenta Coloured Line)* required on each side of corridor.
- *Total Property required for Intersection 1 = 4.47 acres / Intersection 2 = 1.35 acres*
- *Total Property of both Intersections 1 & 2 = 5.82 acres*

# Between Int #2 & #3: Roundabout

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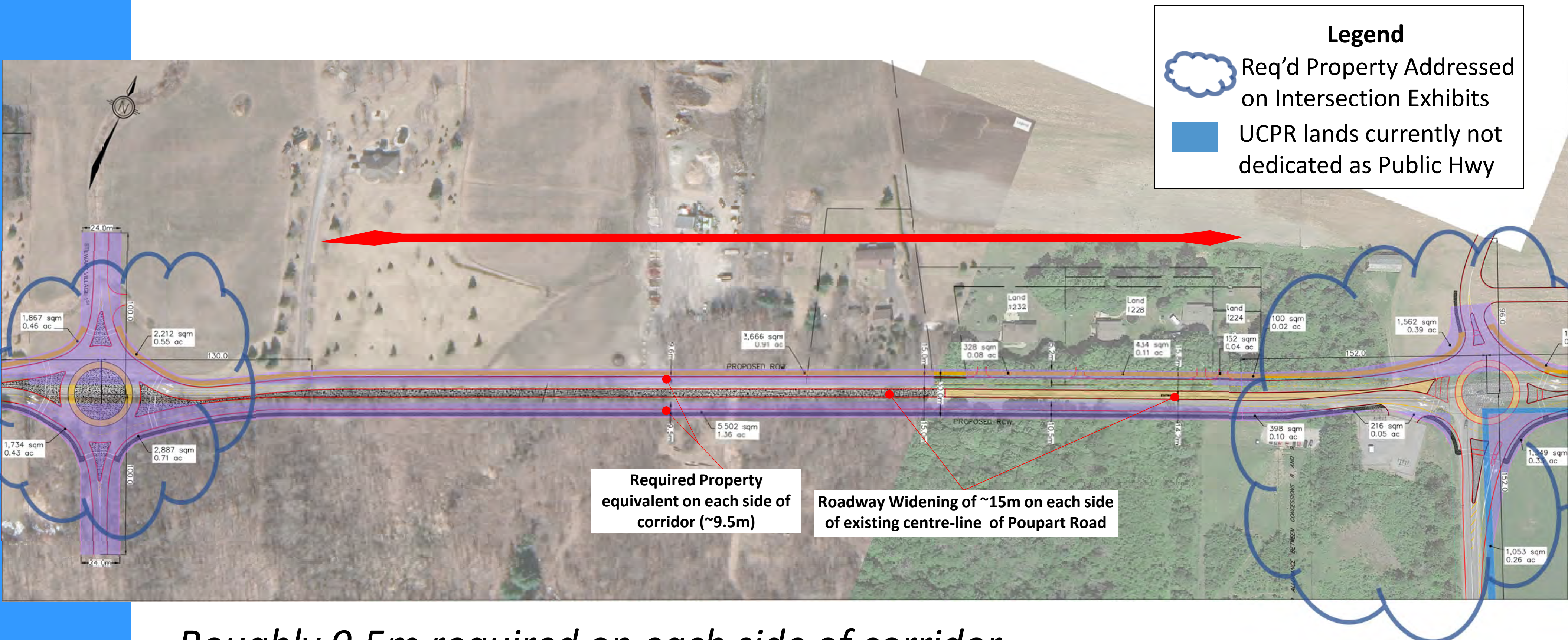


- *Roughly 9.5m required on each side of corridor*
  *( Approx. 5.2m is required from existing dwellings on the north side of the corridor.)*
- *Areas in have been included in intersection exhibits.*
- *Right-of-Way required north of Corridor excluding Roundabouts = 1.14 Acres*
- *Right-of-Way required south of Corridor excluding Roundabouts = 1.36 Acres*

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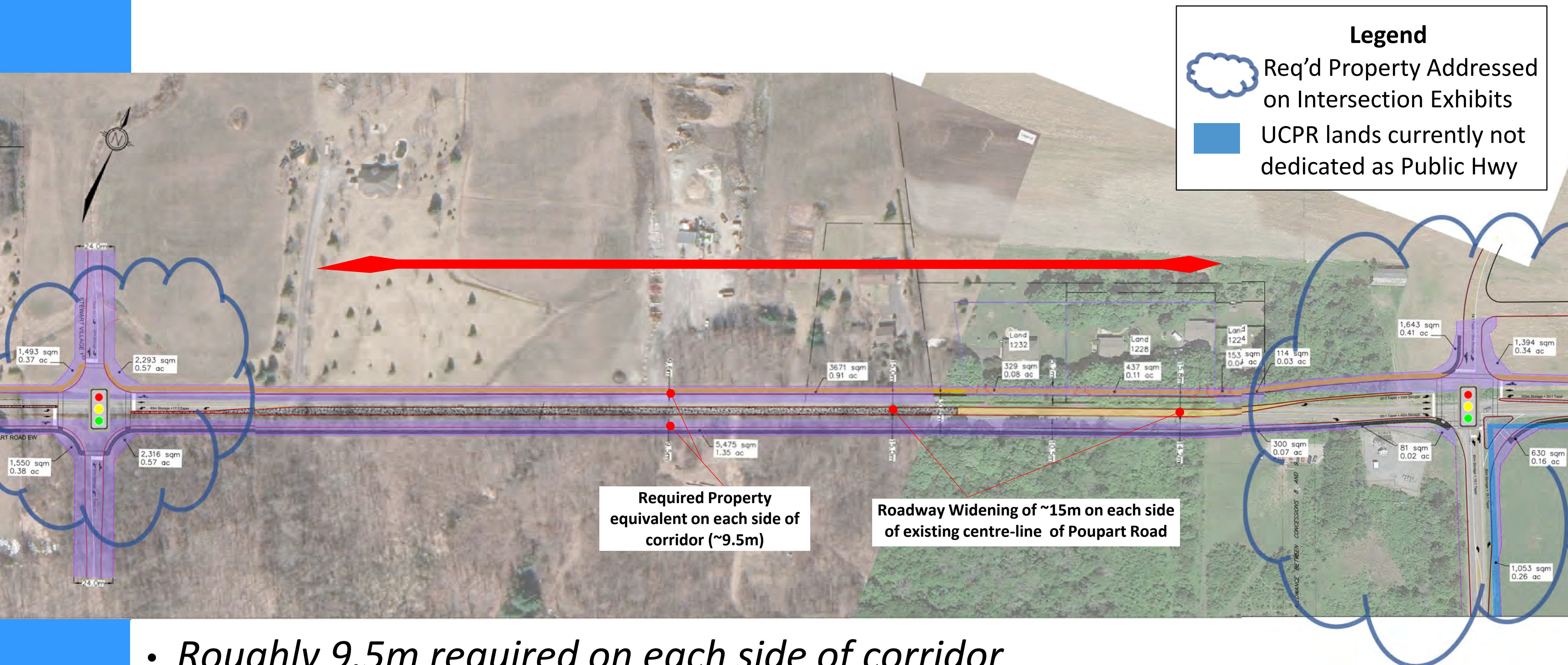
# Between Int #2 & #3: Traffic Signals




- *Roughly 9.5m required on each side of corridor*
  *(Approx. 5.2m required from existing dwellings on north side).*
- *Areas in* [cloud symbol] *have been included in intersection exhibits.*
- *Right-of-Way required north of Corridor excluding intersections = 1.14 Acres*
- *Right-of-Way required south of Corridor excluding intersections = 1.35 Acres*

# Between Int #1 & #2: Roadway Cross-Sections

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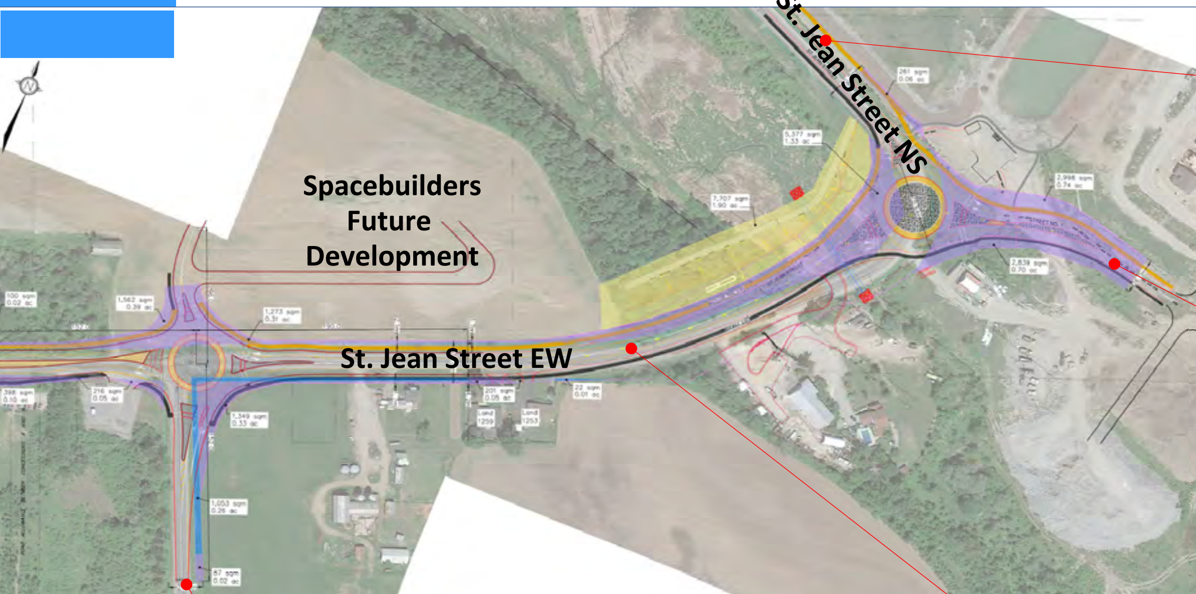


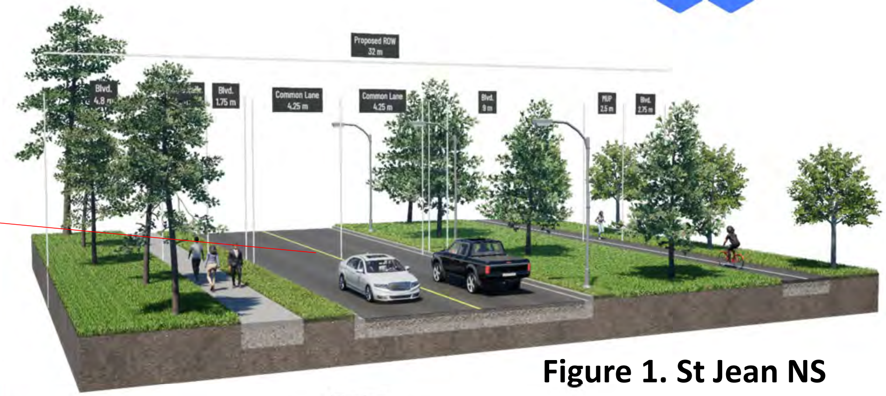

Figure 1. St Jean NS

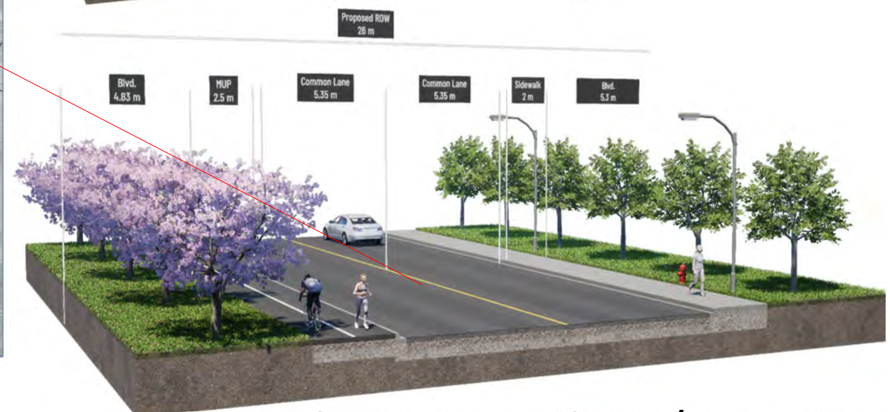


Figure 2. Intersection #1 / Bronze Avenue

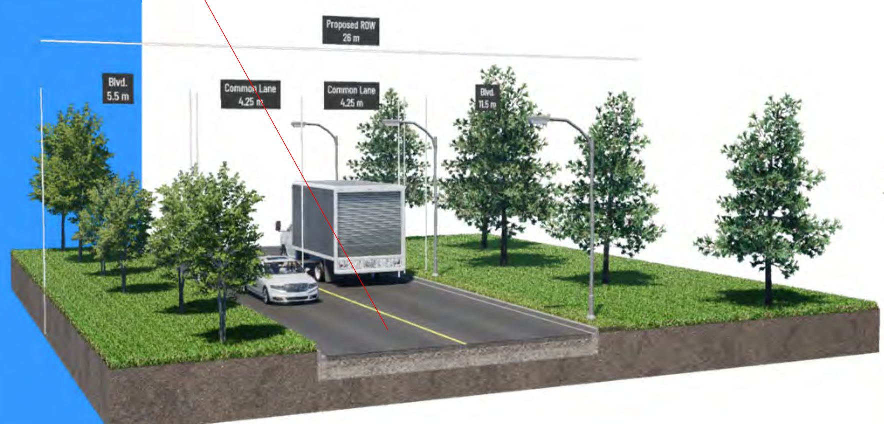


Figure 3. St Jean Street NS
(South of Intersection No. 2)

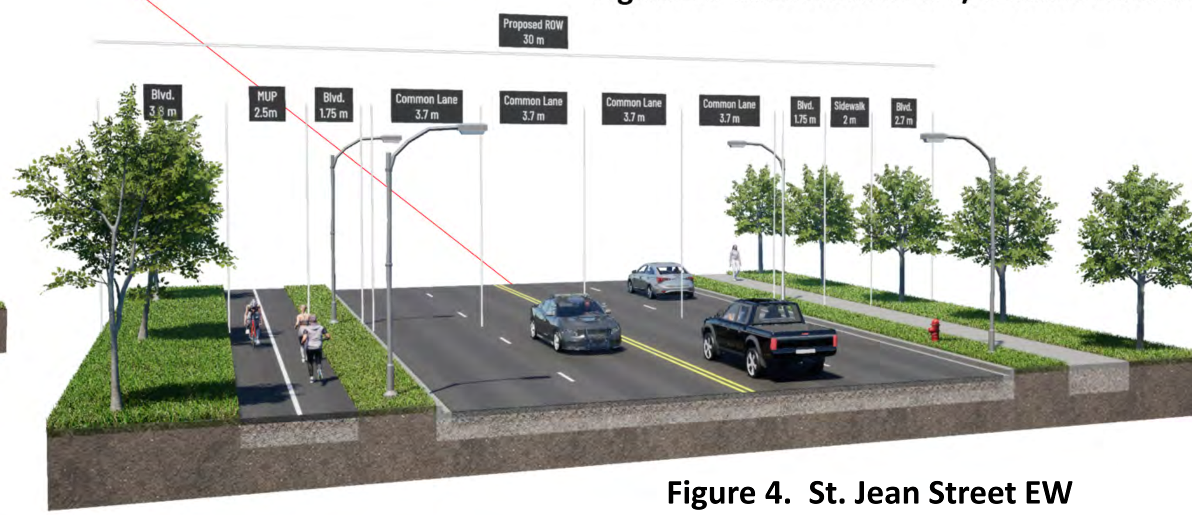


Figure 4. St. Jean Street EW

# Between Int #2 & #3 Roadway Cross-Sections

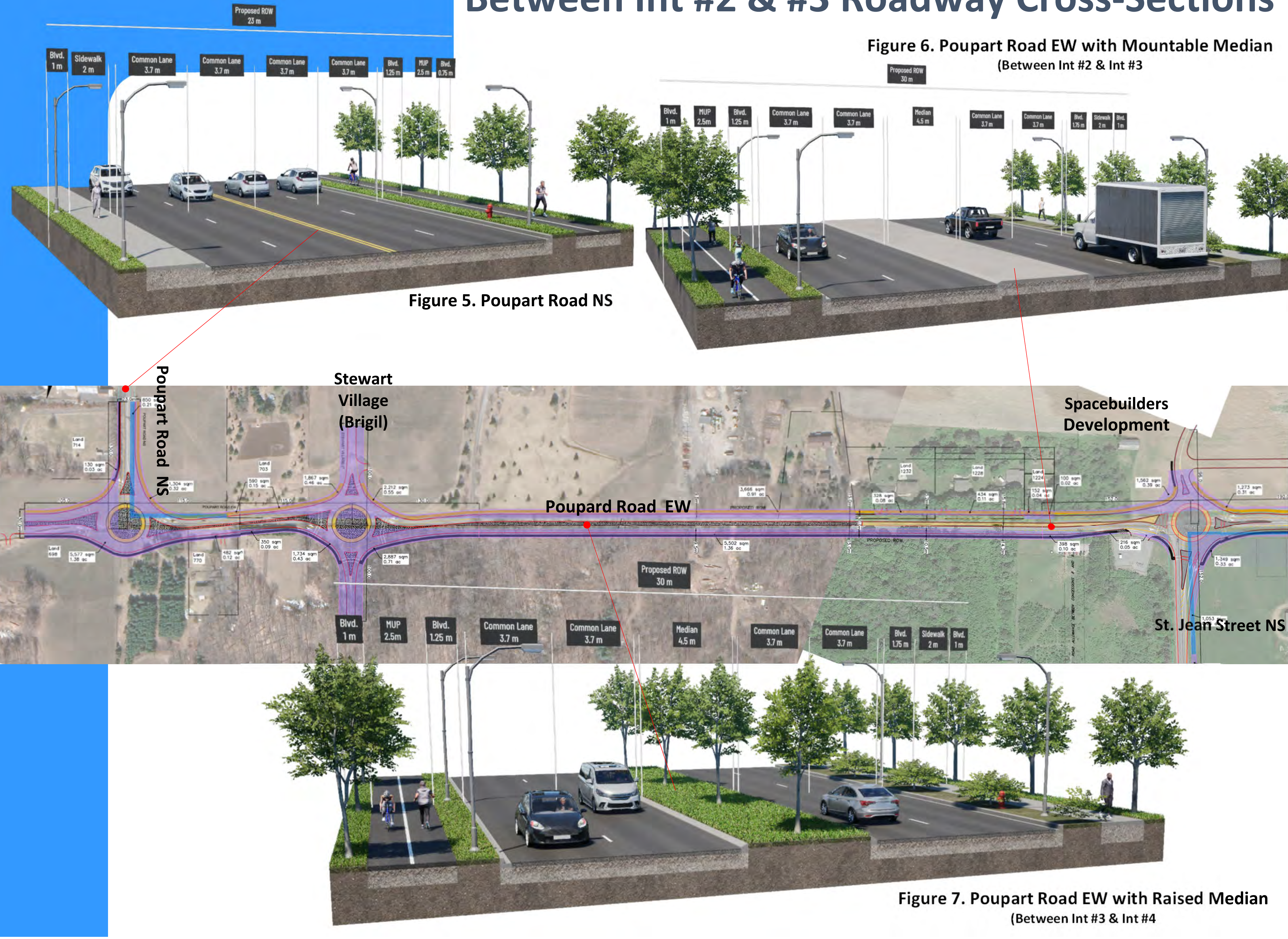


Figure 5. Poupart Road NS

Figure 6. Poupart Road EW with Mountable Median
(Between Int #2 & Int #3

Figure 7. Poupart Road EW with Raised Median
(Between Int #3 & Int #4

# Next Steps

**Respond to Public Comments**


**Further Technical Evaluation**

**Refine and recommend a plan with mitigations**


**Fall Meeting: Recommended Plan**

Following this Public Consultation Centre, we will:

- Review and respond to comments received;
- Evaluate the concepts from the perspective of impacts to the environment, air quality, noise, utilities, geo-technical, drainage, storm-water, property impacts, cultural and built heritage;
- refine the improvement alternatives;
- Identify a recommended plan and propose mitigation measures; and
- Present the recommended plan at a second meeting in the Fall, 2023.

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# Prochaines étapes

**Répondre aux commentaires du public**


**Évaluation technique complémentaire**

**Affiner et recommander un plan assorti de mesures d’atténuation**


**Rencontre à l’automne : plan recommandé**

À la suite du Centre de consultation publique, nous allons :

- examiner et répondre aux commentaires reçus;
- évaluer les concepts du point de vue des impacts sur l’environnement, la qualité de l’air, le bruit, les services publics, la géotechnique, le drainage, les eaux pluviales, les impacts sur la propriété, le patrimoine culturel et bâti;
- affiner les solutions d’amélioration;
- identifier un plan recommandé et proposer des mesures d’atténuation; et
- présenter le plan recommandé lors d’une deuxième rencontre à l’automne 2023.

# Before and After Renderings

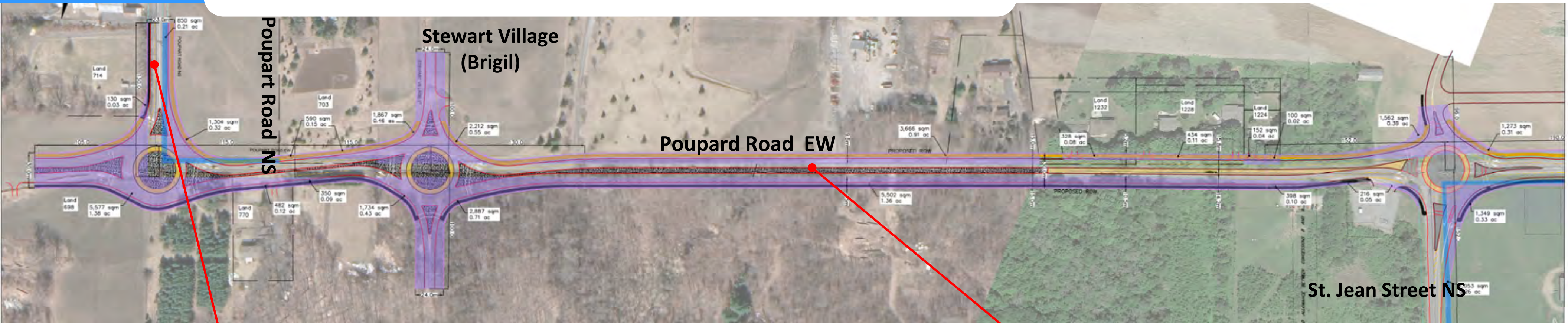




Figure 1. Poupart Road NS Concept
(North of Intersection 4)

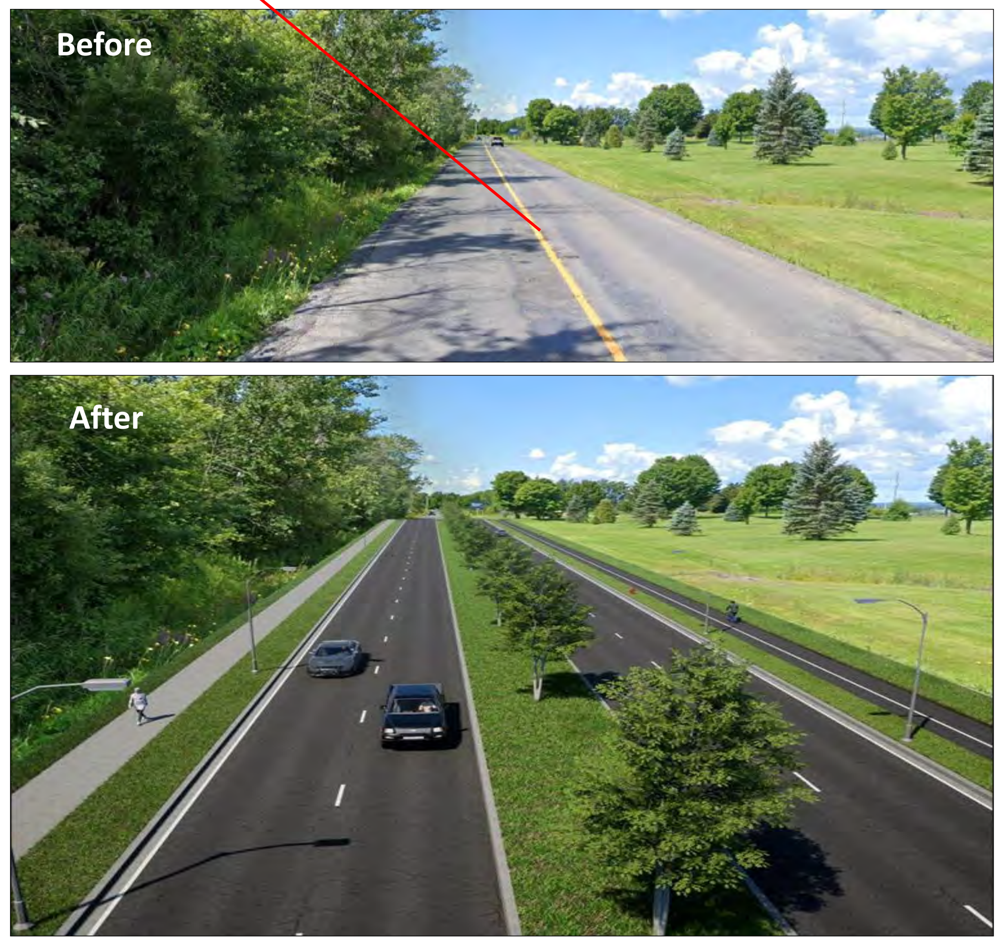



Figure 2. Before and After Concepts of Poupard Road EW
(West of Intersection 2)

# Next Steps

**Thank you for participating in the Public Consultation Centre. We welcome your comments.**

- Information is being collected in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

**To contact a member of the Project Team, please email:**

**Richard Campeau**
**Gestionnaire, Projets en capital / Manager, Capital Projects**
**Infrastructures et Aménagement du territoire / Infrastructure and Planning**
**Cité de / City of Clarence-Rockland**
**1560 rue Laurier Street, Rockland, Ontario, K4K 1P7**
**tél.: (613) 446-6022 #2239**
**E-mail: abeaulieu@clarence-rockland.com**

**Arthur Gordon**
**Consultant Project Manager**
**Castleglenn Consultants Inc.**
**2460 Lancaster Road, Suite 200**
**Ottawa, Ontario, K1B 4S5**
**Phone: (613) 731-4052 / Fax: (613) 731-0253**
**E-mail: Konstantin Joulanov <kjoulanov@castleglenn.ca>**

- **For more information, please visit:**

**City Web Site where this presentation will be posted.**

- **If you would like more information regarding this Class EA study, please contact a Project Team member. Contact information is provided on the comment sheet.**

# Prochaines étapes

**Nous vous remercions d'avoir participé au Centre de consultation publique. Vos commentaires sont les bienvenus.**

- Les renseignements sont collectés conformément à la *Loi sur l'accès à l'information et la protection de la vie privée*. À l'exception des informations personnelles, tous les commentaires feront partie du dossier public.

## Pour contacter un membre de l'équipe projet :

**Richard Campeau**
**Gestionnaire, Projets en capital**
**Infrastructures et Aménagement du territoire**
**Cité de Clarence-Rockland**
**1560 rue Laurier, Rockland, Ontario, K4K 1P7**
**tél.: (613) 446-6022 poste 2239**
**courriel : abeaulieu@clarence-rockland.com**

**Arthur Gordon**
**Conseiller/gestionnaire de projets**
**Castleglenn Consultants Inc.**
**2460, chemin Lancaster, bureau 200**
**Ottawa, Ontario, K1B 4S5**
**tél. : (613) 731-4052 / téléc. : (613) 731-0253**
**courriel : Konstantin Joulanov <kjoulanov@castleglenn.ca>**

- **Pour de plus amples renseignements :**

**Site web de la Cité où cette présentation sera affichée.**

- **Si vous souhaitez obtenir de plus amples renseignements sur cette Évaluation environnementale de classe générale, veuillez contacter un membre de l'équipe de projet. Les coordonnées des personnes à contacter figurent sur la feuille de commentaires.**

**Feel Free to Fill out this Comment Sheet Online! Visit:**

St-Jean - Poupart Reconstruction - City of Clarence-Rockland

**→ Click on "Comment Sheet"**

***St. Jean Street - Poupart Road Widening Project***

***Environmental Assessment: Phase 3 and 4***

## *Public Consultation Centre - June 15th, 2023*

(Optional)

Name: [redacted]

Address: [redacted]

Postal Code: [redacted]

~~Phone No.~~: [redacted]

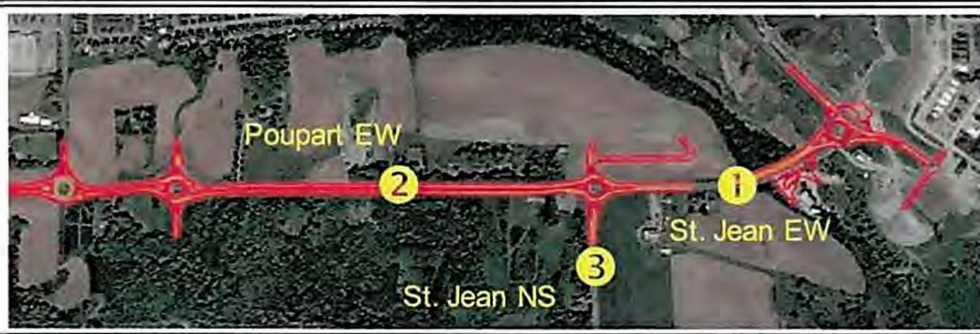
***Personal Information that you provide on this form is protected under the Freedom of Information and Protection of Privacy Act. The City of Clarence-Rockland would like to hear your comments or concerns. Consultation is an important part of the Municipal Class Environmental Assessment process and will help in shaping our environment and form part of the project documentation. With the exception of personal information, all comments will become part of the public record.***

**1. How often do you travel on...**

**a) #1 :** 1 times-per week.

**b) #2:** 1 times-per week.

**c) #3:** Ø times-per week.




**2. Do you have any concerns related to travel along the "existing" St. Jean-Poupart corridor?**
(Noise, near misses, traffic volumes, intersection congestion, speeding, pedestrian/cyclists roadway width, etc.)

none, no concerns but, i don't use that road often.

**3. Do you have any __non-traffic__ related comments or concerns about the project? Please specify.**
(Property impacts, access provisions, economic impacts, environmental impacts etc.)

Ø

Castleglenn Consultants

Clarence-Rockland

CORPORATION de la Cité de / of the City of CLARENCE-ROCKLAND

***St. Jean Street - Poupart Road Widening Project***
***Environmental Assessment: Phase 3 and 4***

## *Public Consultation Centre - June 15th, 2023*

**4. Please indicate which one of the following aspects related to changes along the St. Jean-Poupart corridor are most important to you by circling the letter in front of the statement:**

**The upgraded roadway and intersections must provide .....**

a. easy and fast access to/from my home, or job.

b. access to newly developing lands to stimulate the economy and accommodate the forecast growth of the community.

c. more convenient east-west access between the existing and planned communities.

d. for an alternative access route to the Highway 17 corridor.

e. additional roadside facilities to accommodate the needs of pedestrians and cyclists.

**5. Do you have any other roadway upgrades that you wish the study team to consider?**

1.

2.

3.

**6. Are their particular areas along the existing corridor that you wish to identify where you feel unsafe ..**

a) as a pedestrian: walking up the hill, on the shoulder of the road.

b) as a motorist:

**7. Do you have any additional comments or concerns regarding this study or any of the information that was presented?**

- I was very surprised by the amount of round-abouts being planned (5) but am very happy about the sidewalk that would go all the way to the Walmart neighbourhood.
- "Yes" to roundabouts, "no" to traffic lights → they "backup" the traffic too much!

Please return your comment sheet, either at the end of the meeting or, if you wish, by e-mail (kjoulanov@castleglenn.ca), postage or fax by **Friday, July 7th, 2023**.

Should you have any questions or concerns please contact **Mr. Arthur Gordon**, Consultant Project Manager, ***CastleGlenn Consultants Inc.*** toll-free by phone at (613) 731-4052, by fax at (613) 731-0253, or by mail at 2460 Lancaster Road, Suite 200, Ottawa, Ontario, K1B 4S5.

**Feel Free to Fill out this Comment Sheet Online! Visit:**

St-Jean - Poupart Reconstruction - City of Clarence-Rockland

**→ Click on "Comment Sheet"**

***St. Jean Street - Poupart Road Widening Project***

***Environmental Assessment: Phase 3 and 4***

## *Public Consultation Centre - June 15th, 2023*

(Optional)

Name: [redacted]

Address: [redacted]

Postal Code: [redacted]

Phone No.: [redacted]

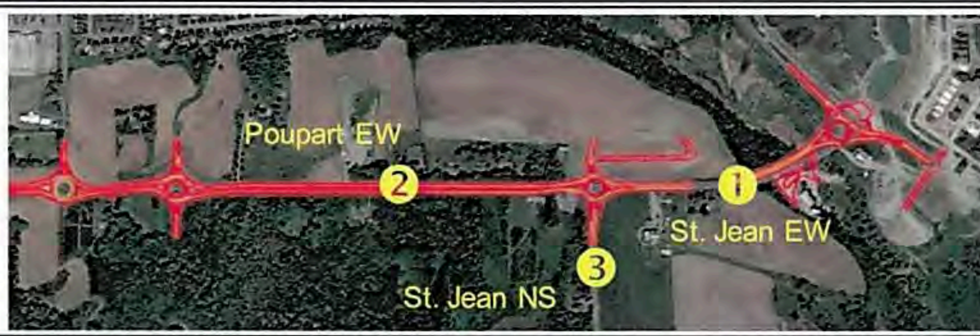
***Personal Information that you provide on this form is protected under the Freedom of Information and Protection of Privacy Act. The City of Clarence-Rockland would like to hear your comments or concerns. Consultation is an important part of the Municipal Class Environmental Assessment process and will help in shaping our environment and form part of the project documentation. With the exception of personal information, all comments will become part of the public record.***

**1. How often do you travel on…**

**a) #1 :**____ times-per week.

**b) #2:** ____ times-per week.

**c) #3:** ____ times-per week.




**2. Do you have any concerns related to travel along the "existing" St. Jean-Poupart corridor?**
(Noise, near misses, traffic volumes, intersection congestion, speeding, pedestrian/cyclists roadway width, etc.)

wild life habitat ) SUR-POPULATION

maple site INFRASTRUCTURE

ERABLIERE SANTE, EDUCATION

BOISEES SERVICE DEL A VILLE

TAXES

**3. Do you have any non-traffic related comments or concerns about the project? Please specify.**
(Property impacts, access provisions, economic impacts, environmental impacts etc.)

ROUND ABOUTS RULE!

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CORPORATION de la Cité de / of the City of CLARENCE-ROCKLAND

*St. Jean Street - Poupart Road Widening Project*
*Environmental Assessment: Phase 3 and 4*

## *Public Consultation Centre - June 15th, 2023*

**4. Please indicate which one of the following aspects related to changes along the St. Jean-Poupart corridor are most important to you by circling the letter in front of the statement:**

**The upgraded roadway and intersections must provide .....**

a. easy and fast access to/from my home, or job.

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c. more convenient east-west access between the existing and planned communities.

d. for an alternative access route to the Highway 17 corridor.

e. additional roadside facilities to accommodate the needs of pedestrians and cyclists.

**5. Do you have any other roadway upgrades that you wish the study team to consider?**

1.

2.

3.

**6. Are their particular areas along the existing corridor that you wish to identify where you feel unsafe ..**

a) as a pedestrian:

b) as a motorist:

**7. Do you have any additional comments or concerns regarding this study or any of the information that was presented?**

Please return your comment sheet, either at the end of the meeting or, if you wish, by e-mail (kjoulanov@castleglenn.ca), postage or fax by **Friday, July 7th, 2023**.

Should you have any questions or concerns please contact **Mr. Arthur Gordon**, Consultant Project Manager, ***CastleGlenn Consultants Inc.*** toll-free by phone at (613) 731-4052, by fax at (613) 731-0253, or by mail at 2460 Lancaster Road, Suite 200, Ottawa, Ontario, K1B 4S5.

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St-Jean - Poupart Reconstruction - City of Clarence-Rockland

**→ Click on "Comment Sheet"**

***St. Jean Street - Poupart Road Widening Project***
***Environmental Assessment: Phase 3 and 4***

## *Public Consultation Centre - June 15th, 2023*

(Optional)

Name: [redacted]

Postal Code: [redacted]

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**1. How often do you travel on…**

**a) #1** : 10 times-per week.

**b) #2:** ____ times-per week.

**c) #3:** ____ times-per week.


**2. Do you have any concerns related to travel along the "existing" St. Jean-Poupart corridor?**
(Noise, near misses, traffic volumes, intersection congestion, speeding, pedestrian/cyclists roadway width, etc.)

Mt. Poupart is not suitable for the volume of Trafic.

**3. Do you have any non-traffic related comments or concerns about the project? Please specify.**
(Property impacts, access provisions, economic impacts, environmental impacts etc.)

This is the 1rst time I hear that you have to Annex property on the South side of MT. Poupart. No respect for the hand oweners.

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Clarence-Rockland

CORPORATION de la Cité de / of the City of CLARENCE-ROCKLAND

*St. Jean Street - Poupart Road Widening Project*
*Environmental Assessment: Phase 3 and 4*

## *Public Consultation Centre - June 15th, 2023*

**4. Please indicate which one of the following aspects related to changes along the St. Jean-Poupart corridor are most important to you <u>by circling the letter in front of the statement</u>:**

**The upgraded roadway and intersections must provide .....**

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c. more convenient east-west access between the existing and planned communities.

d. for an alternative access route to the Highway 17 corridor.

e. additional roadside facilities to accommodate the needs of pedestrians and cyclists.

**5. Do you have any other roadway upgrades that you wish the study team to consider?**

1. The MT. Poupart rd needs to improved but yet still a bottle neck to access the 174.
2. 
3. 

**6. Are their particular areas along the existing corridor that you wish to identify where you feel unsafe ..**

a) as a pedestrian: unsafe to walk

b) as a motorist: ditch is very dangerous - Many cars end up in ditch.

**7. Do you have any additional comments or concerns regarding this study or any of the information that was presented?**

The study is fine - However The Land oweners should have been notifyed previously on possible annexation of property. No repect of property of Land oweners. When are you going to make sure to respect the name of the st. Montée Poupart

Please return your comment sheet, either at the end of the meeting or, if you wish, by e-mail (kjoulanov@castleglenn.ca), postage or fax by **Friday, July 7th, 2023**.

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**Vous pouvez également remplir ce formulaire en ligne! Pour ce faire, veuillez accéder à cette page Web :**

Réaménagement de la rue St-Jean / du chemin Poupart – Cité de Clarence-Rockland

**→ et cliquer sur « feuille de commentaires »**

***Projet d'élargissement de la rue St-Jean / du chemin Poupart***

***Évaluation environnementale – phases 3 et 4***

## *Consultation publique – 15 juin 2023*

(Optionnel)

Nom : [redacted]

Adress[redacted]

Code postal : [redacted]

Numéro de telephone [redacted]

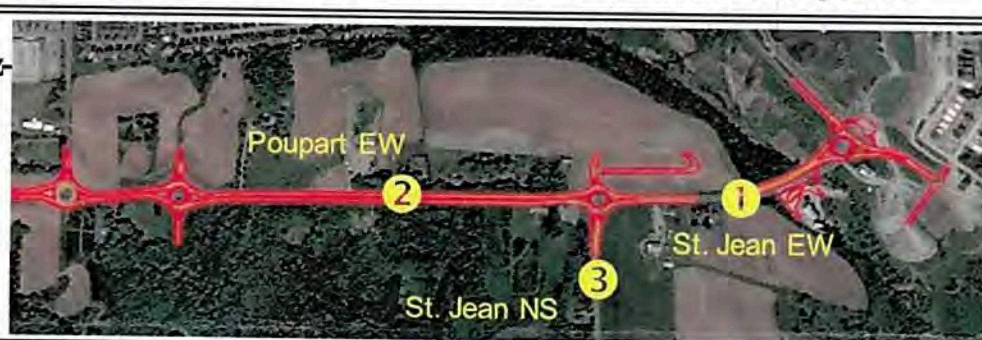
***Les renseignements personnels que vous fournissez sur ce formulaire sont protégés en vertu de la Loi sur l'accès à l'information et la protection de la vie privée. La Cité de Clarence-Rockland souhaite recueillir vos commentaires et connaître vos préoccupations. La consultation est un élément important du processus d'évaluation environnementale municipale de portée générale (EEMPG). Elle contribuera à façonner notre environnement et fera partie intégrante de la documentation du projet. À l'exception des renseignements personnels, tous les commentaires feront partie du dossier public.***

**1. À quelle fréquence empruntez-vous…**

**a) nº 1 :**____ fois par semaine.

**b) nº 2 :** ____ fois par semaine.

**c) nº 3 :** ____ fois par semaine.




**2. Avez-vous des préoccupations concernant les déplacements le long du corridor « existant » St-Jean/Poupart?** (bruit, accidents évités de justesse, volumes de circulation, congestion aux intersections, excès de vitesse, largeur de la chaussée pour piétons et cyclistes, etc.)

Definitivement le corridor existant doit être amélioré pour etre capable de soutenir la circulation avec le nouveau developpement Stewart et Morris.
Une autre sortie sur la 174 devrait être considéré

**3. Avez-vous des commentaires ou des préoccupations non liés à la circulation concernant ce projet? Veuillez préciser** (répercussions sur les propriétés, dispositions relatives à l'accès, répercussions économiques, répercussions environnementales, etc.)

~~Les propriétés existantes sur Poupart~~
Les propriétaires sur Poupart doivent être extrêment inquiets de l'élargissement de Poupart / St-Jean.

Castleglenn Consultants

Clarence-Rockland

CORPORATION de la Cité de / of the City of CLARENCE-ROCKLAND

*Projet d'élargissement de la rue St-Jean / du chemin Poupart*

*Évaluation environnementale – phases 3 et 4*

## *Consultation publique – 15 juin 2023*

**4. Parmi les aspects suivants liés aux changements le long du corridor St-Jean / Poupart, veuillez indiquer lequel est le plus important pour vous en <u>encerclant la lettre de l'énoncé</u> :**

**La modernisation du réseau routier et des intersections doit permettre…**

a. des déplacements conviviaux et rapides entre le travail et la maison.

b. un accès aux terrains nouvellement aménagés pour stimuler l'économie et répondre à la croissance prévue de la communauté.

c. un accès est-ouest plus pratique entre les collectivités actuelles et futures.

d. une voie d'accès alternative au corridor de la route 17.

e. des installations en bordure de route pour répondre aux besoins des piétons et cyclistes.

**5. Est-ce qu'il y a d'autres éléments à la modernisation du réseau routier dont vous souhaitez que l'équipe de l'étude tienne compte?**

1.

On devrait donne priorité pour la piste

2. cyclable et piétons près du réseau routier

3.

**6. Est-ce qu'il y a des parties du corridor actuel où vous ne vous sentez pas en sécurité? Si tel est le cas, pouvez-vous les identifier?**

a) En tant que piéton(ne) :

b) En tant qu'automobiliste :

**7. Avez-vous d'autres commentaires ou préoccupations au sujet de cette étude ou de l'information présentée?**

Définitivement les roundabouts devraient être considéré comme la meilleure option

Veuillez remettre la feuille de commentaires remplie à la fin de la rencontre ou, si vous le souhaitez, veuillez l'acheminer par courriel (kjoulanov@castleglenn.ca), par la poste ou par télécopieur d'ici le **vendredi 7 juillet 2023**.

Pour toute question ou préoccupation, veuillez communiquer avec **M. Arthur Gordon**, conseiller/gestionnaire de projets, ***CastleGlenn Consultants Inc.*** par téléphone (613-731-4052), par télécopieur (613-731-0253), ou par la poste (2460, chemin Lancaster, bureau 200, Ottawa (Ontario) K1B 4S5).

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Réaménagement de la rue St-Jean / du chemin Poupart – Cité de Clarence-Rockland

**→ et cliquer sur « feuille de commentaires »**

***Projet d'élargissement de la rue St-Jean / du chemin Poupart***

***Évaluation environnementale – phases 3 et 4***

## *Consultation publique – 15 juin 2023*

(Optionnel)

Nom : [redacted]

Adress[redacted]

Code postal :

Numéro de telephone [redacted]

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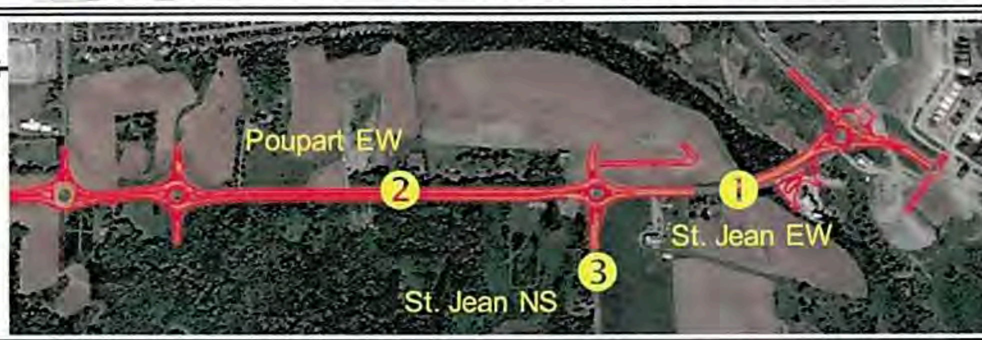
**1. À quelle fréquence empruntez-vous…**

**a) nº 1 :** 1 fois par semaine.

**b) nº 2 :** 3 fois par semaine.

**c) nº 3 :** 2 fois par semaine.




**2. Avez-vous des préoccupations concernant les déplacements le long du corridor « existant » St-Jean/Poupart?** (bruit, accidents évités de justesse, volumes de circulation, congestion aux intersections, excès de vitesse, largeur de la chaussée pour piétons et cyclistes, etc.)

Trop de circulation pour ce chemin. Fossé très creux!

**3. Avez-vous des commentaires ou des préoccupations <u>non liés à la circulation</u> concernant ce projet? Veuillez préciser** (répercussions sur les propriétés, dispositions relatives à l'accès, répercussions économiques, répercussions environnementales, etc.)

- le nom de ce chemin a été enregistré comme "Montée Poupart" et non Poupart ou Poupard Rd. Remettez le nom tel qui avait été enregistré.

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CORPORATION de la Cité de / of the City of CLARENCE-ROCKLAND

*Projet d'élargissement de la rue St-Jean / du chemin Poupart*

*Évaluation environnementale – phases 3 et 4*

## *Consultation publique – 15 juin 2023*

**4. Parmi les aspects suivants liés aux changements le long du corridor St-Jean / Montee Poupart, veuillez indiquer lequel est le plus important pour vous en <u>encerclant la lettre de l'énoncé</u> :**

**La modernisation du réseau routier et des intersections doit permettre…**

a. des déplacements conviviaux et rapides entre le travail et la maison.

b. un accès aux terrains nouvellement aménagés pour stimuler l'économie et répondre à la croissance prévue de la communauté.

c. un accès est-ouest plus pratique entre les collectivités actuelles et futures.

d. une voie d'accès alternative au corridor de la route 17.

e. des installations en bordure de route pour répondre aux besoins des piétons et cyclistes.

**5. Est-ce qu'il y a d'autres éléments à la modernisation du réseau routier dont vous souhaitez que l'équipe de l'étude tienne compte?**

1. - Avisés les propriétaires directement affectés par ce projet
2.
3.

**6. Est-ce qu'il y a des parties du corridor actuel où vous ne vous sentez pas en sécurité? Si tel est le cas, pouvez-vous les identifier?**

a) En tant que piéton(ne) : = marcher sur ce chemin n'est pas à recommander
- Trop étroit & autos vont trops vite.

b) En tant qu'automobiliste : . Très étroit & dangereux

**7. Avez-vous d'autres commentaires ou préoccupations au sujet de cette étude ou de l'information présentée?**

- les 2 intersections côté ouest sont beaucoup trops proche l'un de l'autre. Si ce chemin est pour continuer vers l'ouest éventuellement, c'est

Veuillez remettre la feuille de commentaires remplie à la fin de la rencontre ou, si vous le souhaitez, veuillez l'acheminer par courriel (kjoulanov@castleglenn.ca), par la poste ou par télécopieur d'ici le **vendredi 7 juillet 2023**.

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**→ et cliquer sur « feuille de commentaires »**

***Projet d'élargissement de la rue St-Jean / du chemin Poupart***

***Évaluation environnementale – phases 3 et 4***

## *Consultation publique – 15 juin 2023*

(Optionnel)

Nom : [redacted]

Adresse : [redacted]

Code postal : [redacted]

Numéro de telephone : [redacted]

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**1. À quelle fréquence empruntez-vous…**

**a) nº 1 :** 1 fois par semaine.

**b) nº 2 :** 1 fois par semaine.

**c) nº 3 :** 1 fois par semaine.


**2. Avez-vous des préoccupations concernant les déplacements le long du corridor « existant » St-Jean/Poupart?** (bruit, accidents évités de justesse, volumes de circulation, congestion aux intersections, excès de vitesse, largeur de la chaussée pour piétons et cyclistes, etc.)

Très étroit; aucun gard-fou et le fosset du côté nord est profond.. donc c'est dangereux ~~en~~ à cause du volume de la circulation.

**3. Avez-vous des commentaires ou des préoccupations non liés à la circulation concernant ce projet? Veuillez préciser** (répercussions sur les propriétés, dispositions relatives à l'accès, répercussions économiques, répercussions environnementales, etc.) Le 2e rond point à

~~Le 2e rond point situé plus à~~

partir de l'ouest : (prévu sur la montée Poupart)

~~l'ouest~~ : je trouve qu'il est de trop.

Castleglenn Consultants

Clarence-Rockland

CORPORATION de la Cité de / of the City of CLARENCE-ROCKLAND

*Projet d'élargissement de la rue St-Jean / du chemin Poupart*

*Évaluation environnementale – phases 3 et 4*

## *Consultation publique – 15 juin 2023*

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d. une voie d'accès alternative au corridor de la route 17.

e. des installations en bordure de route pour répondre aux besoins des piétons et cyclistes.

**5. Est-ce qu'il y a d'autres éléments à la modernisation du réseau routier dont vous souhaitez que l'équipe de l'étude tienne compte?**

1.

2.

3.

**6. Est-ce qu'il y a des parties du corridor actuel où vous ne vous sentez pas en sécurité? Si tel est le cas, pouvez-vous les identifier?**

a) En tant que piéton(ne) : et à vélo : Très étroit et les voitures circulent vite.

b) En tant qu'automobiliste :

**7. Avez-vous d'autres commentaires ou préoccupations au sujet de cette étude ou de l'information présentée?**

Le nom est "Montée Poupart". Merci de respecter le nom dans les plans.

Veuillez remettre la feuille de commentaires remplie à la fin de la rencontre ou, si vous le souhaitez, veuillez l'acheminer par courriel (kjoulanov@castleglenn.ca), par la poste ou par télécopieur d'ici le **vendredi 7 juillet 2023**.

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# APPENDIX “D”

## Public Consultation Centre No. 2: Notice / Contacts

# St-Jean - Poupart Reconstruction



Here is the **presentation that was communicated to the people** present during the open house. Do not hesitate to fill the comment form and give us your opinion on the project.

There is still time to send us your comments and concerns following the Open House on June 15.

Questionnaire

**— October 25 - 2023 - Notice of Public Consultation Centre**

**Public Consultation Centre No. 2**
**Date: Wednesday October 25, 2023**
**Time: 5:00 p.m. to 9:00 p.m.**
**Location: Optimist Performance Hall, 1535 Du Parc Avenue, Hockland, ON K4K 1C3**

The City of Clarence-Rockland continues its work on the environmental assessment necessary to meet the future needs of the St Jean Street and Montée Poupart Side Road corridor. This corridor currently serves as the main route for local and regional traffic.

A Second Public Consultation Center will take place on Wednesday, October 25th, 2023, that will present the consultants preferred vision for the corridor, including the widening of the corridor, roundabouts and the adjacent pedestrian sidewalks and multi-use pathways. The study:

- ensures compliance with the Municipal Class Environmental Assessment (MCEA) process set out in the Ontario Environmental Assessment Act requirements for a Category "C" project.
- addresses Phase 3 (design alternatives leading to preferred design option(s)) and Phase 4 (production of the Environmental Study Report (ESR) document, sharing of the study results and further review).

This second Public Consultation Center aims to generate a further exchange of ideas and expand on the information base to improve decision making. The public review will contribute to further refinement of the preferred design for the chosen solution. Your comments will be accepted until Friday, November 10, 2023, and may be used in further planning of the project.

Your contribution is important to the success of our study!

We look forward to working with you to develop design plans tailored to the requirements of the City of Clarence-Rockland.

St. Jean Street - Montée Poupart Corridor

# APPENDIX "E"

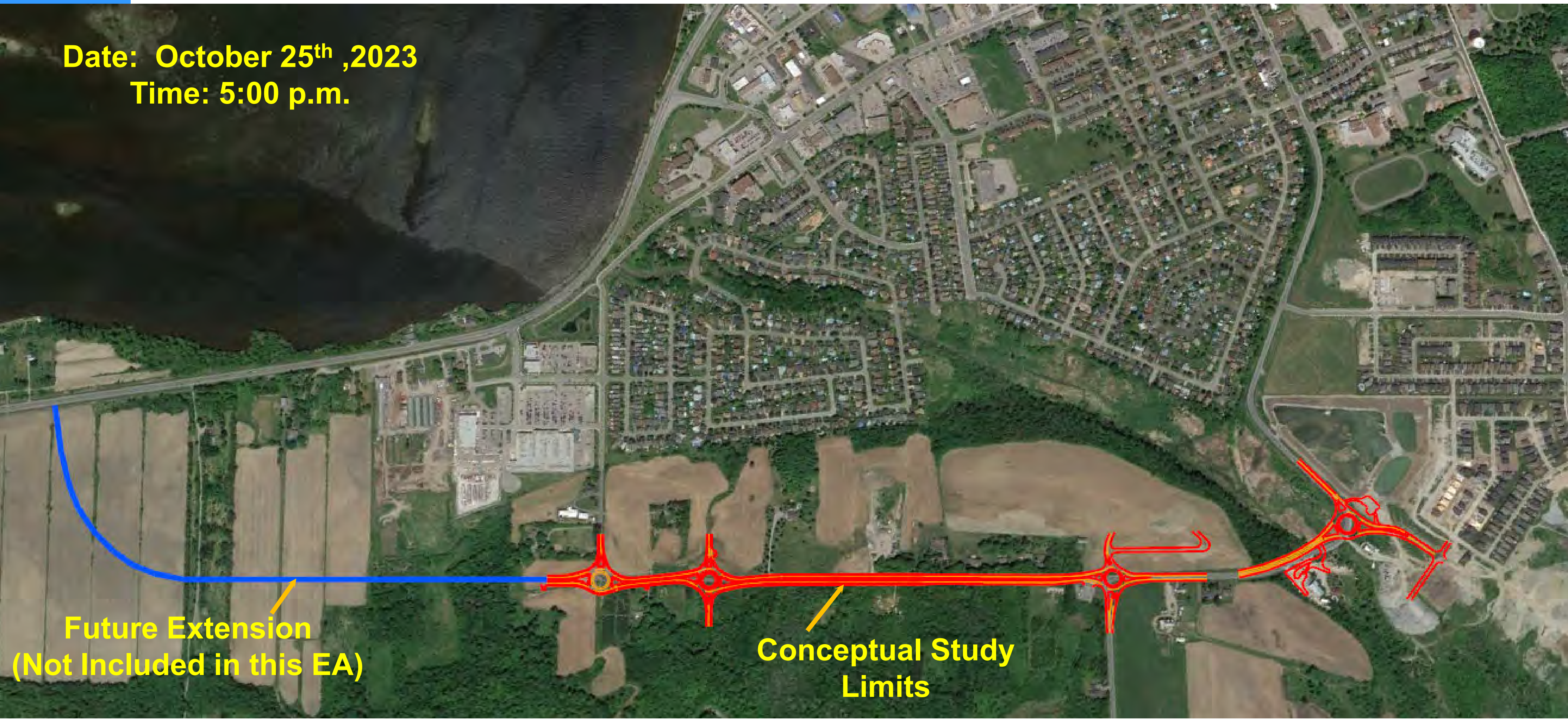
## Public Consultation Centre No. 2: Presentation Materials

CORPORATION de la Cité de / of the City of CLARENCE-ROCKLAND

Castleglenn Consultants
Engineers, Project Managers & Planners

# St-Jean Street - Montée Poupart Side Road
## Municipal Environmental Assessment

*Welcome to the Public Consultation Centre #2*



CORPORATION
de la Cité de / of the City of
CLARENCE-ROCKLAND

Castleglenn Consultants
Engineers, Project Managers & Planners

# You will have a chance to Review


**Study Purpose and Overview**

**Multi-Modal Transportation Master Plan, Vision and Guiding Principles**

**The Preferred Alternative**


**Next Steps**

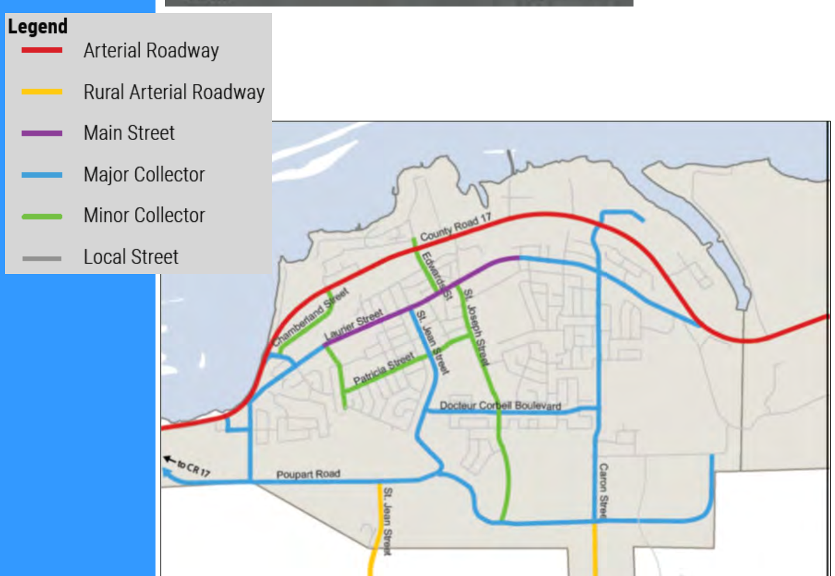
- Representatives from the City of Clarence-Rockland & Castleglenn Consultants are available to discuss the project with you.
- Please ask questions and share your opinions with us.
- If you have accessibility requirements that are needed to participate in this project, please contact a Project Team member.
- Please complete a comment sheet at today’s Public Consultation Centre event.
- We encourage you to sign in.
- Your input is appreciated.

# Introduction

- The purpose of this study is to address the functional planning, environmental assessment and municipal approval processes for the St-Jean Street-Montée Poupart Side Road corridor.
- The objectives of this study include:
  - conforming to the Provincial Municipal Class Environmental Assessment (MCEA) process identified under the Ontario Environmental Assessment Act requirements for a Class "C" project. This requires that an Environmental Study Report (ESR) be prepared and filed for review by provincial public and review agencies;
  - Identifying St. Jean Street-Montée Poupart Side Road Intersection improvements to meet interim and long-term transportation needs;
  - Completing an access review of commercial entrances and intersections to the corridors to ensure safe and efficient traffic operations and to support ongoing and proposed development of surrounding lands; and
  - Considering all road users including active transportation and recreational trail users.

# Introduction


- The City of Clarence Rockland completed its "*Multi-modal Transportation Master Plan*" (MMTMP) in 2019.
- The Province has acknowledged that the City's MMTMP satisfies the first two phases of the five-phase EA process.
- The St-Jean Street-Montée Poupart Side Road corridor was classified as a "major collector" roadway intended to service the existing and future communities planned for Clarence-Rockland. Major Collector roadways should …
  - connect to Arterial and Rural Arterial Roadways.
  - accommodate pedestrian sidewalks on both sides of the street where needed
  - have opportunities to accommodate active transportation through the implementation of multi-use paths.
  - have a typical right-of-way width of 18m-to-24m depending on the configuration.



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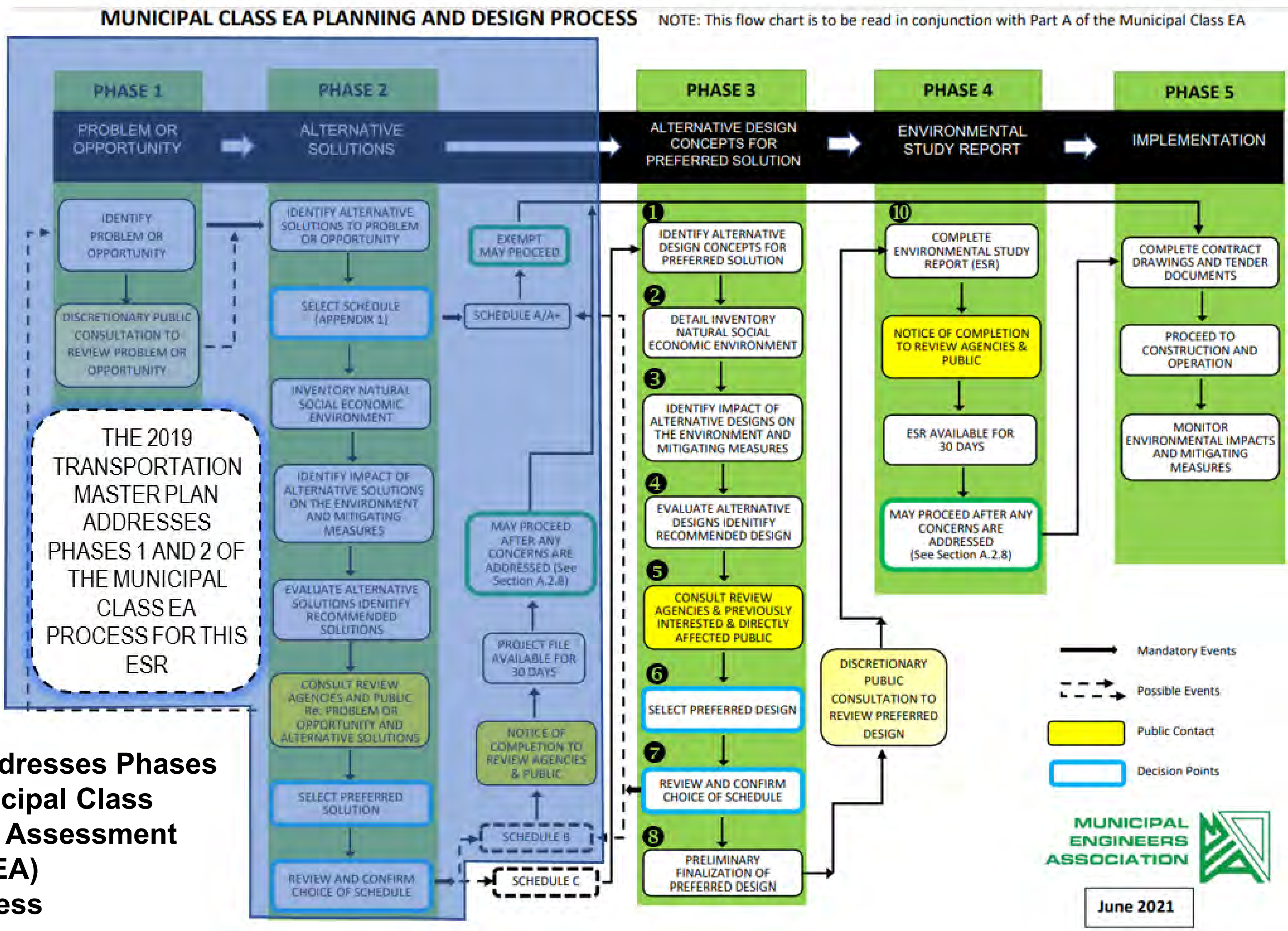
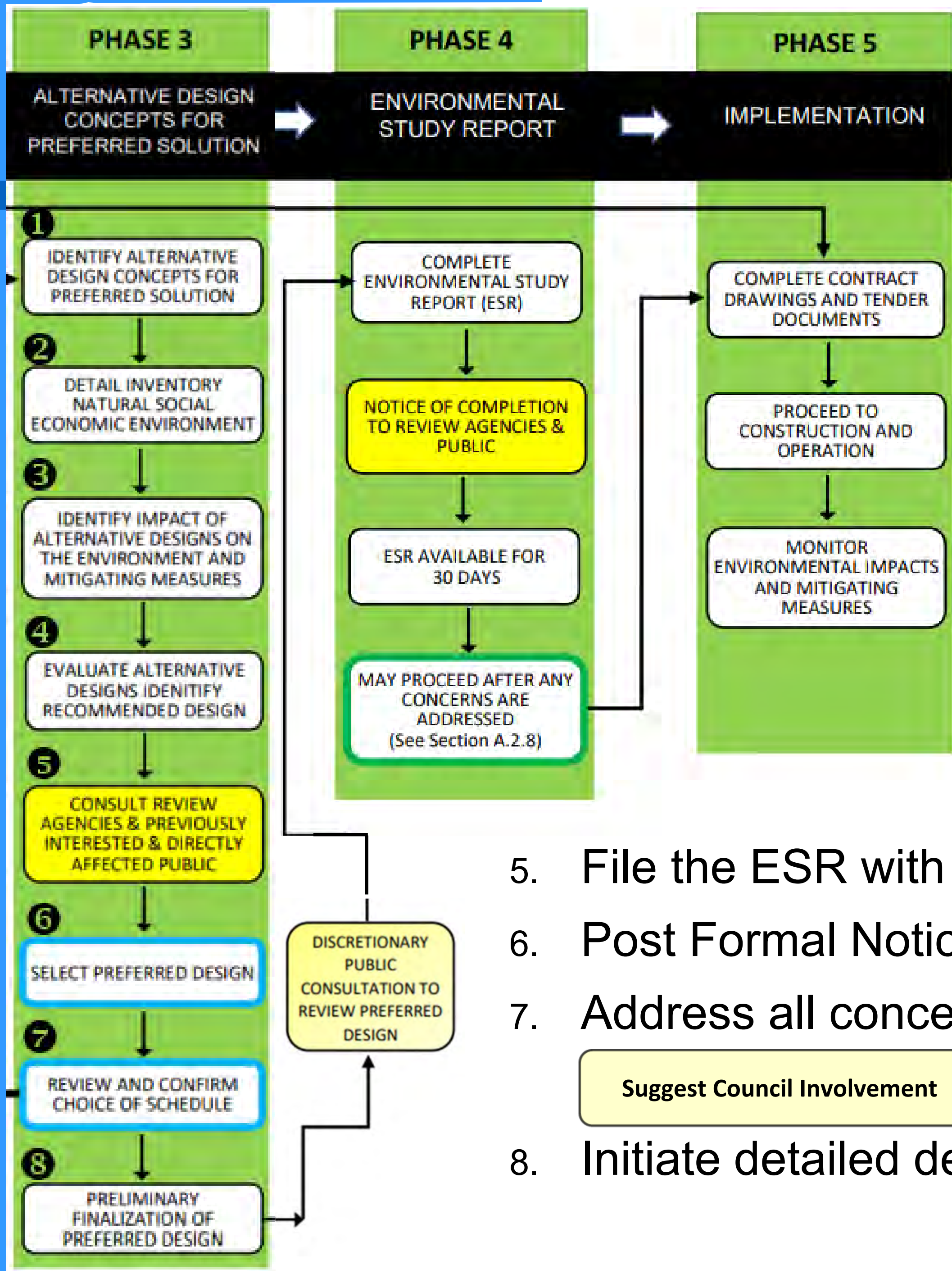
# MEA Process (Phases 3-thru-5)

**Municipal Class Environmental Assessment (MCEA) Process**




**City's MMTMP Addresses Phases 1 & 2 of Municipal Class Environmental Assessment (MCEA) Process**




# Phase 3 & 4

**<u>Next Steps:</u>**

1. Consultation with agencies, utilities, previously interested & directly affected parties.
2. Formally Select the preferred design(s)/concept(s).
3. Re-confirm this as project as an MEA Class “C” project.
4. Complete the ESR Report
5. File the ESR with the Province.
6. Post Formal Notice of Completion. (30 days)
7. Address all concerns and undertake refinements.

**Suggest Council Involvement**

8. Initiate detailed design process.

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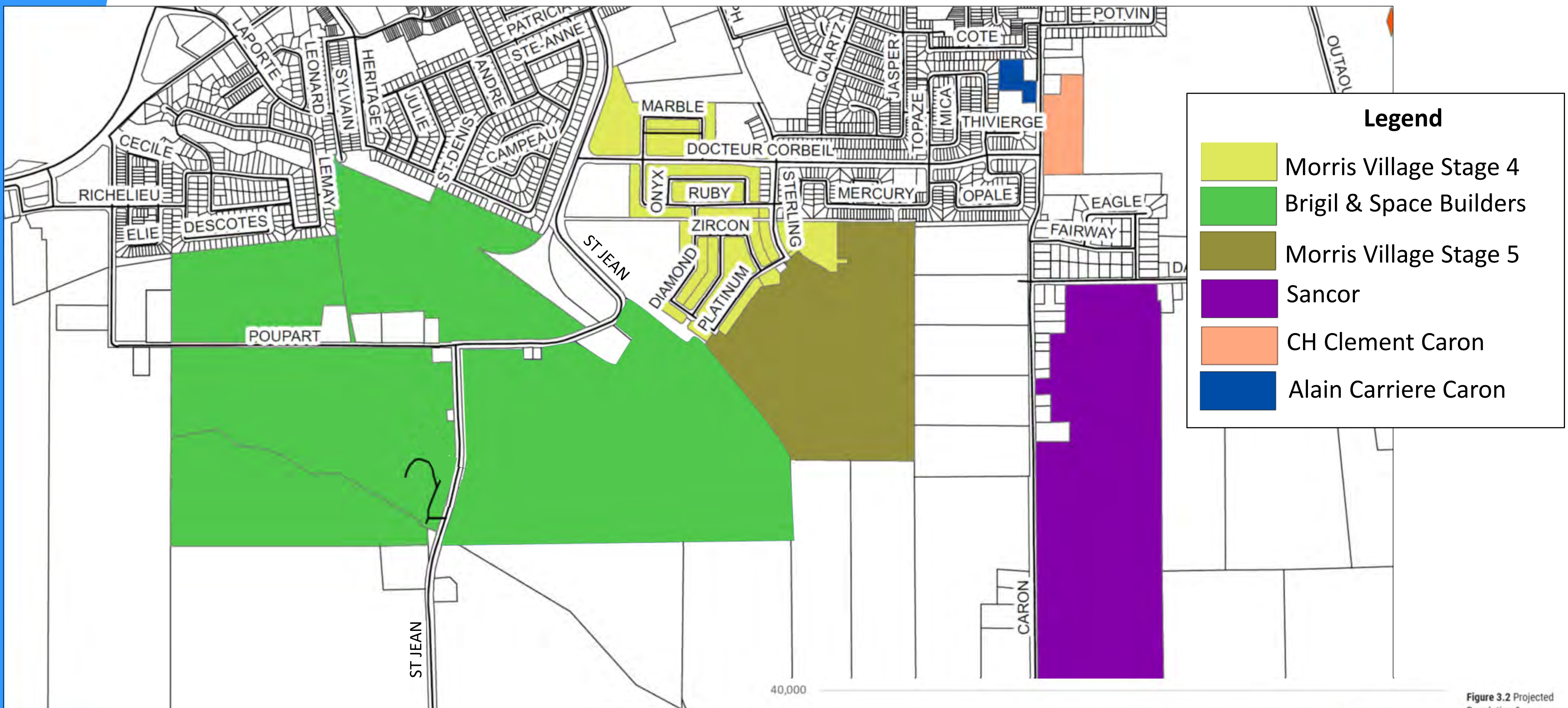
# Planned and On-going Developments
## (as per 2019 MMTMP)




Future growth (2031) forecasts identify that Clarence Rockland was forecast to grow by 8.700 persons in the 15 years between 2016 and 2031. [MMTMP, Pg. 27]

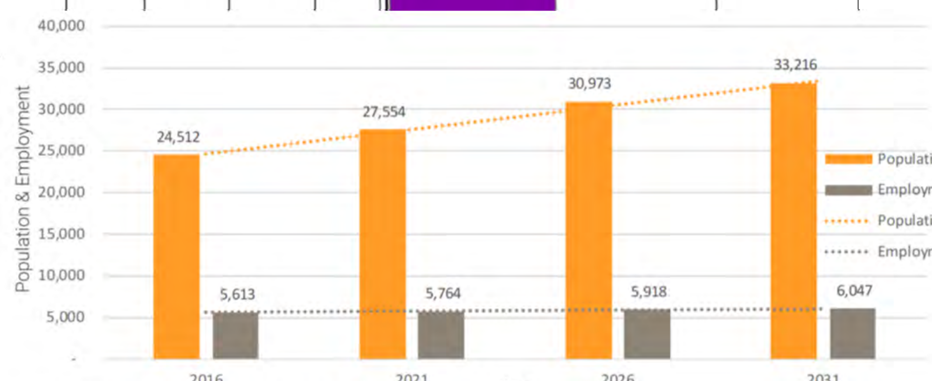



**Figure 3.2** Projected Population & Employment forecasts in Clarence-Rockland by 2031

**Source:** Clarence-Rockland - Staff Revised Growth Forecast, 2018

# Future Transportation Conditions

## (Vehicles per Hour)



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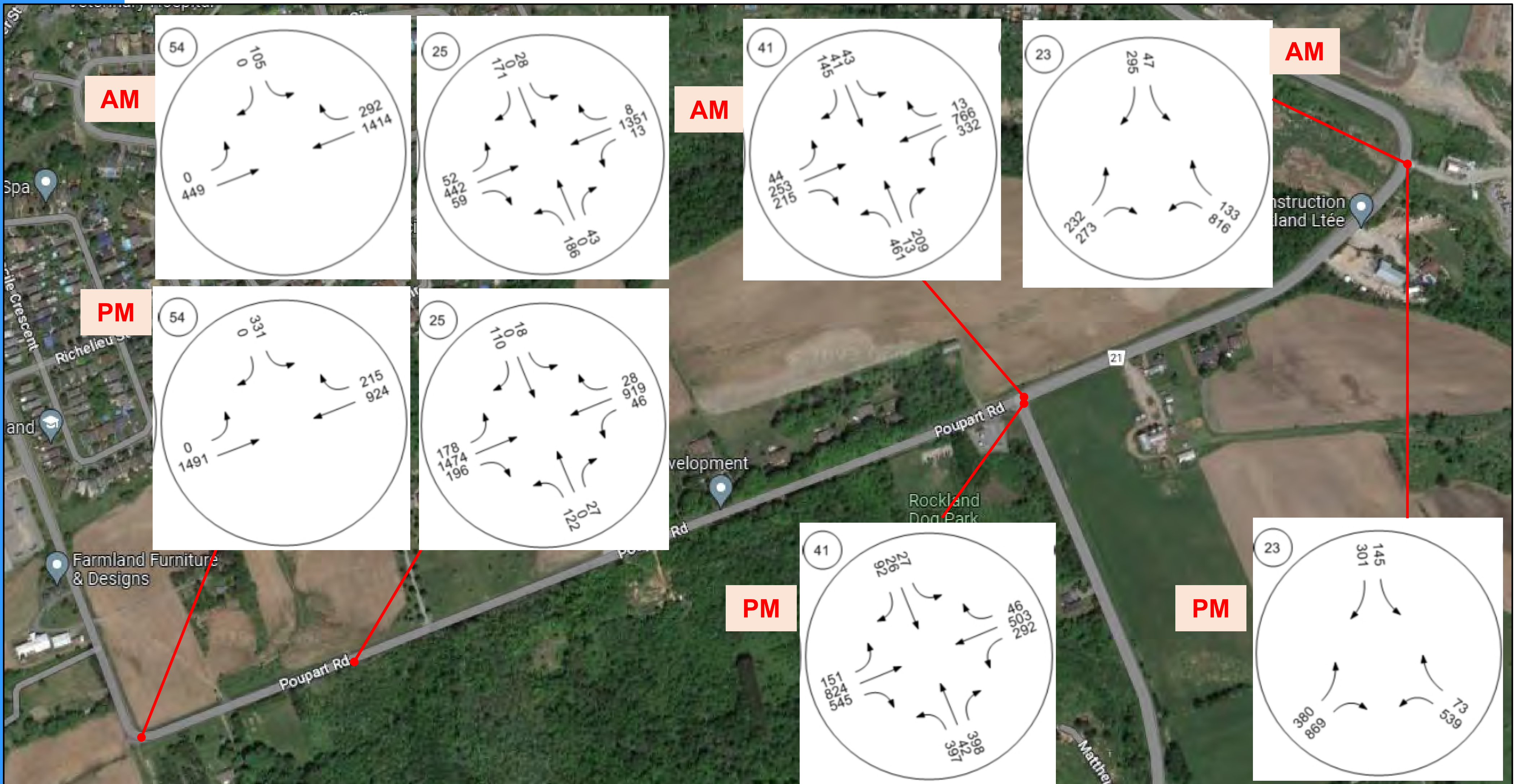


Without improvements, the future 2031 peak hour forecasts significant deteriorated intersection operations along Montée Poupart Side Road which is a key corridor for both internal and external travel needed to sustain future residential growth. [MMTMP, Pg. 27]

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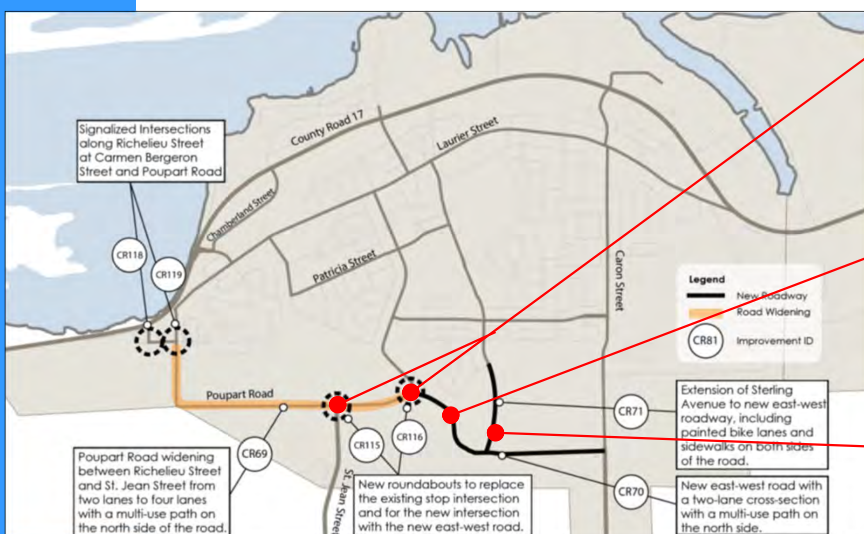
# Master Transportation Plan Conclusions

- **Montée Poupart Side Road Widening:** *"Road widening from two lanes to four between Richelieu Street and the New East-West Roadway. Will include a multi-use pathway on the north side of the roadway."*



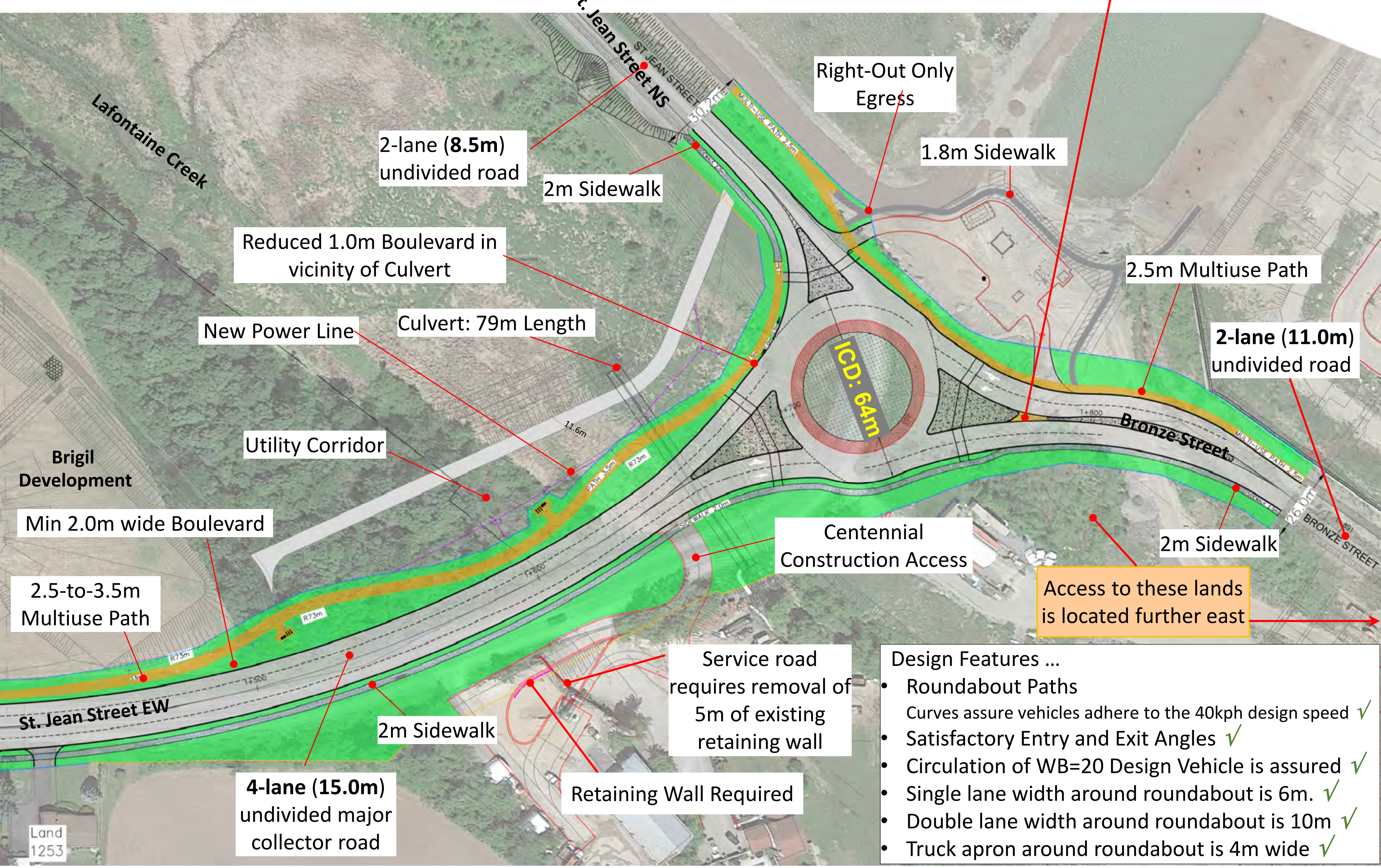

- **Roundabouts:** *"New roundabouts to replace the existing STOP controlled intersections and for the new intersection with the new east west road."*
- **New East-West Road:** *"A new east-west road with a 2-lane cross-section with a multi-use path"* connecting to St. Jean Street.
- **Sterling Ave. Extension:** *"Extension of Sterling Avenue to new east-west roadway, including painted bike lanes and sidewalks on both sides of the road."*

# Intersection #1

# The Preferred Concept

## (ST. JEAN STREET / BRONZE STREET)

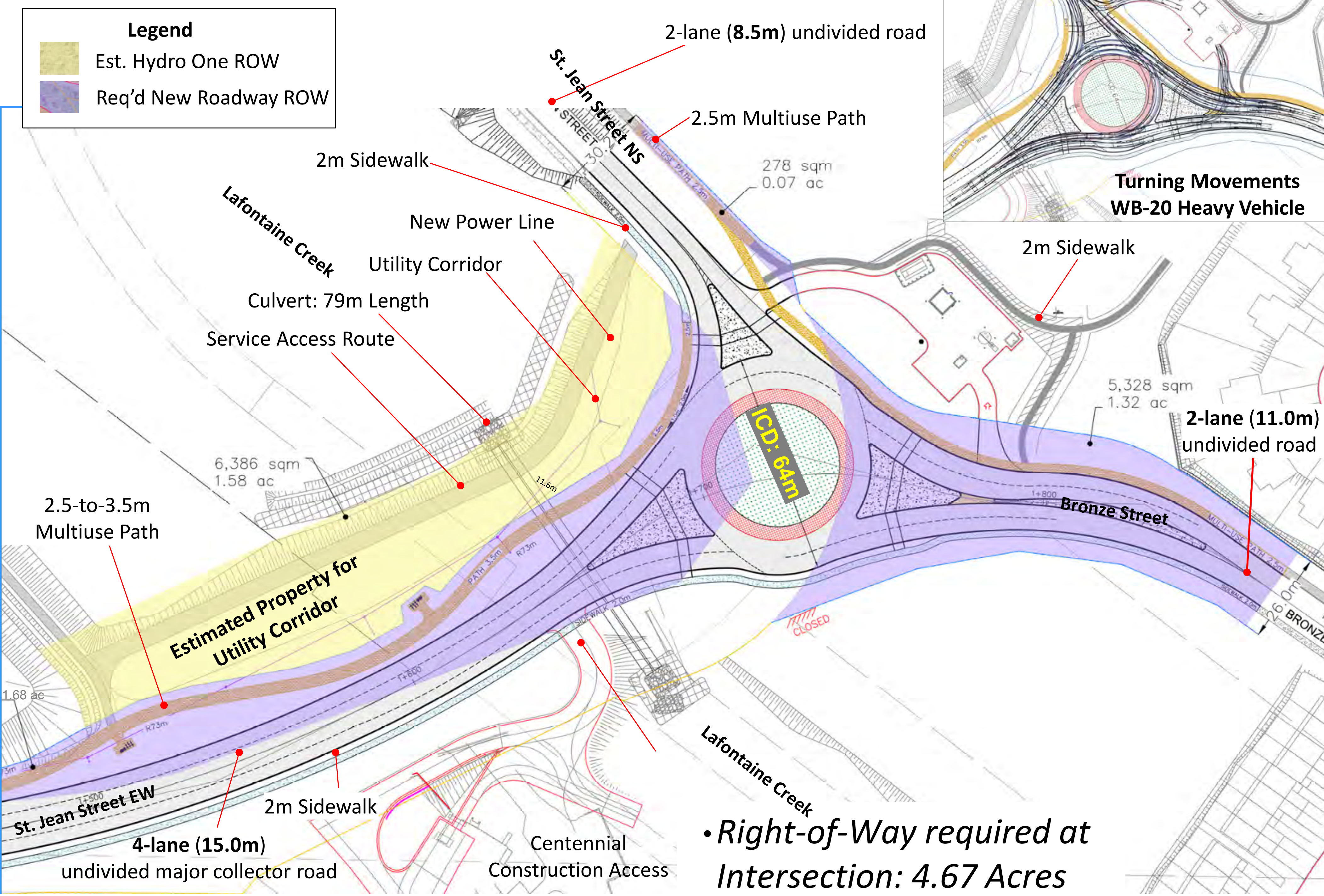
# Int #1: Roundabout (Layout)




Design Features …

- Roundabout Paths
  Curves assure vehicles adhere to the 40kph design speed √
- Satisfactory Entry and Exit Angles √
- Circulation of WB=20 Design Vehicle is assured √
- Single lane width around roundabout is 6m. √
- Double lane width around roundabout is 10m √
- Truck apron around roundabout is 4m wide √

# Int #1: Roundabout (Property)




- *Right-of-Way required at Intersection: 4.67 Acres*

# Intersection #1: Roundabout Option

- *Utility Corridor:* 79m long culvert was determined to be a fixed constraint. A wide swath of lands approximately ~14.0m in width is protected for the north multi-use pathway and the HydroOne utility corridor. In the vicinity of the roundabout the width was reduced to ~12.0m.
- *Traffic Operations:* Eastbound traffic coming down an 8% grade would be required to decelerate from 60kph (posted 50kph) to 30kph approaching the roundabout.

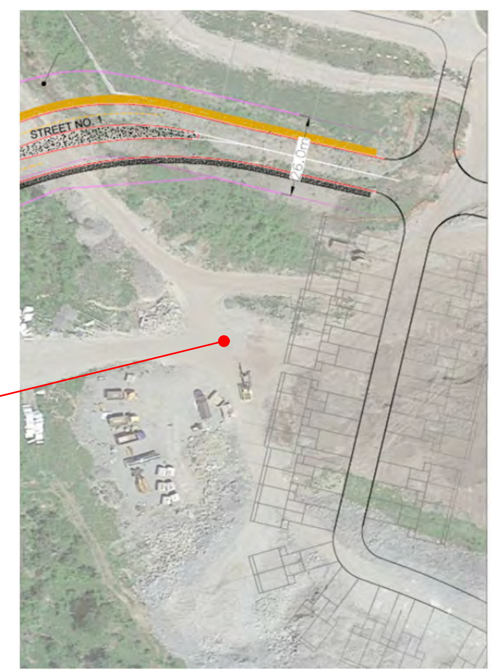
# Intersection #1: Roundabout Option

- *Centennial Construction Impacts:* The new service road arrangement requires a new retaining wall and removal of approximately 7m of a retaining wall on the north side of the loading bay (5m) and parallel to Poupart (2m).

- *Inscribed Circle Diameter:* 64m ICD required for multi-lane configuration due to entry angles & fastest path design criteria and accommodate a WB-20 heavy vehicle.

- *Accesses:* A separate entry access and exit egress is provided to the pumping station and the storm water management pond in the north-east portion of the roundabout.

- *Accesses:* An access to the lands south-east of the roundabout is to be provided from the intersection further to the east of the roundabout as part of site planning.



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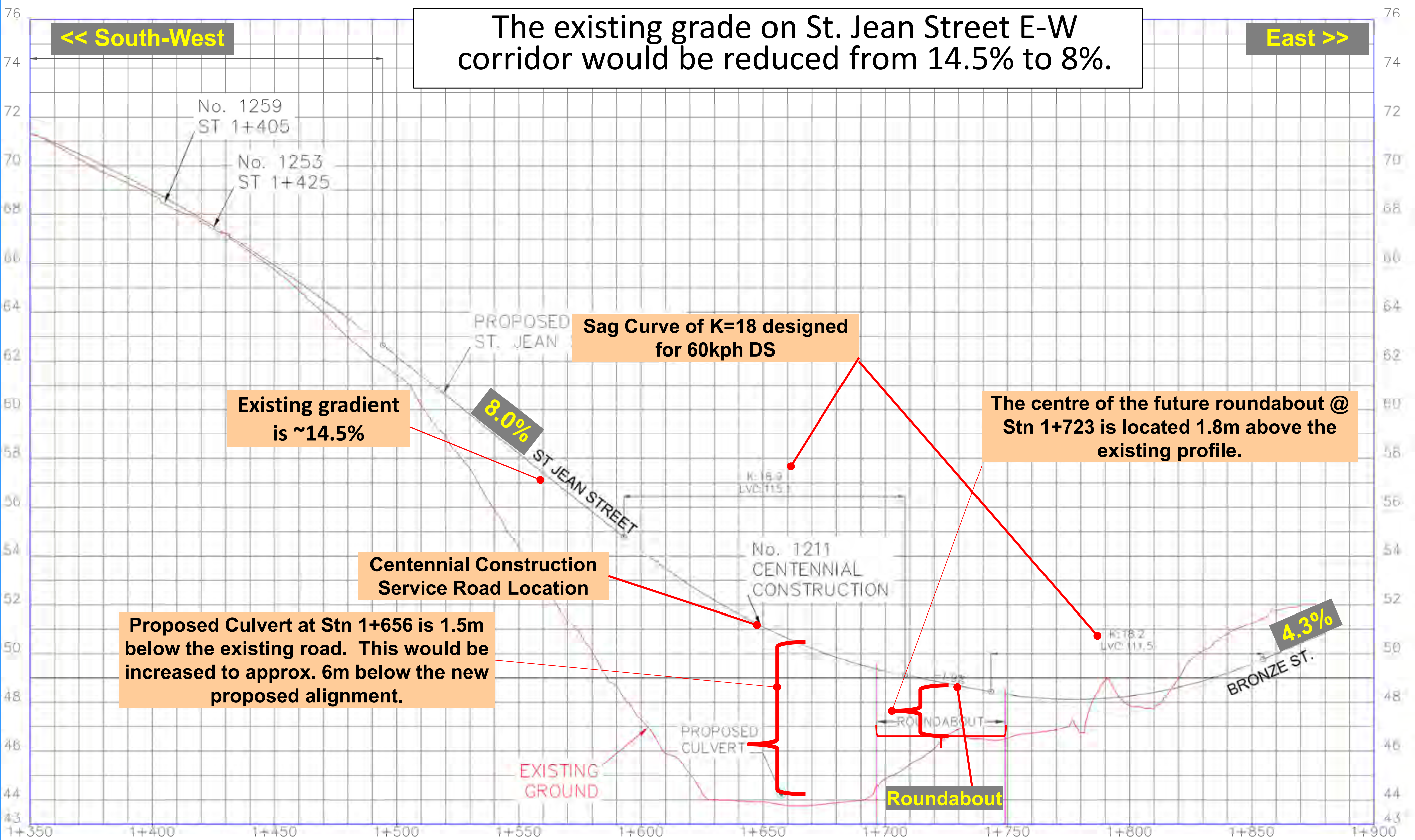
# Intersection #1: Roundabout Profile



# Intersection #2

# The Preferred Concept

## (MONTÉE POUPART SIDE ROAD / ST. JEAN STREET)

# Int #2: Roundabout Option (Layout)

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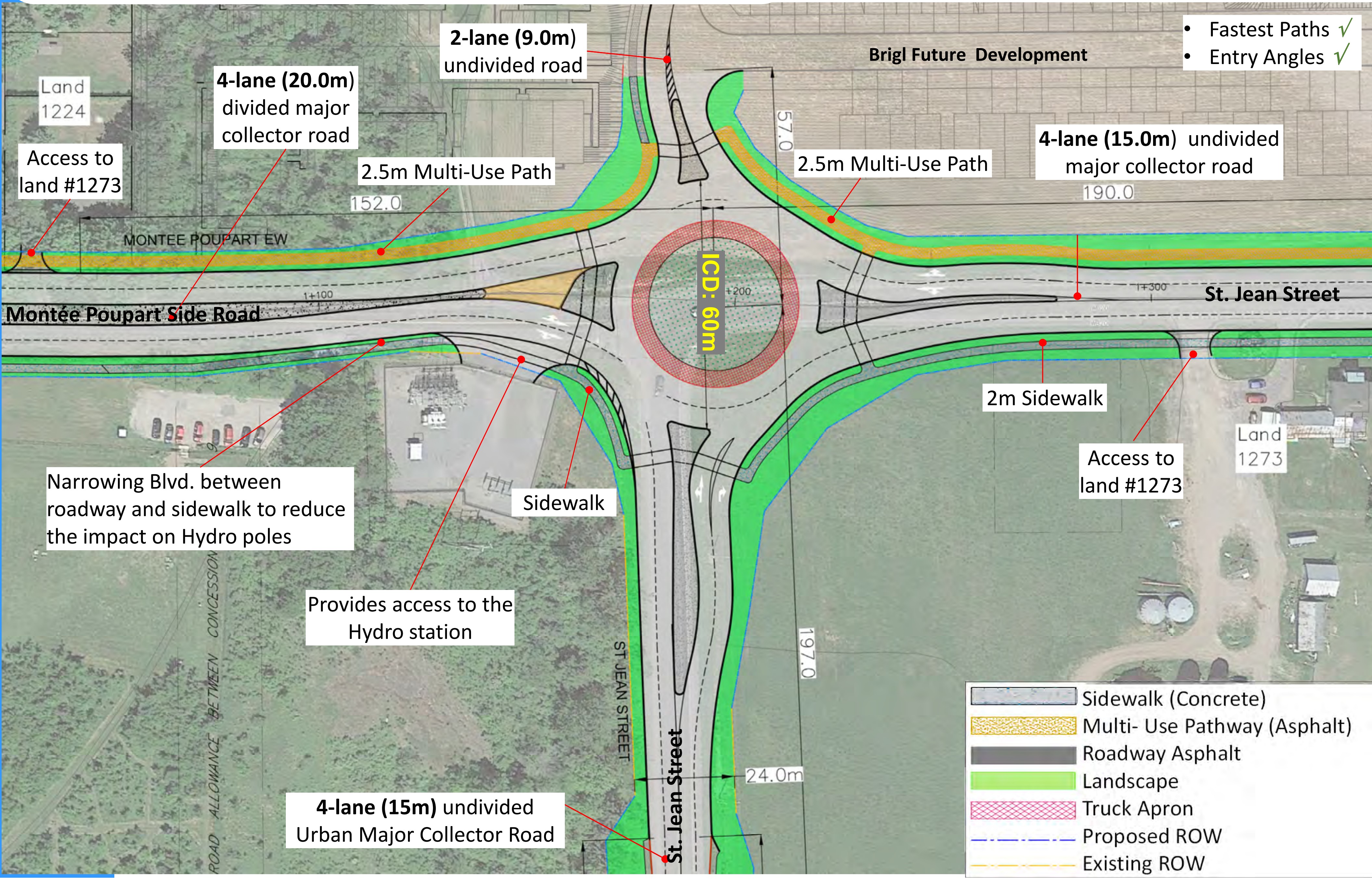
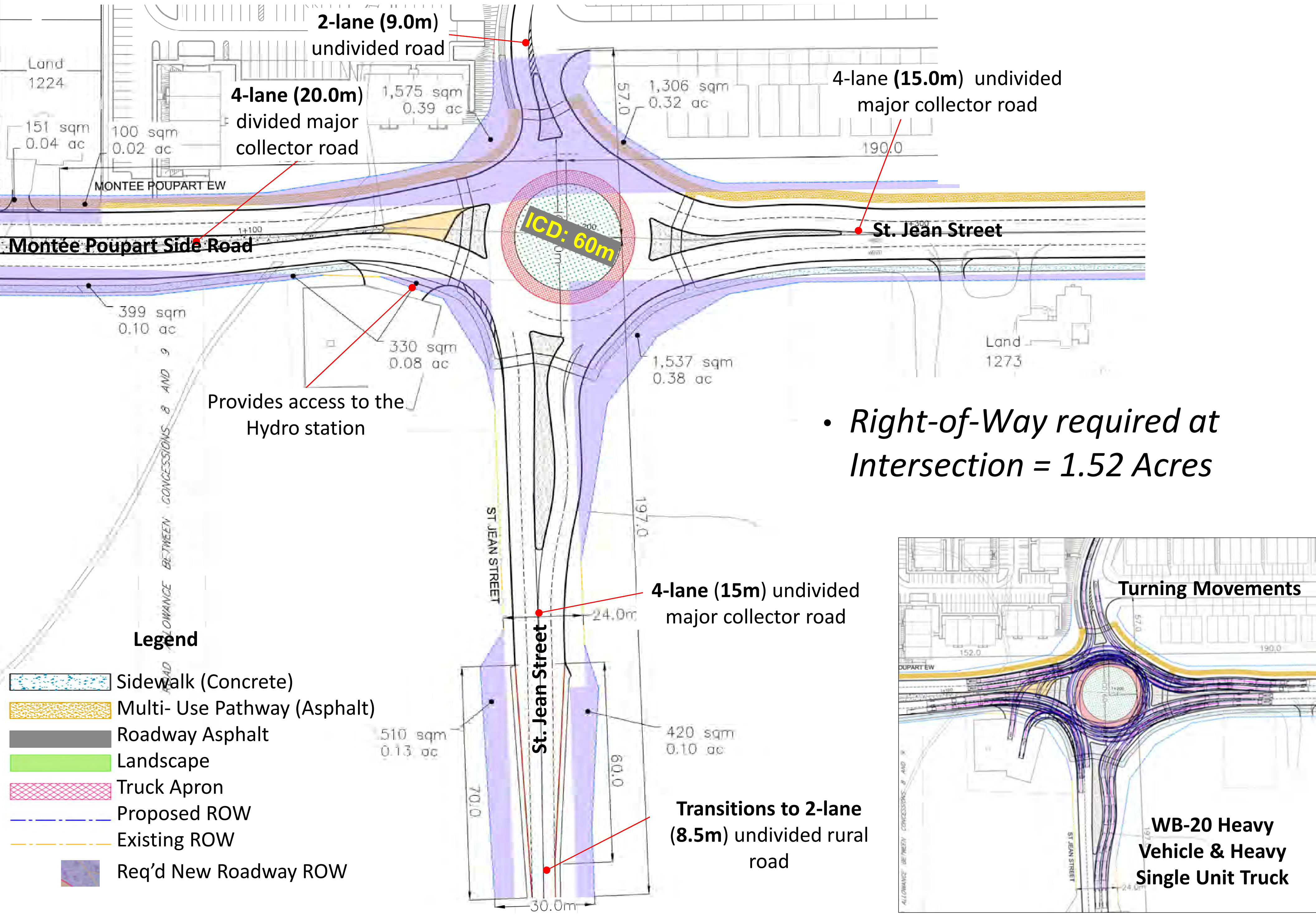


# Int #2: Roundabout (Property)




- *Right-of-Way required at Intersection = 1.52 Acres*

# Intersection #3 and #4

# The Preferred Concept

## (INT#3: MONTÉE POUPART SIDE ROAD EW / STEWART VILLAGE)

## (INT#4: MONTÉE POUPART SIDE ROAD NS / EW)

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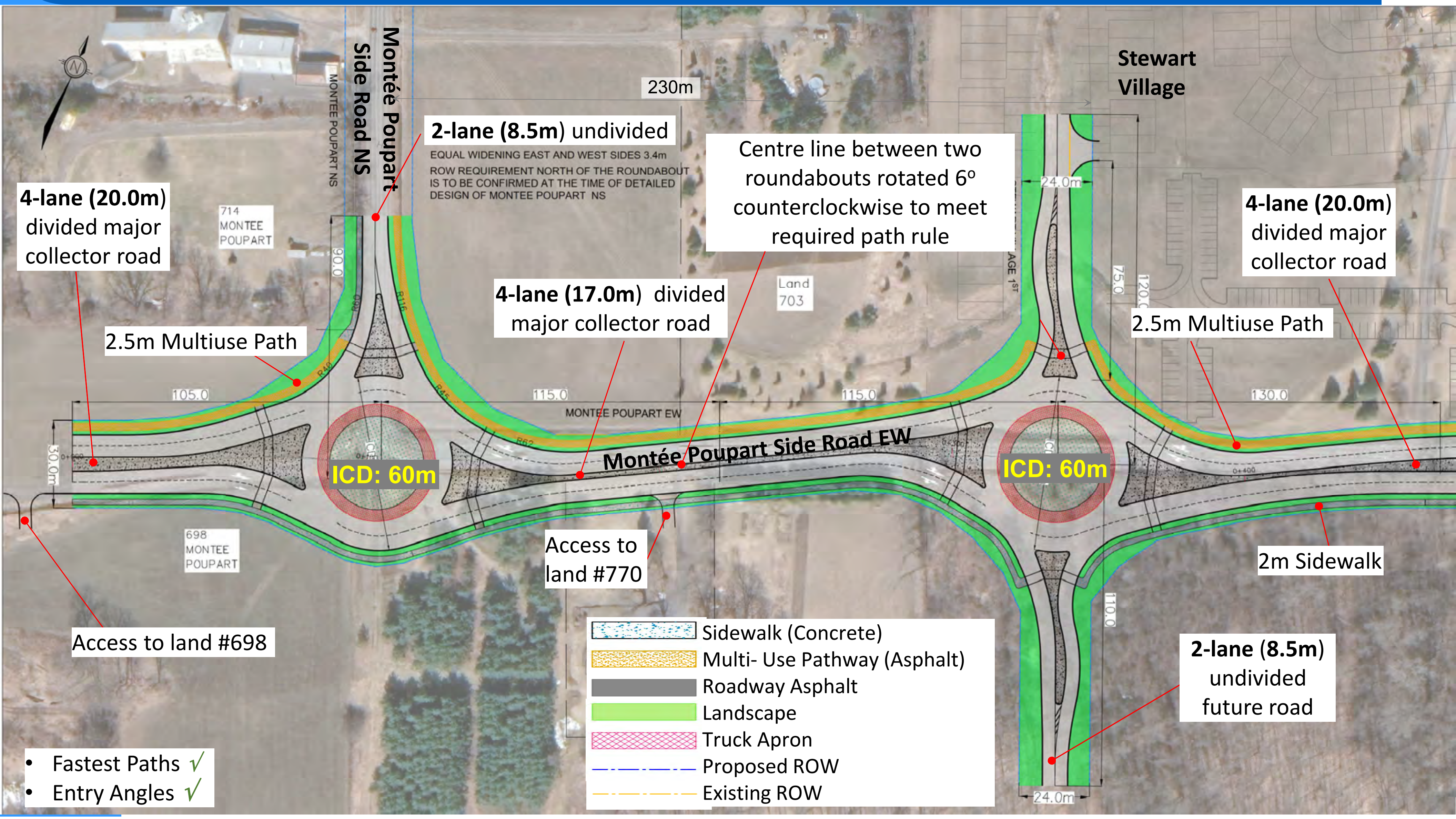
# Int #3 & #4: Roundabout Option (Layout)



# Int #3 & #4: Roundabout (Property)



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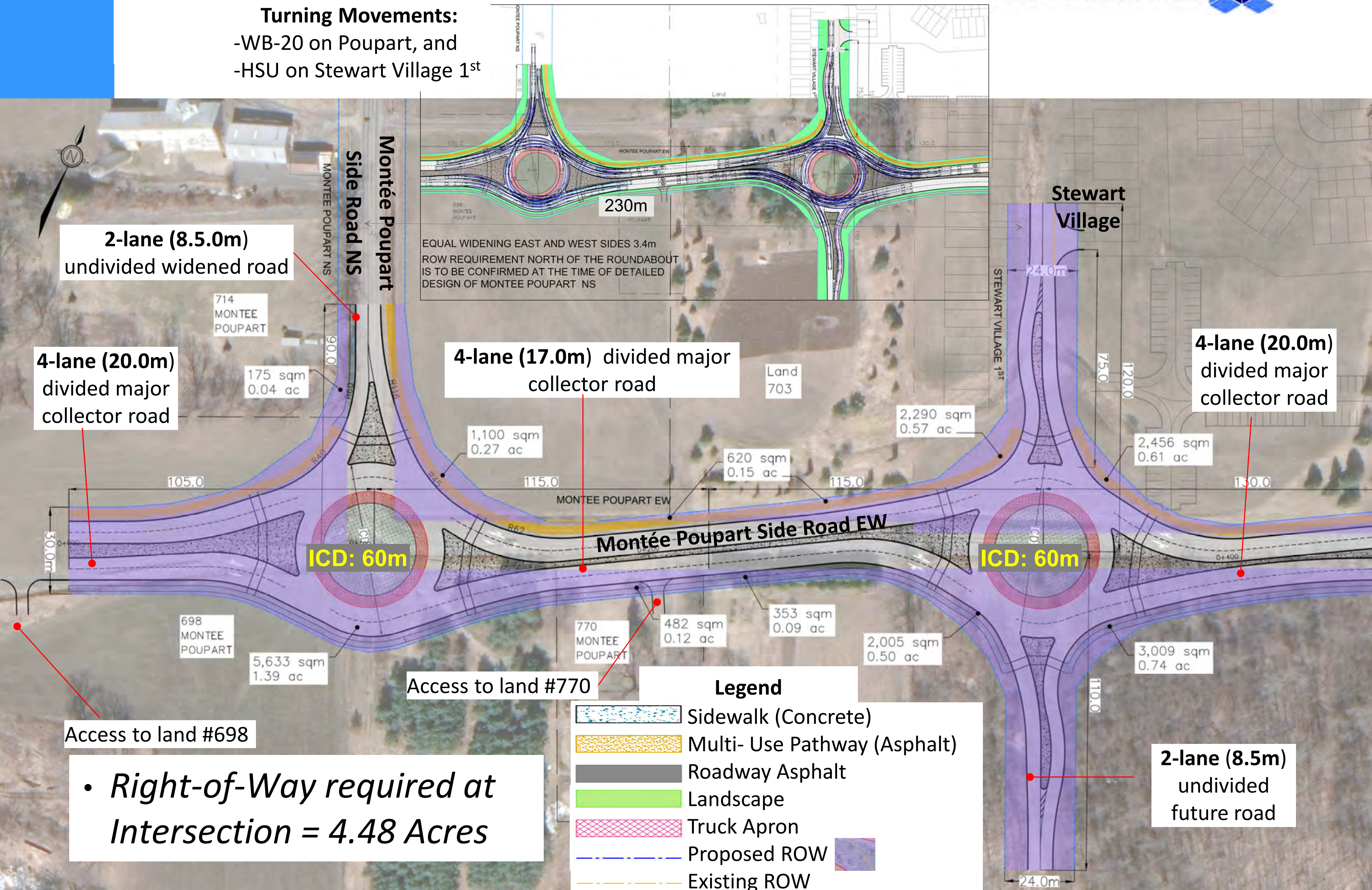
**Turning Movements:**
-WB-20 on Poupart, and
-HSU on Stewart Village 1st




- *Right-of-Way required at Intersection = 4.48 Acres*

# Roadway Corridors between the Intersections

# The Preferred Concept

# Between Int #1 & #2: Roundabout



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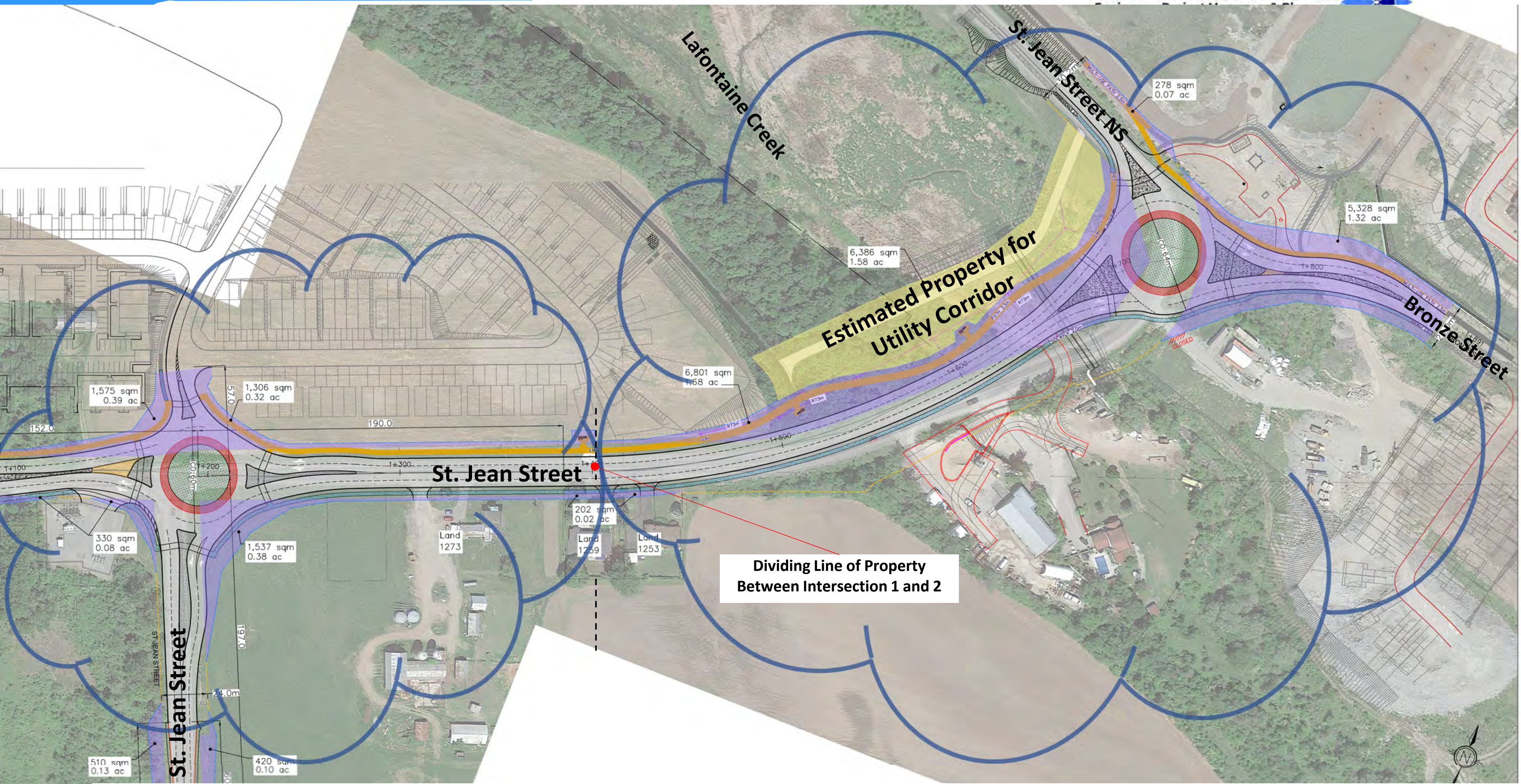


- *~ 2m of additional property (Magenta Coloured Line) required on each side of corridor.*
- *Total Property required for Intersection 1 = 4.67 acres*
- *Total Property required for Intersection 2 = 1.52 acres*
- *Total Property of both Intersections 1 & 2 = 6.19 acres*

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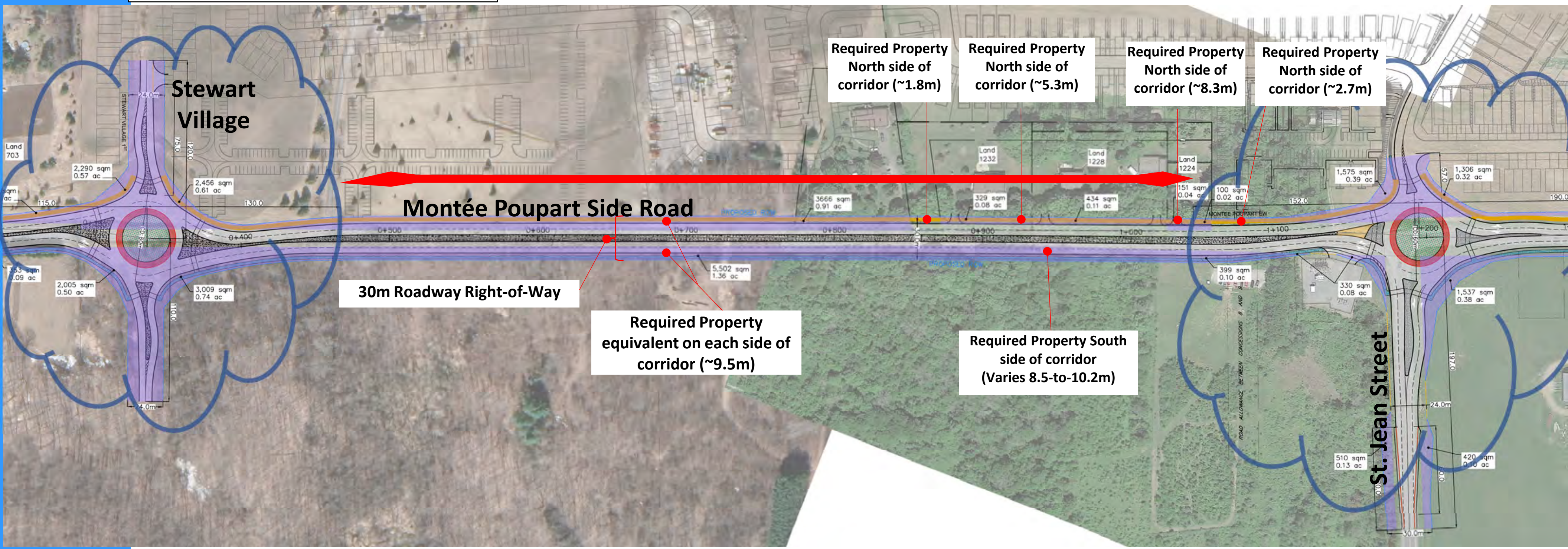
**Legend**

Req'd Property Addressed on Intersection Exhibits

# Between Int #2 & #3: Roundabout




- *Roughly 9.5m required on each side of corridor*
  *( Property requirements on north side of the corridor vary. Existing Roadway ROW is not perfectly straight.)*
- *Areas in ☁ have been included in intersection exhibits.*
- *Right-of-Way required north of Corridor excluding Roundabouts = 1.14 Acres*
- *Right-of-Way required south of Corridor excluding Roundabouts = 1.36 Acres*

# Between Int #1 & #2: Roadway Cross-Sections

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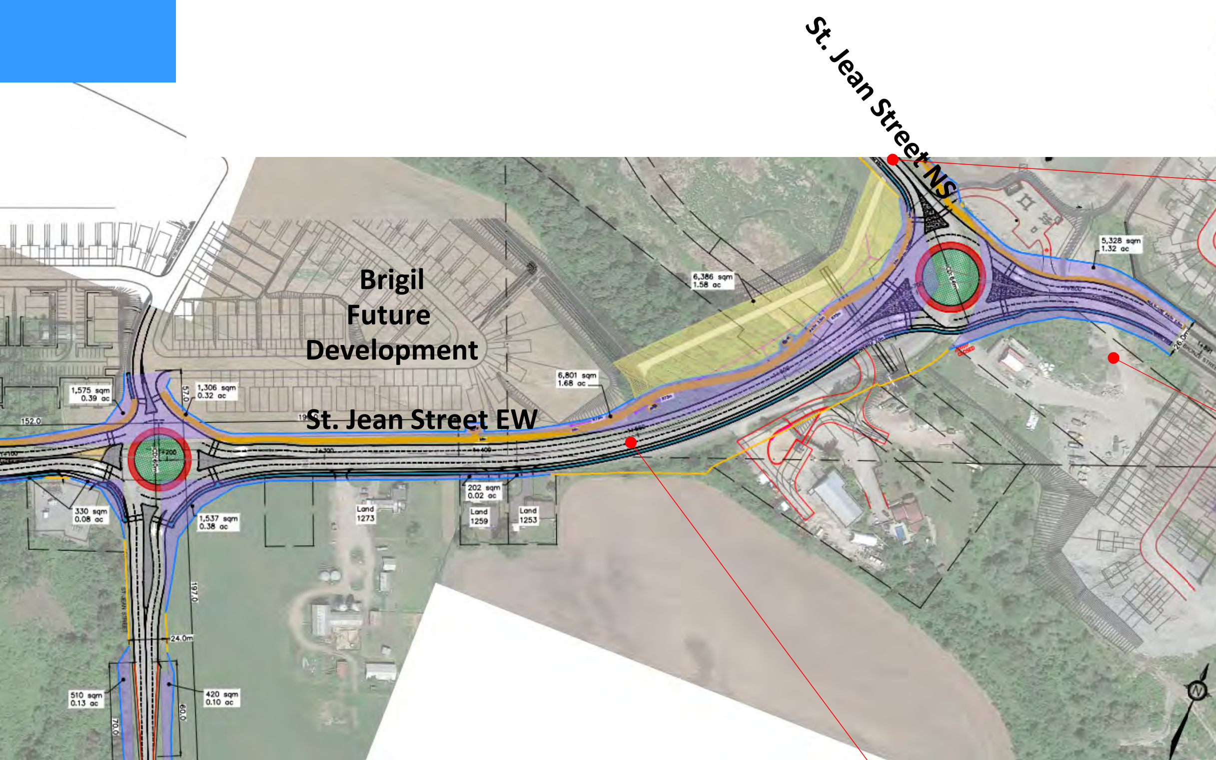


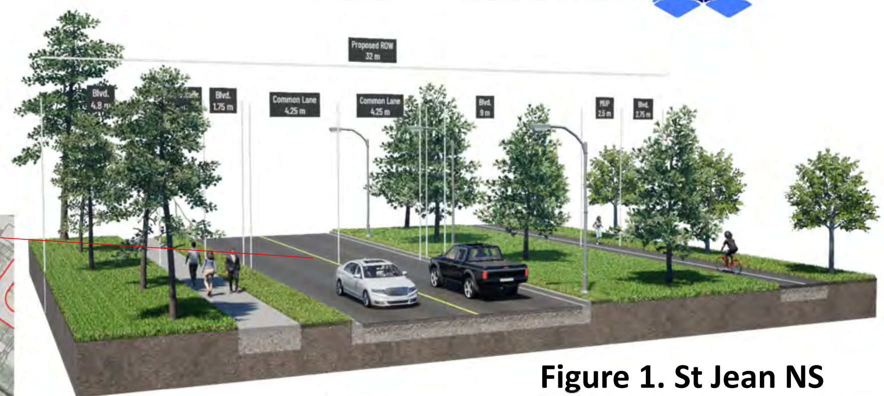

Figure 1. St Jean NS (Looking to the South)

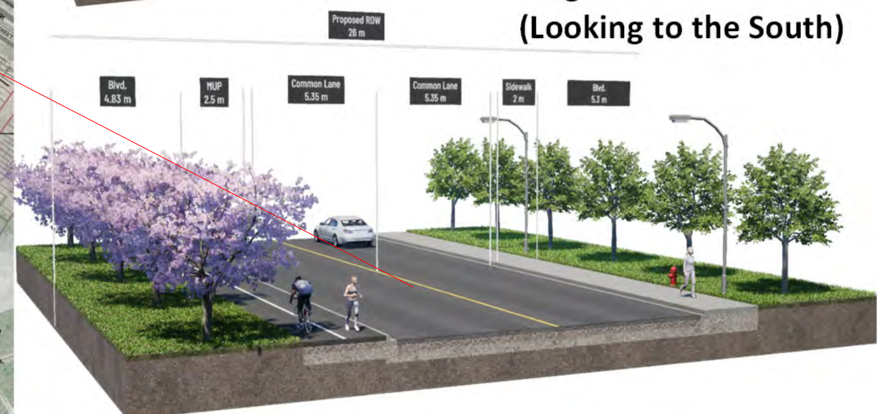


Figure 2. Intersection #1 / Bronze Avenue (Looking to the North)

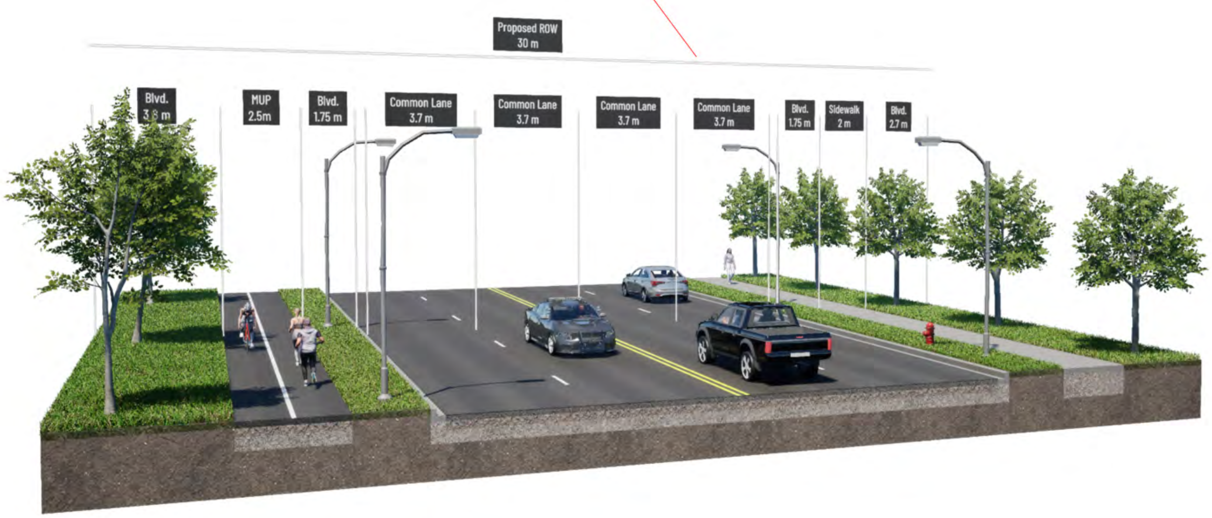


Figure 3. St. Jean Street EW (Looking to the East)

# Between Int #2 & #3 Roadway Cross-Sections

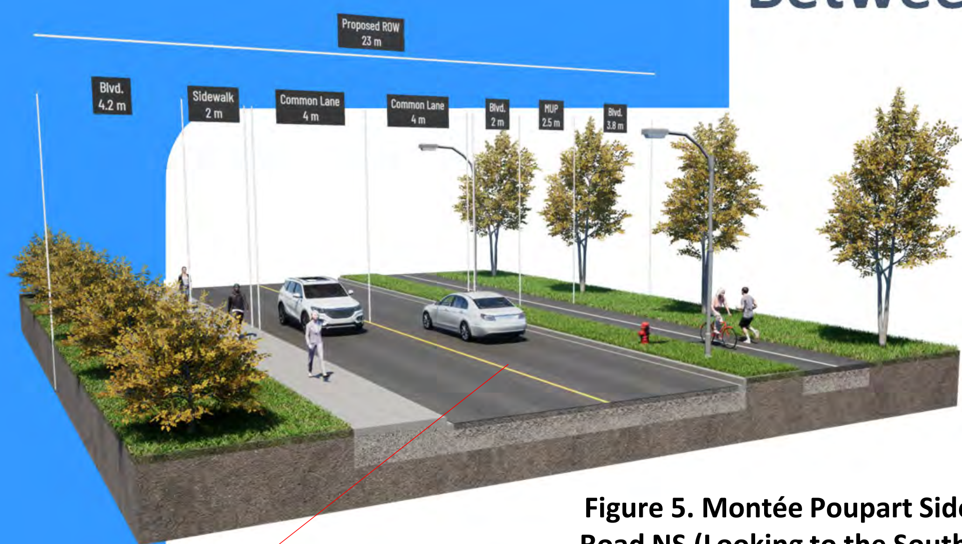


Figure 5. Montée Poupart Side Road NS (Looking to the South)

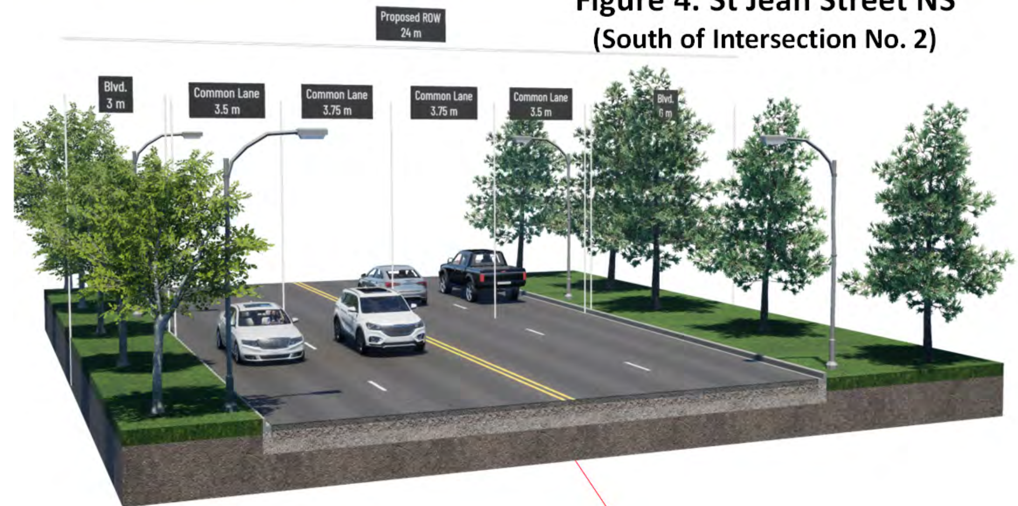


Figure 4. St Jean Street NS
(South of Intersection No. 2)

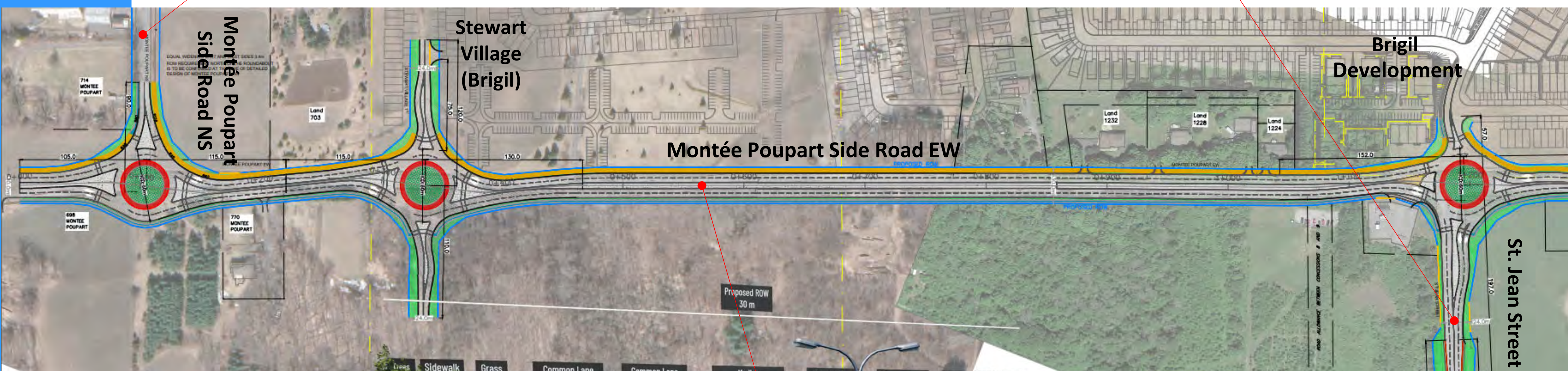



Figure 6. Montée Poupart Side Road EW with Raised Median
(Between Int #2 & Int #4 – Looking to the east)

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# Archeological Assessment


Matrix Heritage

ORIGINAL REPORT

Stage 1 and 2 Archaeological Assessment:
Poupart / St-Jean Street
Part Lots 27, 28, 29, 30, and 31, Concession 1,
Old Survey; Part Lot C, Concession 9; Part Lots C
and D, Concession 8
Geographic Township of Clarence,
Municipality of Clarence-Rockland
United Counties of Prescott-Russell
Rockland, Ontario

Prepared For
Jean Decoeur
Atrel Engineering Ltd
1-2884 Chamberland Street
Rockland, Ontario
K4K 1M6
jeandecoeur@atrel.com
613-446-7423

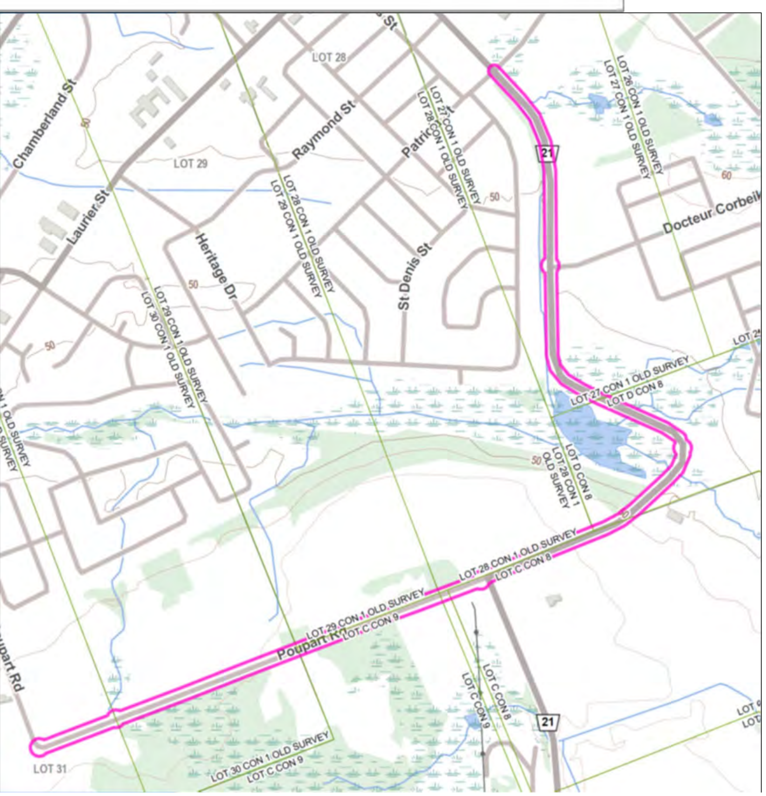
December 2022
Submitted for review December 23, 2022

PIF: P369-0289-2022

Ben Mortimer (License Number P369)

Report: MH1125-REP.01

Matrix Heritage Inc.
6131 Perth Street
Richmond
Ontario K0A 2Z0
Tel: (613) 807-2071
www.MatrixHeritage.ca




- Assessment was completed in accordance with the Provincial Standards and Guidelines for Consultant Archaeologists(2011).
- The entire study area is disturbed (roads, diches, buried utilities, driveways, etc.), permanently wet, steeply sloped, or a combination thereof.
  - The study area had archaeological potential and was thus recommended for a Stage 2 assessment.
  - The Stage 2 assessment resulted in no evidence of archaeological or cultural heritage interest or value.
  - **Conclusion:** No further archaeological investigation was warranted.

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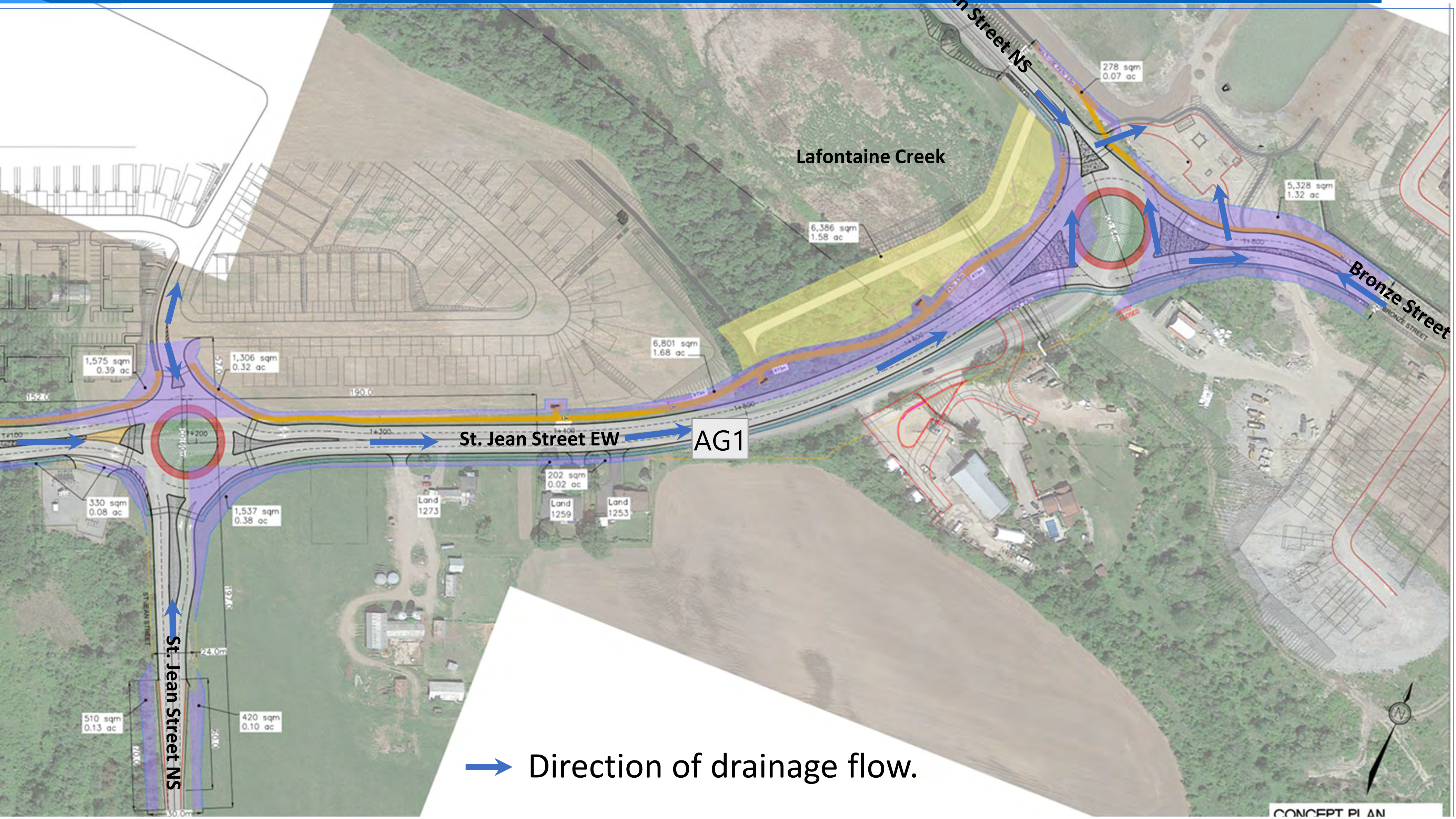
# Drainage-Stormwater Mgmt




Direction of drainage flow.

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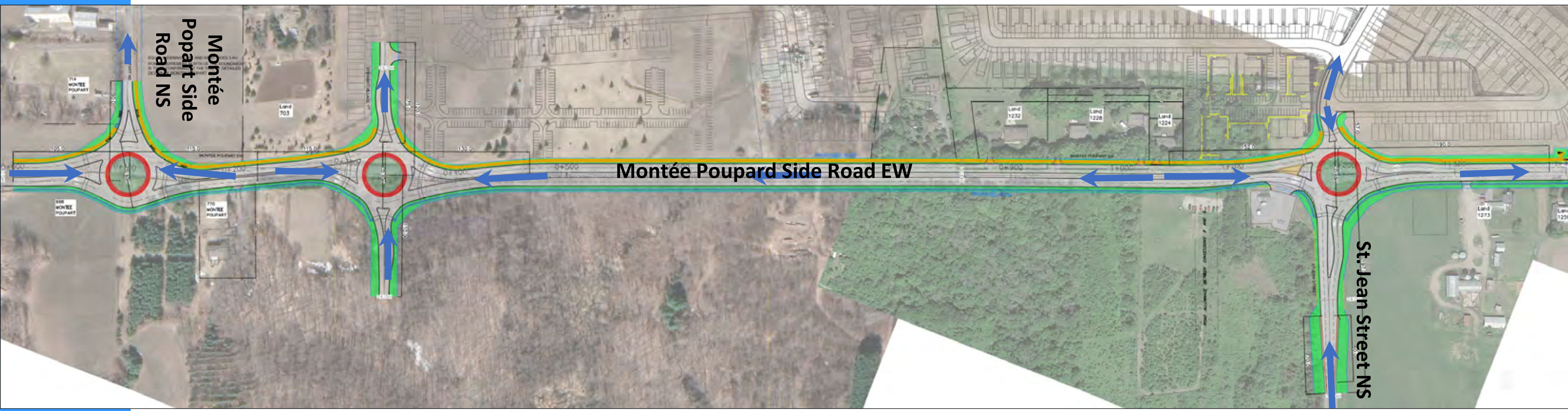
# Drainage-Stormwater Management




→ Direction of drainage flow.

- The drainage along Montée Poupart Side Road is currently provided by rural ditches on both sides of the roadway.
- **Conclusion:** Subsequent to widening, the planned drainage system, for major and minor facilities will provide for an urban curb and gutter solution on both sides of the roadway corridor.

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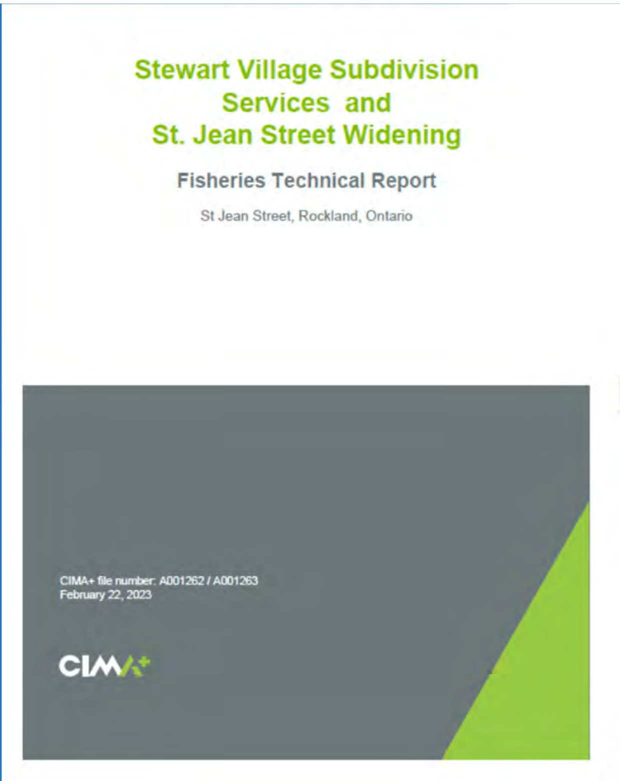

Stewart Village Subdivision Services and St. Jean Street Widening

Fisheries Technical Report

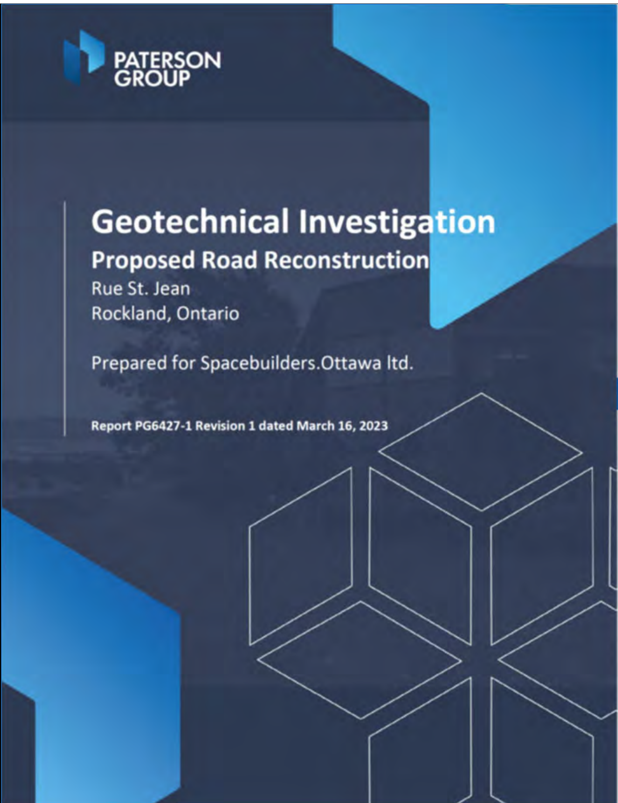
St Jean Street, Rockland, Ontario

CIMA+ file number: A001262 / A001263
February 22, 2023

CIMA+

# Fisheries Technical Report

- The effected areas include:
  - ❑ 5,045m$^2$ indirect fish ephemeral habitat associated with wetland removal and infill.
  - ❑ +290m$^2$ net effect of fish habitat into two twin culverts that provide a wider channel width.
- Mitigation measures were proposed for consideration to lessen the works, activities and undertakings (WUAs) associated with this project that include:
  - ❑ Advance Planning;
  - ❑ Erosion/Sedimentation Control; (120m$^2$ of rock/riverstone below high watermark on each side of culvert);
  - ❑ Fish and Fish Habitat Protection;
  - ❑ Contamination and Spill Management;
- **Conclusion:** The project was found to result in impacts to fish habitat. The Fisheries study was submitted to the Federal Department of Fisheries that provided a review and proposed several culvert design recommendations to avoid and mitigate the impacts.

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# Geotechnical Investigation

- The Geotechnical investigation:
  - Determined the subsoil/groundwater conditions on the alignment within the right-of-way by means of test holes.
  - Provided pavement structure design for the roadways and municipal services based on boreholes and soil information.
- The field investigation included
  - 54 test holes drilled to a maximum 7.5m;
  - Soil sampling at each test hole inclusive of standard penetration tests (SPT), undrained shear strength (USS) etc.;
  - Bedrock samples were recovered & Rock Quality Designation (RQD) determined;
  - Groundwater monitoring was installed in the area of Lafontaine Creek.
- Conclusion: ***The subject site is suitable for the proposed road reconstruction and municipal service installation.*** It is expected that a portion of the roadway and municipal services will be founded on an undisturbed hard to very stiff silty clay bearing surface, glacial till or bedrock.

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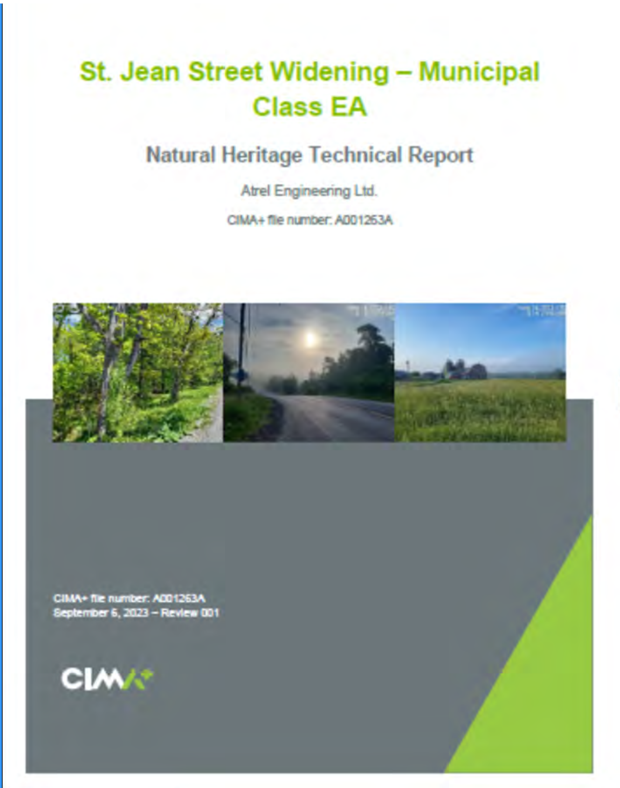

St. Jean Street Widening – Municipal Class EA

Natural Heritage Technical Report

Atrel Engineering Ltd.

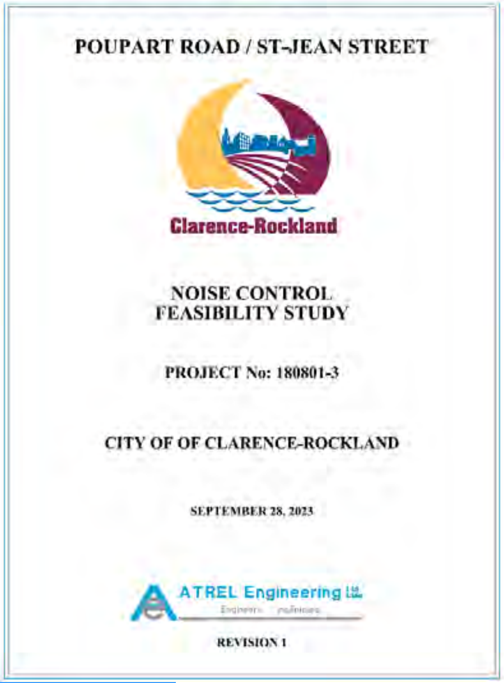
CIMA+ file number: A001263A

CIMA+ file number: A001263A
September 6, 2023 – Review 001

CIMA+

# Natural Heritage

- This environmental study examined and analyzed available information through desk-top research and on-site ecological surveys (July, 2019 & April-to-August, 2022. June, 2023) which included:
  - ❑ Terrestrial; (Vegetation, Wetlands, Woodlands)
  - ❑ Species-at-Risk; (plants)
  - ❑ Wildlife Observations; (Bird Surveys, Amphibian Surveys, Fauna)
  - ❑ Aquatic environment (Fish and Fish Habitat)
- The study provided a summary of the relevant regional, provincial, and federal Acts, Regulations and policies that apply to the proposed project as concerns natural heritage features.
- The DFO National Aquatic Species at Risk Mapping (NASAR) indicated fish habitat but there are no recordings of federal endangered, threatened, or special concerns associated with Lafontaine Creek.
- The Species-at-Risk evaluation confirmed the presence of butternuts in 2023 and reported to MECP. Avoidance and mitigation measures were provided with regard to the butternuts, bats, black ash and birds on nesting on private agricultural lands.
- Significant woodlands were identified outside the City's urban boundary.



POUPART ROAD / ST-JEAN STREET

Clarence-Rockland

NOISE CONTROL
FEASIBILITY STUDY

PROJECT No: 180801-3

CITY OF OF CLARENCE-ROCKLAND

SEPTEMBER 28, 2023

ATREL Engineering Ltd.

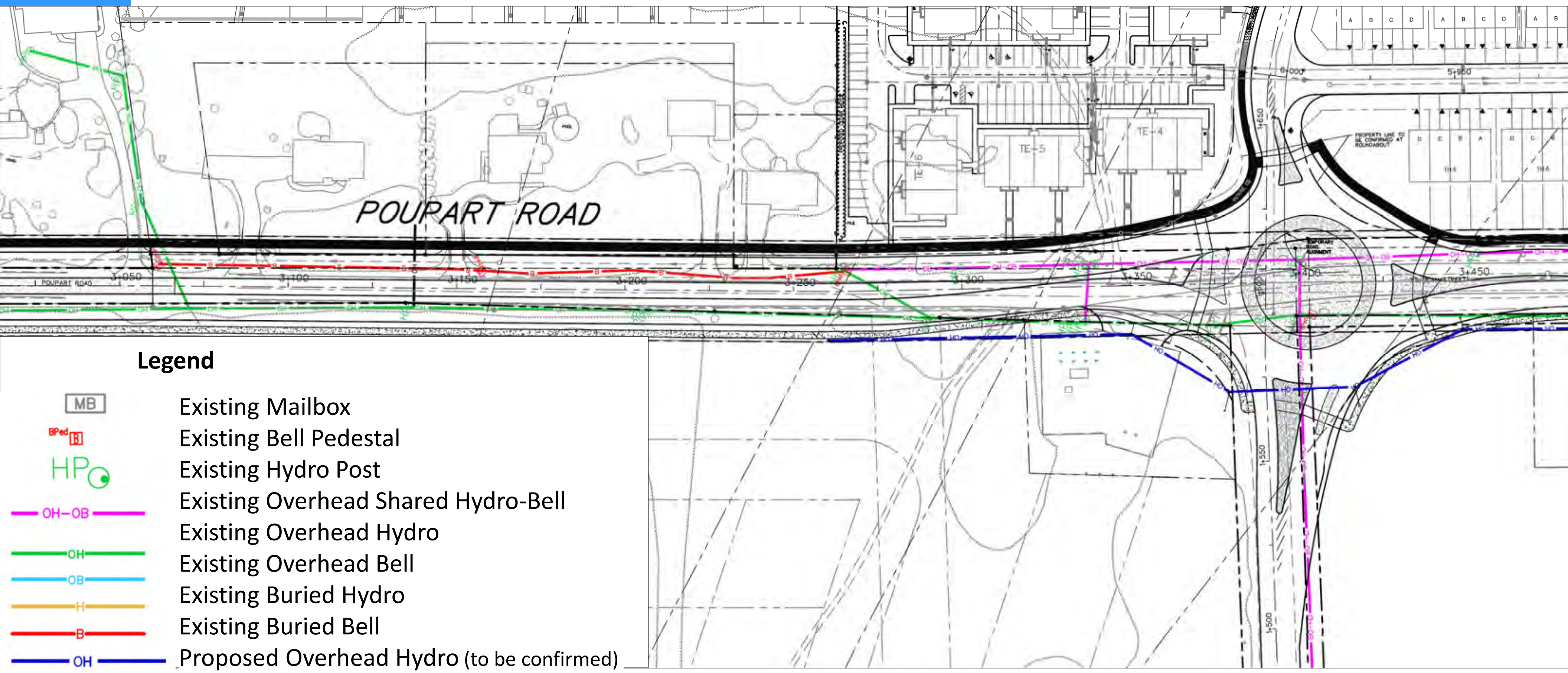
REVISION 1

# Noise Control

- Provincial noise thresholds differ depending on the location (indoor (bedroom/living room/outdoor), time of day (daytime, night-time), type of air conditioning (forced Air vs. central air) and the intended land use.
- It was determined that "*the outdoor living area sound level of all existing dwelling along Montée Poupart Side Road and St-Jean Street were below 55 dBA. Mitigation measures, such as a noise fences are at this time thought unwarranted*".
- Existing home-owners along Montée Poupart Side Road and St-Jean Street shall be advised that "*sound level due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants*"
- New developments (Stewart Village and Morris Village) are to conduct their own respective noise studies.
- The Noise Control Feasibility Study is to be updated at the detailed design stage in which mitigation measures will be re-evaluated and designed accordingly.

# Utilities

- The study surveyed all utilities within the proposed right-of-way and identified the need for either protection or relocation.
- Liaison with utility agencies needed to determined utility relocation/protection measures and costs.



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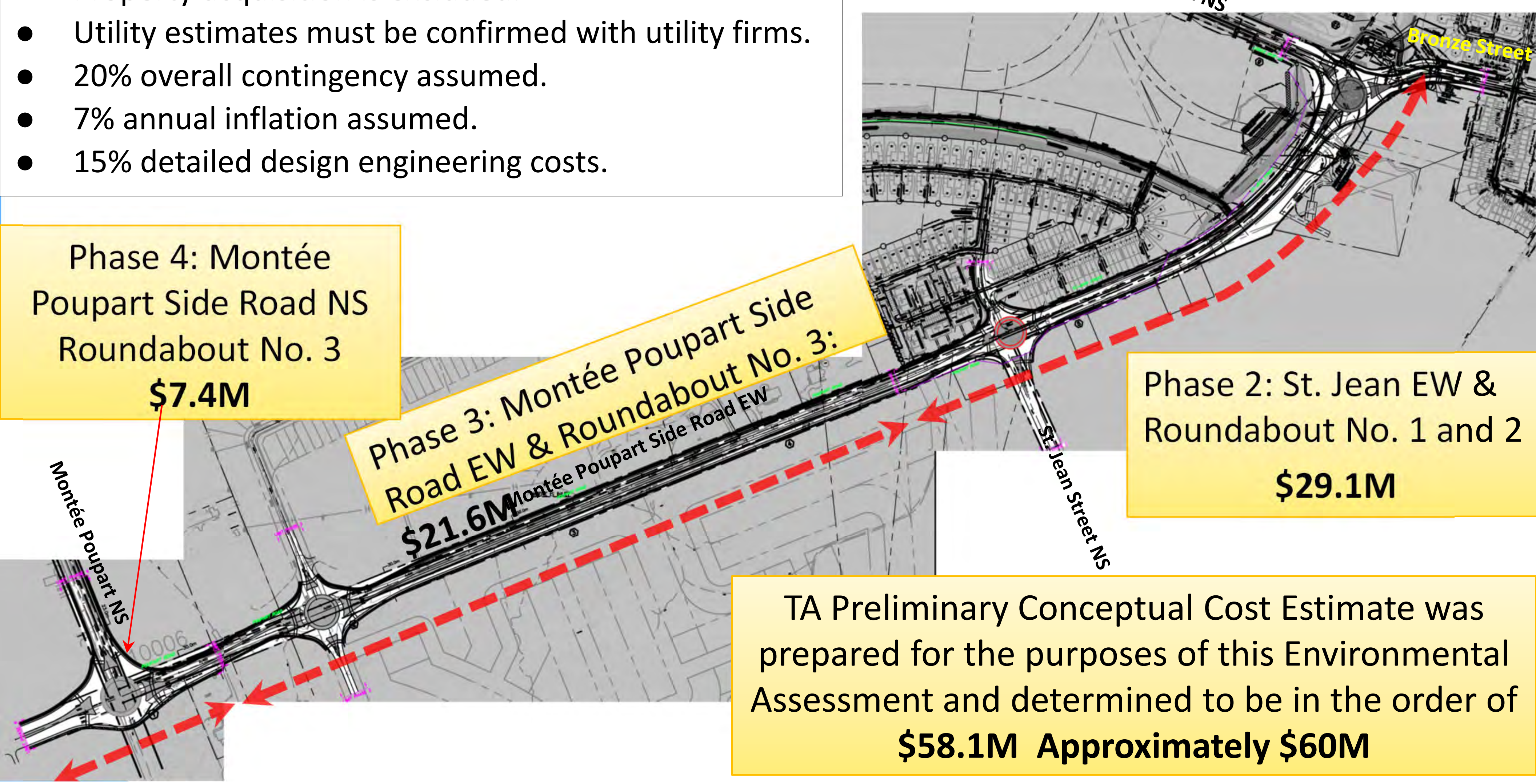
# Conceptual Preliminary Costing

- No provision to address contaminated materials.
- Property acquisition is excluded.
- Utility estimates must be confirmed with utility firms.
- 20% overall contingency assumed.
- 7% annual inflation assumed.
- 15% detailed design engineering costs.




Phase 4: Montée Poupart Side Road NS Roundabout No. 3
**$7.4M**

Phase 3: Montée Poupart Side Road EW & Roundabout No. 3:
**$21.6M**

Phase 2: St. Jean EW & Roundabout No. 1 and 2
**$29.1M**

TA Preliminary Conceptual Cost Estimate was prepared for the purposes of this Environmental Assessment and determined to be in the order of
**$58.1M Approximately $60M**

# Before and After Renderings

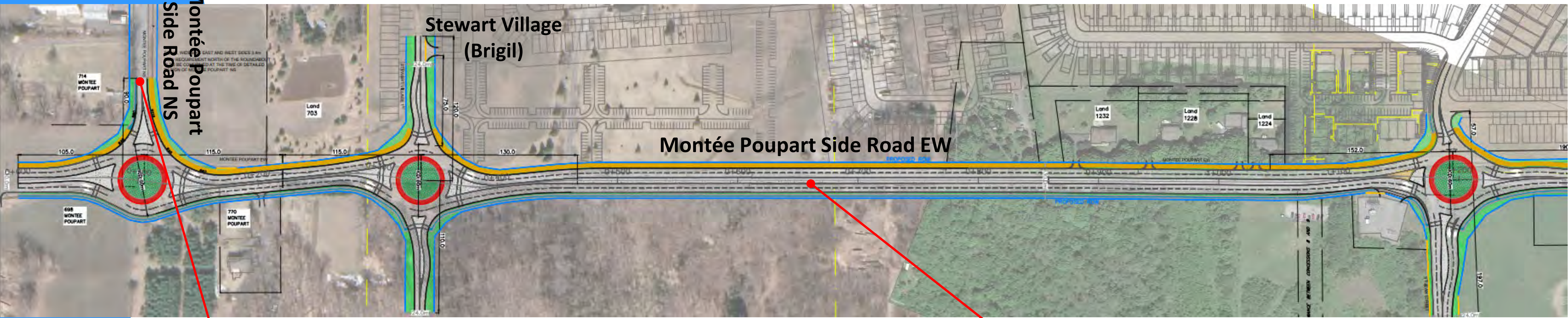




**Figure 1. Monte Poupart NS Concept (North of Intersection 4)**

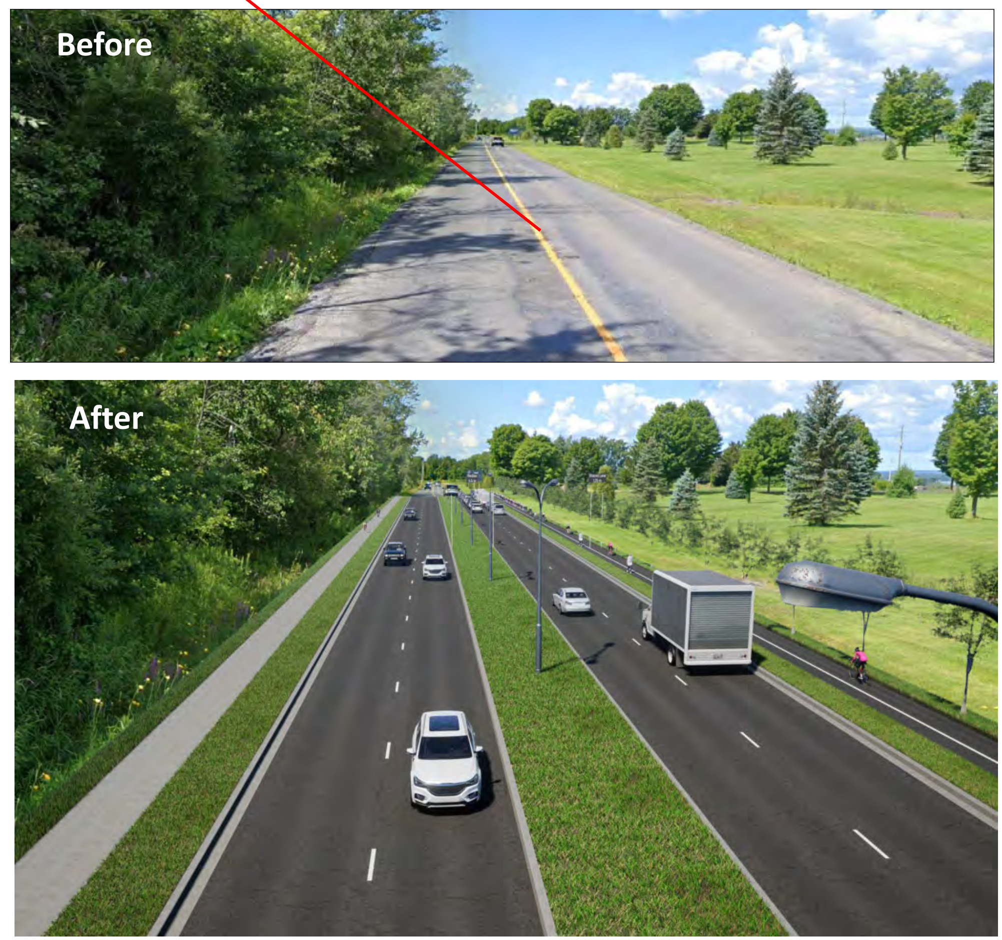


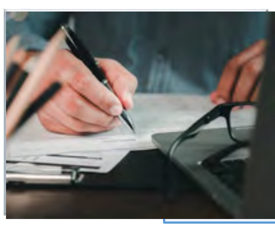

**Figure 2. Before and After Concepts of Montée Poupart EW (West of Intersection 2)**

# Next Steps

**Respond to Public Comments**


**Further Technical Evaluation**

**Refine and recommend a plan with mitigations**



**Produce & Adopt Environmental Study Report**

Following this Public Consultation Centre, we will:

- Review and respond to public comments received;
- Refine the improvement alternatives and the recommended plan and propose mitigation measures;
- Prepare the DRAFT Environmental Study Report;
- Present the recommended plan to Council at meeting in the late Fall, 2023;
- Provide the Notice of Study Completion and the 30-day review period; and
- Respond to comments received.

# Next Steps

**Thank you for participating in the Public Consultation Centre. We welcome your comments.**

- Information is being collected in accordance with the Freedom of Information and Protection of Privacy Act. With the exception of personal information, all comments will become part of the public record.

**To contact a member of the Project Team, please email:**

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- **For more information, please visit:**

**City Web Site where this presentation will be posted.**

- **If you would like more information regarding this Class EA study, please contact a Project Team member. Contact information is provided on the comment sheet.**

**Comments Received at Public Open House No. 2 (Oct 25th, 2023)**

| Comment Received at Meeting | Consultant's Response |
|---|---|
| • Roundabouts are not safe where high volumes of pedestrian traffic (such as schools) are concerned. (Afshin) | Pedestrian Actuted Traffic Signals can be installed at roundabouts should pedestrian safety become a major concern. |
| • Between Roundabout No. 2 at the top of the hill and Roundabout No. 1 at the bottom is planned at an 8% slope (improved from 14.5%). How does this satisfy disabled users that are confined to wheelchairs? (Afshin) | Bicycle accessibility is provided along the multiuse pathway along the north side of the St. Jean corridor. The design of the multi-use pathway provides for 3 intermediate rest areas which are at a 3% grade. As well the path is wider (3.5m) and meanders (rather than being straight and parallel to the roadway) to provide for greater maneuverability.<br>As regards wheelchair accessibility, plans are being considered for a separate pathway that would link by way of multiuse trail the developments on both side of the LaFontaine Tributary north of the St. Jean EW corridor. |
| • Continuity of providing for long term access to the existing Dog Park facility (Andrey) | The plans illustrated at this Public Consultation Centre depict the roadway in the ultimate time frame. The lands on which the existing Dog Park facility is located are owned by a developer and use of such is provided at the discretion of the property owner. The City of Clarence-Rockland has plans in place to develop a new dog park facility to the north of the community. Plans are in place to ultimately close the existing dog park facility at the time when a new replacement facility is developed. |
| • Signage for roundabouts (Konstantin) | Signage in the vicinity of roundabouts will be addressed at the time of detailed design. The signage template for standardization will likely be the recently completed Dr. Corbeil roundabout. Although this roundabout is a single lane configuration, similar signage emphasizing lane directionality will be prepared to assure all motorists using the 2-lane roundabouts will have advance notice of which lanes they should occupy when navigating the roundabout facility. |
| • Lighting along pathways and sidewalks (Konstantin & Arthur) | The centre median lighting along the Montee Poupart EW corridor must ideally provide sufficient lighting to assure the pathways and sidewalks along the corridor are well lit for reasons of pedestrian safety, security and night-time visibility. The need for additional lighting of pathways/sidewalks should be determined at the time of detailed design and consideration should be given to solar powered lighting which could offer reduced lighting (30%) when no pedestrian is present and full lighting (100%) which is motion detected. The solution must adhere to the City of Clarence-Rocklands Lighting Policy. |
| • What is the timing of this project? (Arthur) | Although there is no precise timing that is currently envisioned for the project the ESR document envisions that the project would commence at the eastern limit at the bottom of the Hill and proceed westward in the following manner.<br>• *Stage 1:* The roundabout at the bottom of the hill will likely take place in 3 distinct phases as follows:<br>o *Phase 1:* the underground servicing (major culvert) first being required, followed by the raising of the profile and roadway widening/realignment and re-grading of the hill, followed in turn by the new roundabout at the bottom of the hill. This 600m of |

**Comments Received at Public Open House No. 2 (Oct 25th, 2023)**

<table>
<tr><th>Comment Received at Meeting</th><th>Consultant's Response</th></tr>
<tr><td></td><td>roadway length is estimated to take place over a 3-to-4-year time frame.<br>o *Phase 2:* The roundabout at the top of the hill would then proceed which would be undertaken within an additional year.<br>o *Phase 3*: Lastly, the two remaining roundabouts and 1 km of roadway widening would be in the order of an additional 2 years.<br><br>In total, the project could take 7-to-10 years (2030-to-2033) to be completed.</td></tr>
<tr><td>• How quickly will this facility be needed? (Arthur)</td><td>The need for the project is highly dependent upon the rate of development growth and the prioritization by City Council of this project in relation to all of the other City priorities. Some attendees noted that the municipality is growing at a rate of 200 units per year, (about 500 new residents per year), so it will be some time before the facility is needed.</td></tr>
<tr><td>• The need to develop a new east-west corridor that is more suited to accommodate and ensure pedestrians and cyclists' safety is well recognized. The concept addresses this need. (Arthur)</td><td>This objective was noted in the EA Report, and the fact that the design achieved this is appreciated.</td></tr>
<tr><td>• Vegetation inside of Roundabout (Alain)</td><td>The landscaping plans for the Dr. Corbeil roundabout will be completed early next Spring with low profile vegetation with small trees near the centre of the roundabout. This should be repeated for consistency at all roundabout locations.</td></tr>
<tr><td>• Noise Impacts (Alain)</td><td>A noise study was completed and the requirement for noise mitigation measures has been identified where required. These will be included where applicable in the various sub-division agreements.</td></tr>
<tr><td>• How will traffic speed be controlled along the new 4-lane corridor? (Alain)</td><td><table>
<tr><th>Roadway Segment</th><th>Design Speed (Kmph)</th><th>Posted Speed (Kmph)</th></tr>
<tr><td>Bronze Avenue</td><td>60</td><td>50</td></tr>
<tr><td>St. Jean NS, north of Bronze Avenue</td><td>60</td><td>50</td></tr>
<tr><td>St. Jean EW, west of Bronze Avenue</td><td>50</td><td>50</td></tr>
<tr><td>Montee Poupart Side Road EW from Montee Poupart Side Road NS-to-St. Jean NS</td><td>60</td><td>50</td></tr>
<tr><td>St. Jean NS, south of Montee Poupart Side Road</td><td>70</td><td>60</td></tr>
</table>
The above table outlines the design speed and posted speed associated with each segment of the St. Jean-Montée Poupart Side Road corridor under study. Within the vicinity of roundabouts 30Kmph would be the posted speed. The design of each roundabout have incorporated curvilinear approaches further encouraging motorists to adhere to the speed limit. When completed, traffic speeds within the area will continue to be monitored and measures implemented/engaged to assure adherence to posted speeds.</td></tr>
</table>

**Comments Received at Public Open House No. 2 (Oct 25th, 2023)**

| Comment Received at Meeting | Consultant's Response |
|---|---|
| • Will the main Hydro power line along Poupart be buried? (Alain) | This is up to Hydro One.<br>Estimates will be provided for both solutions (Buried and above ground). |
| • Additional Pedestrian Trails (Stonedust surface) would be appreciated. (Alain) | This environmental assessment is limited to the St. Jean-Montée Poupart Side Road corridor, and as such is limited to those roadside facilities that would be parallel to the corridor and that would best facilitate pedestrian and non-motorized modes of travel. For these reasons a hard surface was preferred for the adjacent sidewalks and multiuse pathways<br>The concept of a municipal "trail network" would more properly be the focus of an off-road trail network study. In general, Stonedust surfaces are better suited for off-road recreational pathways in that they provide a hard stable inexpensive surface that complements the natural landscapes. On the other hand, Stonedust can be difficult for some to walk on, can create dust, be subject to erosion, can be contaminated by weeds, don't accommodate in-line skaters and is characterized by higher maintenance costs. |
| • There should be a future provision to extend the Multi-use Trail proposed along the east side of Montee Poupart NS up to Laurier to connect to the Walmart. | This has been identified in the City's traffic study and in addition it is being considered in the update to the new City Transportation Master Plan. As this section of roadway is developed pedestrian provisions that would facilitate crossings of Montee Poupart NS at the Walmart entrance should be considered. |
| • Future Water Tower (Jonathan) | A water tower is being planned on the south side of Poupart near the communication tower (near 1515 St. Jean property). This has been identified in the City's Water Master Plan. |
| • Fire Hydrants along the road corridor. | Water servicing is to be planned along the Poupart-St. Jean corridor. The completion of the detailed design in coordination with all utilities will be used to decide which side of the corridor to run the water servicing related to the provision of water for fire hydrants. |

# APPENDIX “F”

## Traffic Analysis: Synchro Results: Existing (2023) Conditions

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.4 |
| Intersection LOS | A |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 46 | 39 | 77 | 111 | 49 | 89 |
| Future Vol, veh/h | 46 | 39 | 77 | 111 | 49 | 89 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 48 | 41 | 81 | 117 | 52 | 94 |
| Number of Lanes | 1 | 0 | 0 | 1 | 1 | 0 |

| Approach | EB | WB | NB |
|---|---|---|---|
| Opposing Approach | WB | EB | |
| Opposing Lanes | 1 | 1 | 0 |
| Conflicting Approach Left | | NB | EB |
| Conflicting Lanes Left | 0 | 1 | 1 |
| Conflicting Approach Right | NB | | WB |
| Conflicting Lanes Right | 1 | 0 | 1 |
| HCM Control Delay | 7.7 | 8.9 | 8.2 |
| HCM LOS | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 |
|---|---|---|---|
| Vol Left, % | 36% | 0% | 41% |
| Vol Thru, % | 0% | 54% | 59% |
| Vol Right, % | 64% | 46% | 0% |
| Sign Control | Stop | Stop | Stop |
| Traffic Vol by Lane | 138 | 85 | 188 |
| LT Vol | 49 | 0 | 77 |
| Through Vol | 0 | 46 | 111 |
| RT Vol | 89 | 39 | 0 |
| Lane Flow Rate | 145 | 89 | 198 |
| Geometry Grp | 1 | 1 | 1 |
| Degree of Util (X) | 0.172 | 0.104 | 0.245 |
| Departure Headway (Hd) | 4.264 | 4.201 | 4.45 |
| Convergence, Y/N | Yes | Yes | Yes |
| Cap | 843 | 854 | 811 |
| Service Time | 2.281 | 2.218 | 2.45 |
| HCM Lane V/C Ratio | 0.172 | 0.104 | 0.244 |
| HCM Control Delay | 8.2 | 7.7 | 8.9 |
| HCM Lane LOS | A | A | A |
| HCM 95th-tile Q | 0.6 | 0.3 | 1 |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 8.2 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 34 | 9 | 23 | 14 | 32 | 19 | 83 | 55 | 4 | 14 | 55 | 14 |
| Future Vol, veh/h | 34 | 9 | 23 | 14 | 32 | 19 | 83 | 55 | 4 | 14 | 55 | 14 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 36 | 9 | 24 | 15 | 34 | 20 | 87 | 58 | 4 | 15 | 58 | 15 |
| Number of Lanes | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 2 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 2 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 2 |
| HCM Control Delay | 8.2 | 8 | 8.5 | 7.9 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | EBLn2 | WBLn1 | SBLn1 |
|---|---|---|---|---|---|
| Vol Left, % | 58% | 100% | 0% | 22% | 17% |
| Vol Thru, % | 39% | 0% | 28% | 49% | 66% |
| Vol Right, % | 3% | 0% | 72% | 29% | 17% |
| Sign Control | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 142 | 34 | 32 | 65 | 83 |
| LT Vol | 83 | 34 | 0 | 14 | 14 |
| Through Vol | 55 | 0 | 9 | 32 | 55 |
| RT Vol | 4 | 0 | 23 | 19 | 14 |
| Lane Flow Rate | 149 | 36 | 34 | 68 | 87 |
| Geometry Grp | 2 | 7 | 7 | 5 | 2 |
| Degree of Util (X) | 0.185 | 0.056 | 0.043 | 0.086 | 0.106 |
| Departure Headway (Hd) | 4.467 | 5.642 | 4.633 | 4.537 | 4.371 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes |
| Cap | 806 | 636 | 774 | 791 | 822 |
| Service Time | 2.48 | 3.362 | 2.353 | 2.556 | 2.385 |
| HCM Lane V/C Ratio | 0.185 | 0.057 | 0.044 | 0.086 | 0.106 |
| HCM Control Delay | 8.5 | 8.7 | 7.6 | 8 | 7.9 |
| HCM Lane LOS | A | A | A | A | A |
| HCM 95th-tile Q | 0.7 | 0.2 | 0.1 | 0.3 | 0.4 |

| Intersection | | | | | | |
|---|---|---|---|---|---|---|
| Int Delay, s/veh | 1.2 | | | | | |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 7 | 7 | 25 | 135 | 78 | 14 |
| Future Vol, veh/h | 7 | 7 | 25 | 135 | 78 | 14 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 7 | 7 | 26 | 142 | 82 | 15 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 284 | 90 | 97 | 0 | - | 0 |
| Stage 1 | 90 | - | - | - | - | - |
| Stage 2 | 194 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | 706 | 968 | 1496 | - | - | - |
| Stage 1 | 934 | - | - | - | - | - |
| Stage 2 | 839 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 693 | 968 | 1496 | - | - | - |
| Mov Cap-2 Maneuver | 693 | - | - | - | - | - |
| Stage 1 | 916 | - | - | - | - | - |
| Stage 2 | 839 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 9.5 | 1.2 | 0 |
| HCM LOS | A | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1496 | - | 808 | - | - |
| HCM Lane V/C Ratio | 0.018 | - | 0.018 | - | - |
| HCM Control Delay (s) | 7.5 | 0 | 9.5 | - | - |
| HCM Lane LOS | A | A | A | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | 0.1 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 7 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 140 | 111 | 62 | 73 | 59 | 48 |
| Future Vol, veh/h | 140 | 111 | 62 | 73 | 59 | 48 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 147 | 117 | 65 | 77 | 62 | 51 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 279 | 104 | 0 | 0 | 142 | 0 |
| Stage 1 | 104 | - | - | - | - | - |
| Stage 2 | 175 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | - | - | 4.12 | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Cap-1 Maneuver | 711 | 951 | - | - | 1441 | - |
| Stage 1 | 920 | - | - | - | - | - |
| Stage 2 | 855 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 680 | 951 | - | - | 1441 | - |
| Mov Cap-2 Maneuver | 680 | - | - | - | - | - |
| Stage 1 | 920 | - | - | - | - | - |
| Stage 2 | 817 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 12 | 0 | 4.2 |
| HCM LOS | B | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 778 | 1441 | - |
| HCM Lane V/C Ratio | - | - | 0.34 | 0.043 | - |
| HCM Control Delay (s) | - | - | 12 | 7.6 | 0 |
| HCM Lane LOS | - | - | B | A | A |
| HCM 95th %tile Q(veh) | - | - | 1.5 | 0.1 | - |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 9.5 |
| Intersection LOS | A |

| Movement | EBT | EBR | WBL | WBT | NBL | NBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 108 | 84 | 118 | 73 | 94 | 141 |
| Future Vol, veh/h | 108 | 84 | 118 | 73 | 94 | 141 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 114 | 88 | 124 | 77 | 99 | 148 |
| Number of Lanes | 1 | 0 | 0 | 1 | 1 | 0 |

| Approach | EB | WB | NB |
|---|---|---|---|
| Opposing Approach | WB | EB | |
| Opposing Lanes | 1 | 1 | 0 |
| Conflicting Approach Left | | NB | EB |
| Conflicting Lanes Left | 0 | 1 | 1 |
| Conflicting Approach Right | NB | | WB |
| Conflicting Lanes Right | 1 | 0 | 1 |
| HCM Control Delay | 9.1 | 9.8 | 9.7 |
| HCM LOS | A | A | A |

| Lane | NBLn1 | EBLn1 | WBLn1 |
|---|---|---|---|
| Vol Left, % | 40% | 0% | 62% |
| Vol Thru, % | 0% | 56% | 38% |
| Vol Right, % | 60% | 44% | 0% |
| Sign Control | Stop | Stop | Stop |
| Traffic Vol by Lane | 235 | 192 | 191 |
| LT Vol | 94 | 0 | 118 |
| Through Vol | 0 | 108 | 73 |
| RT Vol | 141 | 84 | 0 |
| Lane Flow Rate | 247 | 202 | 201 |
| Geometry Grp | 1 | 1 | 1 |
| Degree of Util (X) | 0.315 | 0.253 | 0.272 |
| Departure Headway (Hd) | 4.586 | 4.507 | 4.877 |
| Convergence, Y/N | Yes | Yes | Yes |
| Cap | 782 | 794 | 734 |
| Service Time | 2.63 | 2.554 | 2.925 |
| HCM Lane V/C Ratio | 0.316 | 0.254 | 0.274 |
| HCM Control Delay | 9.7 | 9.1 | 9.8 |
| HCM Lane LOS | A | A | A |
| HCM 95th-tile Q | 1.4 | 1 | 1.1 |

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 9.3 |
| Intersection LOS | A |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Vol, veh/h | 142 | 59 | 99 | 17 | 28 | 34 | 44 | 88 | 25 | 21 | 45 | 21 |
| Future Vol, veh/h | 142 | 59 | 99 | 17 | 28 | 34 | 44 | 88 | 25 | 21 | 45 | 21 |
| Peak Hour Factor | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 | 0.95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 149 | 62 | 104 | 18 | 29 | 36 | 46 | 93 | 26 | 22 | 47 | 22 |
| Number of Lanes | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| Opposing Approach | WB | EB | SB | NB |
| Opposing Lanes | 1 | 2 | 1 | 1 |
| Conflicting Approach Left | SB | NB | EB | WB |
| Conflicting Lanes Left | 1 | 1 | 2 | 1 |
| Conflicting Approach Right | NB | SB | WB | EB |
| Conflicting Lanes Right | 1 | 1 | 1 | 2 |
| HCM Control Delay | 9.6 | 8.5 | 9.5 | 8.8 |
| HCM LOS | A | A | A | A |

| Lane | NBLn1 | EBLn1 | EBLn2 | WBLn1 | SBLn1 |
|---|---|---|---|---|---|
| Vol Left, % | 28% | 100% | 0% | 22% | 24% |
| Vol Thru, % | 56% | 0% | 37% | 35% | 52% |
| Vol Right, % | 16% | 0% | 63% | 43% | 24% |
| Sign Control | Stop | Stop | Stop | Stop | Stop |
| Traffic Vol by Lane | 157 | 142 | 158 | 79 | 87 |
| LT Vol | 44 | 142 | 0 | 17 | 21 |
| Through Vol | 88 | 0 | 59 | 28 | 45 |
| RT Vol | 25 | 0 | 99 | 34 | 21 |
| Lane Flow Rate | 165 | 149 | 166 | 83 | 92 |
| Geometry Grp | 2 | 7 | 7 | 5 | 2 |
| Degree of Util (X) | 0.228 | 0.239 | 0.222 | 0.112 | 0.127 |
| Departure Headway (Hd) | 4.96 | 5.752 | 4.807 | 4.842 | 5.006 |
| Convergence, Y/N | Yes | Yes | Yes | Yes | Yes |
| Cap | 721 | 622 | 743 | 734 | 712 |
| Service Time | 3.013 | 3.507 | 2.562 | 2.909 | 3.067 |
| HCM Lane V/C Ratio | 0.229 | 0.24 | 0.223 | 0.113 | 0.129 |
| HCM Control Delay | 9.5 | 10.3 | 8.9 | 8.5 | 8.8 |
| HCM Lane LOS | A | B | A | A | A |
| HCM 95th-tile Q | 0.9 | 0.9 | 0.8 | 0.4 | 0.4 |

| Intersection | |
|---|---|
| Int Delay, s/veh | 2.6 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 26 | 51 | 36 | 131 | 141 | 20 |
| Future Vol, veh/h | 26 | 51 | 36 | 131 | 141 | 20 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | - | 0 | 0 | - |
| Grade, % | 0 | - | - | 0 | 0 | - |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 27 | 54 | 38 | 138 | 148 | 21 |

| Major/Minor | Minor2 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 373 | 159 | 169 | 0 | - | 0 |
| Stage 1 | 159 | - | - | - | - | - |
| Stage 2 | 214 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | 4.12 | - | - | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Cap-1 Maneuver | 628 | 886 | 1409 | - | - | - |
| Stage 1 | 870 | - | - | - | - | - |
| Stage 2 | 822 | - | - | - | - | - |
| Platoon blocked, % | | | | - | - | - |
| Mov Cap-1 Maneuver | 610 | 886 | 1409 | - | - | - |
| Mov Cap-2 Maneuver | 610 | - | - | - | - | - |
| Stage 1 | 845 | - | - | - | - | - |
| Stage 2 | 822 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 10.2 | 1.6 | 0 |
| HCM LOS | B | | |

| Minor Lane/Major Mvmt | NBL | NBT | EBLn1 | SBT | SBR |
|---|---|---|---|---|---|
| Capacity (veh/h) | 1409 | - | 769 | - | - |
| HCM Lane V/C Ratio | 0.027 | - | 0.105 | - | - |
| HCM Control Delay (s) | 7.6 | 0 | 10.2 | - | - |
| HCM Lane LOS | A | A | B | - | - |
| HCM 95th %tile Q(veh) | 0.1 | - | 0.4 | - | - |

| Intersection | |
|---|---|
| Int Delay, s/veh | 4.4 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Vol, veh/h | 52 | 101 | 126 | 123 | 124 | 139 |
| Future Vol, veh/h | 52 | 101 | 126 | 123 | 124 | 139 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | - | None | - | None | - | None |
| Storage Length | 0 | - | - | - | - | - |
| Veh in Median Storage, # | 0 | - | 0 | - | - | 0 |
| Grade, % | 0 | - | 0 | - | - | 0 |
| Peak Hour Factor | 95 | 95 | 95 | 95 | 95 | 95 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 55 | 106 | 133 | 129 | 131 | 146 |

| Major/Minor | Minor1 | | Major1 | | Major2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 606 | 198 | 0 | 0 | 262 | 0 |
| Stage 1 | 198 | - | - | - | - | - |
| Stage 2 | 408 | - | - | - | - | - |
| Critical Hdwy | 6.42 | 6.22 | - | - | 4.12 | - |
| Critical Hdwy Stg 1 | 5.42 | - | - | - | - | - |
| Critical Hdwy Stg 2 | 5.42 | - | - | - | - | - |
| Follow-up Hdwy | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Cap-1 Maneuver | 460 | 843 | - | - | 1302 | - |
| Stage 1 | 835 | - | - | - | - | - |
| Stage 2 | 671 | - | - | - | - | - |
| Platoon blocked, % | | | - | - | | - |
| Mov Cap-1 Maneuver | 409 | 843 | - | - | 1302 | - |
| Mov Cap-2 Maneuver | 409 | - | - | - | - | - |
| Stage 1 | 835 | - | - | - | - | - |
| Stage 2 | 597 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 12.8 | 0 | 3.8 |
| HCM LOS | B | | |

| Minor Lane/Major Mvmt | NBT | NBR | WBLn1 | SBL | SBT |
|---|---|---|---|---|---|
| Capacity (veh/h) | - | - | 620 | 1302 | - |
| HCM Lane V/C Ratio | - | - | 0.26 | 0.1 | - |
| HCM Control Delay (s) | - | - | 12.8 | 8.1 | 0 |
| HCM Lane LOS | - | - | B | A | A |
| HCM 95th %tile Q(veh) | - | - | 1 | 0.3 | - |

# APPENDIX “G”

## Utilities: Existing and Proposed


ATREL Engineering Ltd Ltée
Engineers - Ingénieurs

180801-3 - ST-JEAN STREET & POUPART ROAD

| | | |
|---|---|---|
| SCALE: 1:1500 | EXISTING UTILITIES | |
| | FEBRUARY 27, 2024 | EU-1 |

CS1
PROPOSED 23.0 METRE R.O.W. (180801-CS1)
POUPART AT WALMART
NORTH-SOUTH SEGMENT
N.T.S.
CS2
PROPOSED 30.0 METRE R.O.W. (180801-CS2)
POUPART-DIVIDED
EAST-WEST SEGMENT
N.T.S.
CS3
PROPOSED 30.0 METRE R.O.W. - UNDIVIDED (180801-CS3)
ST-JEAN - HILL
EAST-WEST SEGMENT
N.T.S.
CS4
PROPOSED 26.0 METRE R.O.W. (180801-CS4)
STREET No.1 (MORRIS VILLAGE)
EAST-WEST SEGMENT
N.T.S.
CS5
PROPOSED 26.0 METRE R.O.W. (180801-CS5)
ST-JEAN AT PARK AND POND
NORTH-SOUTH SEGMENT
N.T.S.
POUPART ROAD
POUPART ROAD
POUPART ROAD
ST-JEAN STREET
ST-JEAN STREET
INTERSECTION 1
INTERSECTION 2
INTERSECTION 3
INTERSECTION 4
PHASE 2
2024-2026
PHASE 3
2027-2028
DEPENDENT ON RATE
OF DEVELOPMENT
PHASE 4
2029
DEPENDENT ON RATE
OF DEVELOPMENT
PROPOSED TRANSFORMER
OH PROPOSED OVERHEAD HYDRO (TO BE CONFIRMED, OPT. 1)
H PROPOSED BURIED HYDRO (TO BE CONFIRMED, OPT. 2)
HBC PROPOSED BURIED HYDRO, CABLEVISION AND BELL (BY OTHERS)
H PROPOSED BURIED HYDRO (BY OTHERS)
G PROPOSED GAS LINE (BY OTHERS)
MB EXISTING MAILBOX
BPed EXISTING BELL PEDESTAL
HP EXISTING HYDRO POST
HBCG PROPOSED BURIED GAS, HYDRO, BELL AND CABLE VISION (BY OTHERS)
G PROPOSED INTERIM GAS (BY OTHERS)
G PROPOSED GAS LINE
BC PROPOSED BURIED BELL & CABLE VISION
ATREL Engineering Ltd Ltée
Engineers - Ingénieurs
180801-3 - ST-JEAN STREET & POUPART ROAD
SCALE:
1:1500
PROPOSED UTILITIES
FEBRUARY 27, 2024
U-1

**APPENDIX “H”**

**Geotechnical Investigation**

**Report PG6427-1,**

**Paterson, March 16, 2023**

PATERSON GROUP

# Geotechnical Investigation

## Proposed Road Reconstruction

Rue St. Jean

Rockland, Ontario

Prepared for Spacebuilders.Ottawa ltd.

**Report PG6427-1 Revision 1 dated March 16, 2023**

# Table of Contents

# Appendices

# 1.0 Introduction

Paterson Group Inc. (Paterson) was commissioned by Spacebuilders Ottawa ltd (Spacbuilders) to conduct a Geotechnical Investigation for the proposed St. Jean Street and Poupart Road roadway reconstruction and servicing to be located in Rockland, Ontario (refer to Figure 1 - Key Plan presented in Appendix 2).

The objectives of the geotechnical investigation were to:

- Determine the subsoil and groundwater conditions along the proposed servicing alignment within the right-of-way by means of test holes.
- Provide geotechnical recommendations for the design of the proposed pavement structure and municipal services based on the results of the boreholes and other soil information available. These recommendations include permissible grade raises and other construction considerations which may affect its design

The following report has been prepared specifically and solely for the aforementioned project which is described herein. It contains our findings and includes geotechnical recommendations pertaining to the design and construction of the subject development as they are understood at the time of writing this report.

Investigating the presence or potential presence of contamination on the subject property was not part of the scope of work of this present investigation.

# 2.0 Proposed Development

It is our understanding that the proposed development will consist of a full roadway reconstruction and installation of municipal services along St. Jean Street, Poupart Road, and include a crossing of Lafontaine Creek. The municipal services will include water, sanitary and storm sewers. In addition, gas and hydro lines will be installed along the boulevards of the roadways. It is anticipated that the new roadway construction will consist of five (5) roundabouts and will municipally service multiple proposed subdivisions along St. Jean Street and Poupart Road.

# 3.0 Method of Investigation

## 3.1 Field Investigation

### Field Program

Paterson conducted a field geotechnical investigation on November 14to 28, 2022. At that time a total of fifty-four (54) boreholes were drilled to a maximum depth of 7.5 m. The test hole locations were distributed in a manner to provide general coverage of the subject site and taking into consideration underground utilities and site features. The test hole locations are illustrated on Drawing PG6427-1 - Test Hole Location Plan attached. The test hole logs for this investigation are attached for reference.

The boreholes were drilled using a truck-mounted or track mounted auger drill rig operated by a two-person crew. All fieldwork was conducted under the full-time supervision of personnel from Paterson's geotechnical division under the direction of a senior engineer. The drilling procedure consisted of auguring to the required depths at the selected locations and sampling the overburden soils.

### Sampling and In Situ Testing

Soil samples were recovered using a 50 mm diameter split-spoon sampler or from the auger flights. The split-spoon and auger samples were classified on site and placed in sealed plastic bags. All samples were transported to our laboratory. The depths at which the split-spoon and auger samples were recovered from the boreholes are shown as SS and AU, respectively, on the Soil Profile and Test Data sheets in Appendix 1.

The Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples. The SPT results are recorded as "N" values on the Soil Profile and Test Data sheets. The "N" value is the number of blows required to drive the split-spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing was carried out at regular depth intervals in cohesive soils, using field vanes. Reference should be made to the Soil Profile and Test Data Sheets provided in Appendix 1.

Bedrock samples were recovered from ten (10) boreholes BH1-22, BH23-22, BH25-22, BH27-22 to BH29-22, BH44-22, BH45-22, BH47-22, BH50-22, and BH54-22. Using a core barrel and diamond drilling techniques. The bedrock samples were classified on site, placed in hard cardboard core boxes, and transported to Paterson's laboratory. The details at which rock core samples were recovered from the boreholes are presented as RC on Soil Profile and Test Data Sheets in Appendix 1.

The recovery value and Rock Quality Designation (RQD) value were calculated for each drilled section of bedrock and are presented on the borehole logs.
The recovery value is the length of the bedrock sample recovered over the length of the drilled section.

RQD value is the total length of intact rock pieces longer than 100 mm over the length of the core run. The values indicate rock quality.

The subsurface conditions observed in the test holes were recorded in detail in the field. The soil profiles are logged on the Soil Profile and Test Data sheets in Appendix 1 of this report.

**Groundwater**

Groundwater monitoring wells were installed in five (5) boreholes (BH30-22 to BH34-22) to permit monitoring of the groundwater levels subsequent to the completion of the sampling program in the area of the Lafontaine Creek crossing. Flexible standpipe piezometers were also installed in the remaining borehole locations to permit monitoring of the groundwater levels subsequent to the completion of the sampling program. The groundwater observations are discussed in subsection 4.3 and presented in the Soil Profile and Test Data Sheets in Appendix 1.

## 3.2 Field Survey

The test hole locations were selected in the field by Paterson personnel in a manner to provide general coverage of the proposed development, taking into consideration site features. The test hole locations along with ground surface elevations were surveyed by Paterson personnel using high precision GPS equipment. The ground surface elevations were referenced to a geodetic datum. The test hole locations from the previous investigation are understood to reference a geodetic datum. The locations of the boreholes and the ground surface elevations for each borehole location are presented on Drawing PG6427-1 - Test Hole Location Plan Pages 1 through 9 in Appendix 2.

## 3.3 Laboratory Testing

Soil samples were collected from the subject site during the investigation and were visually examined in our laboratory to review the results of the field logging. All samples will be stored in the laboratory for a period of one month after issuance of this report. The samples will then be discarded unless otherwise directed.

A total of three hundred and eight (308) natural water content tests were completed for the subject site from between all boreholes. The results of the moisture contents are presented in the Soil Profile and Test Data Sheets in Appendix 1.

Grain size analyses were conducted on seven (7) soil samples recovered during the field investigation from boreholes BH4-22, BH33-22 to BHBH36-22, BH38-22 and BH42-22. Mechanical (i.e. sieve and wash sieve) and/or Hydrometer test methods were used to determine the grain size distribution of each sample.
The results of the grain size analyses are presented on the Grain Size Distribution sheets in Appendix 1.

Six (6) representative soil samples recovered during the field investigation from boreholes BH32-22, BH34-22, BH38-22, BH40-22, BH42-22, and BH43-22 were submitted for Atterberg limits to determine the plastic index properties of the sample silty clay stratum. The results of this test are presented on the Plasticity Chart sheets in Appendix 1.

## 3.4 Analytical Testing

Two (2) soil sample was submitted for analytical testing to assess the corrosion potential for exposed ferrous metals and the potential of sulphate attacks against subsurface concrete structures. The sample was analyzed to determine the concentration of sulphate and chloride, the resistivity, and the pH of the sample. The results are discussed in Section 6.7 and shown in Appendix 1.

# 4.0 Observations

## 4.1 Surface Conditions

The subject site currently consists of an existing 2.7 km two-way paved road structure along St. Jean Street and Poupart Road. Existing residential developments were observed along St. Jean Street between Patricia Street and Docteur Corbell Boulevard. Agricultural lands were observed to the north of St. Jean Street and Poupart Road running east to west and a forested area to the south of Poupart Road. Residential and commercial developments are located at the intersection of Poupart Road and Richelieu Street to the east and west, respectively.

Lafontaine Creek was observed to cross St. Jean Street at the transition from north and south to east and west. The creek is orientated northwest to southeast. The topography of the paved roadway slopes north to south down St. Jean Street. A steeper slope with an approximate geodetic elevation change of 20 m is located west of the Lafontaine Creek. The top of this slope is located at the intersection of St. Jean Street and Poupart Road.

It is understood that the agricultural and forested lands are to be developed into residential subdivisions and municipally serviced by the proposed road reconstruction and municipal service installation at the subject site.

## 4.2 Subsurface Profile

**Poupart Road & St. Jean Street - Station 1+775 to 3+800**

Generally, the subsurface profile at the test hole locations (BH1-22 to BH29-22) consists of asphaltic concrete underlain by a fill layer ranging in depth between 0.5 to 2.2 m below grade. The fill layer consists of compact crushed stone with sand overlaying a silty sand to sandy silt and/or silty clay with gravel, cobbles, and trace organics. Topsoil was encountered below the fill layers at boreholes BH6-22 and BH8-22. A thin layer of silty sand and/or silty clay was encountered at BH3-22, BH5-22 to BH11-22. A thin layer glacial till was encountered underlying the either the fill, silty sand, or silty clay layers at all boreholes between BH1-22 to BH29-22. Refusal to auguring was encountered between 1.0 to 4.6 m depth below grade.

**St. Jean Street - Station 3+850 to 3+900 – Lafontaine Creek Crossing**

The subsurface profile at the test hole locations (BH30-22 and BH31-22) consists of thin layer topsoil overlaying a thin fill layer approximately 2.2 m depth below grade surface. The fill layer consists of compact crushed stone with sand or silty clay some topsoil, and trace organics. A thick layer of peat was encountered beneath the filly layer to a depth of 3.8 to 4.0 m below grade. A glacial till deposit was encountered below the peat layer. The glacial layer consists of a very dense grey silty sand with cobbles and boulders. Refusal to auguring was encountered between 5.4 to 6.3 m depth below grade.

It is important to note that a 0.5 m thick firm grey silty clay, trace gravel seam was encountered overlying the glacial till layer in BH30-22. It is further anticipated that the thickness of the peat layer decreases within 15 m west and east of boreholes BH30-22 and BH31-22, respectively. The peat is expected to be limited to the lower laying floodplain around the creek.

**St. Jean Street - Station 3+900 to 6+550 - Pond**

In general, the subsurface profile at the test hole locations (BH32-22 to BH43-22) consists of asphaltic concrete or topsoil underlain by a fill layer ranging in depth between 0 to 2.2 m below grade. The fill layer consists of compact crushed stone with sand overlaying a silty sand to sandy silt and/or silty clay with gravel, cobbles, and trace organics.

Native soils were encountered below the fill layers. The native soils generally consisted of hard to very stiff silty clay extending to a depth of 1.5 to 6.1 m below grade. Silt content was observed to increase with the depth of the clay deposit. The thickness of the clay layer undulates between Stations BH32-22, BH36-22, and BH43-22. A thin glacial till deposit was encountered underlying the fill, silty clay layer at all boreholes between BH32-22 to BH43-22). Refusal to auguring was encountered boreholes BH36-22, BH38-22 to BH40-22 up to a depth of 7.5 m below grade.

**St. Jean Street - Station 6+550 to 7+200**

The subsurface profile at the test hole locations (BH44-22 to BH54-22) consists of asphaltic concrete underlain by a fill layer ranging in depth between 0.4 to 2.9 m below grade. The fill layer consists of compact crushed stone with sand overlaying a silty sand and/or silty clay with gravel, and trace organics. A loose to compact silty sand layer was encountered to a depth of 1.45 to 4.1 m underside of the fill layer at boreholes BH48-22 to BH54-22. The depth of the silty sand layer was observed to decrease towards BH54-22. A thin glacial till deposit was encountered below the fill layer and silty sand layers at all boreholes mentioned above. The glacial till layers consist of compact to very dense grey silty sand to sandy silt with gravel, cobbles and boulders. Refusal to auguring was encountered at boreholes BH45-22 and BH50-22 to a depth of 1.1 and 6.5 m, respectively.

**Bedrock**

Based on available mapping the bedrock deposit along St. Jean Street consists of shale of the Rockcliffe Formation to the north and transitions to limestone and/or dolomite with interbedded shale of the Gull River Formation towards Poupart Road to the southwest with an estimated overburden drift thickness ranging from 1 to 10 m depth.

Based on the samples collected from rock coring, the bedrock consists of fair to excellent quality grey limestone with interbedded shale, poor to excellent quality shale with interbedded limestone or dolostone, or fair to excellent quality grey to dark grey dolostone.

Specific details of the soil profile at each test hole location (BH1-22 to BH54-22) are presented Appendix 1.

## 4.3 Groundwater

Groundwater level readings were recorded on December 6, 2022, the groundwater level readings are presented in the Soil Profile and Test Data sheets in Appendix 1. It should be noted that surface water can become trapped within a backfilled borehole that can lead to higher than typical groundwater level observations. Additionally, groundwater levels are subject to seasonal fluctuations, therefore the groundwater levels could vary at the time of construction.

Long-term groundwater level can also be estimated based on the observed color, moisture levels and consistency of the recovered soil samples. Based on these observations, the long-term groundwater level is expected between 1 to 3 m below grade. Standing water was observed above grade at boreholes BH30-22 and BH31-22 at the time of the current field investigation. It should be noted that groundwater levels are subject to seasonal fluctuations, therefore the groundwater levels could vary at the time of construction.

# 5.0 Discussion

## 5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is suitable for the proposed road reconstruction and municipal service installation. It is expected that a portion of the roadway and municipal services will be founded on an undisturbed hard to very stiff silty clay bearing surface, glacial till or bedrock layer.

Due to the presence of a silty clay layer, the subject site is subjected to a permissible grade raise restriction. Our permissible grade raise recommendations are discussed in Subsection 5.3.

It is also anticipated that a culvert replacement will be required for the Lafontaine Creek roadway crossing. Special construction consideration should be taken into note while installing the proposed culvert crossing.

It is expected that the entirety of the existing paved surface will be removed or pulverized during construction. The existing road base can remain in place where the new proposed grades allow for the full construction of the pavement structure recommended under section 5.8. Alternatively, it is recommended to reconstruct the pavement construction as per design section specified herein.

The above and other considerations are discussed in the following paragraphs.

## 5.2 Site Grading and Preparation

**Stripping Depth**

Topsoil and deleterious fill, such as those containing organic materials or peat, should be stripped from under any proposed municipal structures, paved areas and other settlement sensitive structures prior to placing fill to raise the grade.

**Bedrock Removal**

In areas of weathered bedrock and where only a small quantity of bedrock is to be removed, bedrock removal may be possible by hoe-ramming.
Line drilling and controlled blasting could also be used where a large volume of bedrock needs to be removed. However, prior to blasting, the potential blast damage to the existing structures must be considered.

A pre-blast or pre-construction survey of the existing buildings and underground structures should be carried out prior to commencing site activities. The extent of the survey should be determined by the blasting consultant and should be sufficient to respond to any inquiries/claims related to the blasting operations. The blasting operations should be planned and conducted under the supervision of a licensed professional engineer who is also an experienced blasting consultant.

As a general guideline, maximum peak particle velocities of 25 to 50 mm/s (measured at the structure) should not be exceeded during the blasting program to reduce the risks of damages to the existing structures. Blasting close to freshly placed concrete should also be closely controlled.

The blasting operations should be planned and conducted under the supervision of a licensed professional engineer who is also an experienced blasting consultant.

Excavation side slopes in sound bedrock can be carried out using almost vertical side walls. A minimum 1.0 m horizontal ledge should be left between the bottom of the overburden excavation and the top of the bedrock surface to provide an area to allow for potential sloughing.

**Vibration Considerations**

Construction operations are the cause of vibrations, and possibly, sources of nuisance to the community. Therefore, means to reduce the vibration levels should be incorporated in the construction operations to maintain, as much as possible, a cooperative environment with the residents.

The following construction equipment could be the source of vibrations: hoe ram, compactor, dozer, crane, truck traffic, etc. Vibrations, whether caused by blasting operations or by construction operations, could be the source of detrimental vibrations on the nearby buildings. Therefore, all vibrations are recommended to be limited.

Two parameters are used to determine the permissible vibrations, namely, the maximum peak particle velocity and the frequency. For low frequency vibrations, the maximum allowable peak particle velocity is less than that for high frequency vibrations.

As a guideline, the peak particle velocity should be less than 15 mm/s between frequencies of 4 to 12 Hz, and 50 mm/s above a frequency of 40 Hz (interpolate between 12 and 40 Hz). The guidelines are for current construction standards. Considering that these guidelines are above perceptible human level and, in some cases, could be very disturbing to some people, a pre-construction survey is recommended be completed to minimize the risks of claims during or following the construction of the proposed building.

**Fill Placement**

Fill used for grading beneath the pavement granules should consist of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular B Type I or II. These materials should be tested and approved prior to delivery to the site. The existing silty sand, silty sand and gravel, moist (not wet) and free of cobbles, boulders, and organic matter, may also be used.

The fill should be placed in lifts no greater than 300 mm in thickness and compacted using suitable compaction equipment for the lift thickness. Fill placed below the pavement subgrade level, beneath the paved areas, should be compacted to at least 95% of its standard Proctor maximum dry density (SPMDD). The upper 1 m of the subgrade fill should be compacted to a minimum of 98% of the material's SPMDD.

## 5.3 Foundation Design

### Bearing Resistance Values

Catch basins and maintenance chambers may be founded on engineered fill placed on silty clay, glacial till, or bedrock and can be designed using the allowable bearing presented in Table 1 below. Engineered fill under catch basins and maintenance chambers should consist of OPSS Granular A material placed in maximum 300 mm thick lifts and compacted to a minimum of 98% of its SPMDD.

**Table 1 – Bearing Resistance Values**

| Bearing Surface | Serviceability Limit States (SLS) kPa | Ultimate Limit State (ULS) ,kPa |
|---|---|---|
| Silty Clay | 100 | 150 |
| Glacial Till | 150 | 225 |
| Bedrock | - | 400 |

An undisturbed soil bearing surface consists of a surface from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Catch basins and maintenance chambers placed on engineered fill overlying an undisturbed soil bearing surface and designed using the bearing resistance values herein will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively.

### Lateral Support

The bearing medium under proposed services- is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to clay, sand, and engineered fill bearing media when a plane extending down and out from the bottom edges of the footing, at a minimum of 1.5H:1V, passes only through the in situ soil or engineered fill of the same or higher capacity as that of the bearing medium.

### Settlement and Permissible Grade Raise

Permissible grade raise recommendations have been determined for the current development based on the undrained shear strength values completed within the silty clay deposit during our field investigation. Based on our findings, a permissible grade raise recommendations of **6 m** is recommended for grading for the proposed roadways.

It should however be noted that a layer of firm clay was encountered in BH30-22 under the peat layer. It is recommended that that silty clay layer be removed with the peat layer to expose the underlying compact glacial till in the area to accommodate the proposed grade raise for the creek crossing.

To reduce long term liabilities, consideration should be given to provide means to reduce long term groundwater lowering (e.g. clay dykes, restriction on planting around the structures, etc). It should be noted that building on silty clay deposits increases the likelihood of structure movements and, therefore, of cracking. The use of steel reinforcement in concrete structures placed at key structural locations will tend to reduce cracking as compared to unreinforced concrete structures.

## 5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class C** for foundations constructed at the subject site. The soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the 2012 Ontario Building Code for a full discussion of the earthquake design requirements.

## 5.5 Excavation Side Slopes

The side slopes of excavations in the overburden and weathered bedrock should be either cut back at acceptable slopes or should be retained by shoring systems from the start of the excavation until the structure is backfilled. It is expected that sufficient room will be available for the greater part of the excavation to be undertaken by open-cut methods (i.e. unsupported excavations).

### Unsupported Slopes

The excavation side slopes above the groundwater level extending to a maximum depth of 3 m should be cut back at 1H:1V or flatter. The flatter slope is required for excavation below groundwater level. Excavations below the groundwater level should be cut back at a maximum slope of 2:1V.

Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides. Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by “cut and cover” methods and excavations will not be left open for extended periods of time.

**Temporary Shoring**

Where space restrictions exist, temporary shoring may be required. The design and approval of the shoring system will be the responsibility of the shoring contractor and the shoring designer who is a licensed professional engineer and is hired by the shoring contractor.

It is the responsibility of the shoring contractor to ensure that the temporary shoring is in compliance with safety requirements, designed to avoid any damage to adjacent structures and include dewatering control measures.

In the event that subsurface conditions differ from the approved design during the actual installation, it is the responsibility of the shoring contractor to commission the required experts to re-assess the design and implement the required changes. Furthermore, the design of the temporary shoring system should take into consideration a full hydrostatic condition which can occur during significant precipitation events.

The temporary shoring system is recommended to consist of a soldier pile and lagging system which could be cantilevered, anchored or braced.

Any additional loading due to street traffic, construction equipment, adjacent structures and facilities, etc., should be added to the earth pressures described below. The earth pressures acting on the shoring system may be calculated using the following parameters.

**Table 2 – Soil Parameters**

| Parameters | Values |
|---|---|
| Active Earth Pressure Coefficient ($K_a$) | 0.33 |
| Passive Earth Pressure Coefficient ($K_p$) | 3 |
| At Rest Earth Pressure Coefficient ($K_0$) | 0.5 |
| Unit Weight (y), kN/m$^3$ | 21 |
| Submerged Unit Weight (y), kN/m$^3$ | 13 |

The active earth pressure should be calculated where wall movements are permissible while the at-rest pressure should be calculated if no movement is permissible. The dry unit weight should be calculated above the groundwater level while the effective unit weight should be calculated below the groundwater level.

The hydrostatic groundwater pressure should be included to the earth pressure distribution wherever the effective unit weight are calculated for earth pressures. If the groundwater level is lowered, the dry unit weight for the soil should be calculated full weight, with no hydrostatic groundwater pressure component.

For design purposes, the minimum factor of safety of 1.5 should be calculated.

**Excavation Base Stability**

The base of supported excavations can fail by three general modes:

- ❑ Shear failure within the ground caused by inadequate resistance to loads imposed by grade differences inside and outside of the excavation,
- ❑ Piping from water seepage through granular soils, and
- ❑ Heave of layered soils due to water pressures confined by intervening low permeability soils.

Shear failure of excavation bases are typically rare in granular soils if adequate lateral support is provided. Inadequate dewatering can cause instability in excavations made through granular or layered soils. The potential for base heave in cohesive soils should be determined for stability of flexible retaining systems.

The factor of safety with respect to base heave, $FS_b$ is:

$$\mathrm{FS}_b = \mathrm{N}_b s_u / \sigma_z$$

where,

$N_b$ - Stability factor dependent upon geometry of the excavation and give in Figure 1
$S_u$ - Undrained shear strength of the soil below the base level
$\sigma_z$ - Total overburden and surcharge pressure at the bottom of the excavation

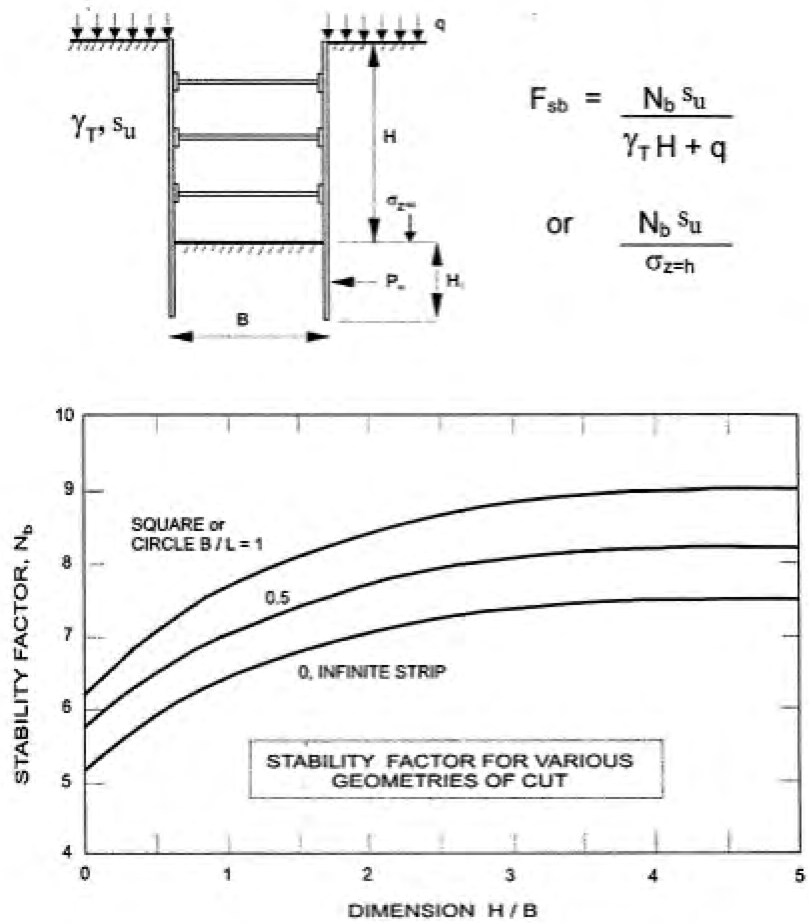


Figure 1 – Stability Factor for Various Geometries of Cut

In the case of soft to firm clays, a factor of safety of 2 is recommended for the base stability.

**Separation Between Existing Services**

It is recommended that the proposed excavation be carried out in a manner as to locate the sidewall of the excavation as far as possible from the existing services. A minimum clearance of 1.5 m is recommended between the centerline of the existing services and sidewalls of the proposed excavation. It is recommended that the clearance be increased as much as possible while providing the required clearance for the proposed service installation.

## 5.6 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with OPSS standards and specifications.

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A material. Where the bedding is located within firm grey silty clay or placed on a bedrock bearing surface, the thickness of the bedding material should be increased to a minimum of 300 mm. The bedding should extend to the spring line of the pipe. Cover material, from the spring line to at least 300 mm above the obvert of the pipe should consist of OPSS Granular A (concrete or PSM PVC pipes) or sand (concrete pipe). The bedding and cover materials should be placed in maximum 225 mm thick lifts compacted to a minimum of 98% of the material's standard Proctor maximum dry density (SPMDD).

In areas where the watermain subgrade transitions from soil to bedrock. It is recommended that the founding medium be inspected in the field to determine how steeply the bedrock surface, where encountered, drops off. A transition treatment should be provided where the bedrock slopes at more than 3H:1V. At these locations, the bedrock should be excavated, and extra bedding placed to provide a 3H:1V transition from the bedrock subgrade toward the soil subgrade. This treatment will reduce the propensity for bending stresses to occur in the watermain.

If suspected fill material is encountered at or below the proposed invert level, this material should be subexcavated to native soils and be backfilled with engineered fill. Engineered fill under service pipes should consist of OPSS Granular A (crushed stone) or Granular B Type II placed in maximum 300 mm thick layers and compacted to a minimum of 98% of the material's SPMDD. Alternatively, the acceptability of the fill could be reviewed by the geotechnical consultant once a sufficient area of the fill has been exposed.

It should generally be possible to re-use the pavement granulars and fill above the cover material if the excavation and filling operations are carried out in dry weather conditions. The silty sand and silty clay, when wet, will be difficult to reuse due to its high fines content which makes compacting this material without an extensive drying period impractical.

Well fractured bedrock should be acceptable as backfill above the cover material provided that the rock fill is placed only from at least 300 mm above the obvert of the service pipe and that all stones are 300 mm or smaller in their longest dimension.

The trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to reduce differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

**Approach Transitions**

Approach transitions should be provided when the trench backfill material is located within the frost zone (1.8 m below the final grade) and backfill material is not compatible with soil exposed on the excavation side walls (i.e. do not have similar frost heaving behaviour).

The excavation side walls are recommended to be profiled at a minimum of 3H:1V from a depth of 1.8 m to the underside of the pavement granules, if the excavation is transverse to the traffic direction. Slopes should be excavated to 1.5H:1V if the trench is longitudinal to the traffic lanes.

**Clay Seals**

When silty clay is encountered at the pipe bedding level, in order too reduce long-term lowering of the groundwater level at this site, clay seals should be provided in the service trenches. The seals should be at least 1.5 m long (in the trench direction) and should extend from trench wall to trench wall. Generally, the seats should extend from the frost line and fully penetrate the bedding, sub-bedding, and cover material. The barriers should consist of relatively dry and weathered brown silty clay placed in maximum 225 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD. The clay seals should be placed at the site boundaries where clay layers are present and at strategic locations at no more than 60 to 100 m intervals in the service trenches.

## 5.7 Grade Separation Between Services

Paterson reviewed the available site servicing and grading plans for the proposed roadway reconstruction and installation of the municipal services. Based on our cursory review of the proposed municipal service depths, it is important to maintain an adequate grade separation between the proposed and future service and existing services which could be located at a high elevation. It is suggested that a horizontal grade separating of 4 m (center to center) be maintained where a vertical grade separation of greater than 3 m is required between services.

Further justification for maintaining such horizontal grade separation are as follows:

- Ensure that any proposed service located at a higher elevation is founded on an undisturbed bearing surface outside the influence of the disturbed material for any proposed service depth.
- Lessen the effects of differential settlement or movement of the proposed service.
- Provide a stable bench within the undisturbed soils in the event that repairs are required on any deeper services. This undisturbed zone beneath the services will provide improved lateral stability in the event of a deep excavation.

## 5.8 Pavement Structure

For design purposes, the pavement structure presented in the following tables could be used for the design of local streets and roadways with bus traffic. For local roadways and roadways with bus traffic, an Ontario Traffic Category B and Category D should be used for design purposes, respectively.

**Table 3 - Recommended Pavement Structure - Arterial Roadways with Bus Traffic**

| Thickness (mm) | Material Description |
|---|---|
| 40 | **Wear Course** – Superpave 12.5-FC2 Asphaltic Concrete |
| 50 | **Upper Binder Course** – Superpave 19.0 Asphaltic Concrete |
| 50 | **Lower Binder Course** – Superpave 19.0 Asphaltic Concrete |
| 150 | **BASE** – OPSS Granular A Crushed Stone |
| 600 | **SUBBASE** – OPSS Granular B Type II Crushed Stone |
| **SUBGRADE** - Either fill, in situ silty clay or sand/crushed stone material placed over in situ soil. | |

**Table 4 - Recommended Pavement Structure - Local Roadways, Access Lanes and Heavy Vehicle Parking**

| Thickness (mm) | Material Description |
|---|---|
| 40 | **Wear Course** – Superpave 12.5 Asphaltic Concrete |
| 50 | **Upper Binder Course** – Superpave 19.0 Asphaltic Concrete |
| 150 | **BASE** – OPSS Granular A Crushed Stone |
| 400 | **SUBBASE** – OPSS Granular B Type II Crushed Stone |
| **SUBGRADE** - Either fill, in situ silty clay or sand/crushed stone material placed over in situ soil. | |

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular A or OPSS Granular B Type II material. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable vibratory equipment.

Minimum Performance Graded PG58H-34 asphalt cement should be used for this project. Cement asphalt should be compacted to a minimum average density of 93% and no more than 98%.

Clean existing granular road subbase materials can be reused upon assessment by the geotechnical consultant at the time of excavation (construction) as to its suitability under the current specifications.

**Transitions Between Pavement Structures**

The proposed pavement structure, where it abuts the existing pavement, should match the existing pavement layers. A 300 mm wide and 50 mm deep stepped joint is recommended where the new asphaltic layer joins with the existing asphaltic layer to provide a more resistant pavement structure to reflective cracking at the joint.

### Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on keeping the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing its load carrying capacity.

Consideration should be given to installing subdrains at each catch basin during the pavement construction. These drains should be at least 3 m long and extend in four orthogonal directions or longitudinally when placed along a curb. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be shaped to promote water flow to the drainage lines. The subdrains will help drain the pavement structure, especially in early Spring when the subgrade is saturated and weaker and, therefore, more susceptible to permanent deformation.

Precaution must also be taken when the subgrade consists of bedrock to ensure that the upper 300 mm of the bedrock surface shattered to permit drainage. Also, in the soil/bedrock transitions the lowest transition point should be drainage satisfactorily.

Transitions should be provided when the subgrade changes from being not frost susceptible to frost susceptible, in particular but not limited to bedrock to soil or soil to bedrock. The transitions should be per Ontario Provincial Standard Drawings (OPSD) 205.010, 205.020, 205.030, 205.040, and 205.050 using a transition treatment depth of 1.8 m.

# 6.0 Design and Construction Precautions

## 6.1 Lafontaine Creek – Culvert and Road Crossing

Based on available plans available at the time of writing, it is understood that a twin concrete box culverts are to be constructed to permit the flow of Lafontaine Creek beneath of the proposed roadway structure. The twin concrete box culverts are approximately 2.4 m by 1.8 m in size and will be approximately 80 m in length. Municipal services are expected to be installed below the concrete box culvert and within the Lafontaine Creek subgrade.

A layer of organic compressible peat material was encountered on each side of the water course. The layer is underlying a layer of silty clay fill material and extends to depths ranging between 39.9 to 40.2 m geodetically at boreholes BH30-22 to BH31-22, respectively. The layer of compressible fill will require full removal from underneath the roadway, services, and structures.

It is further expected that the work will be completed in 2 stages, temporary cofferdams will be required to control the flow of surface and groundwater into the excavation and temporary support the roadway.

The following subsections discuss design and construction precautions in relation to the installation of the concrete box culvert.

**Bearing Resistance Values and Bearing Preparation**

It is anticipated that the box culvert will be founded on the servicing backfill material consisting of compacted OPSS Granular A for the proposed underlying municipal services which in turn will be placed on a native glacial till bearing surface approximately 4 to 4.5 m below the existing grade encountered at BH30-22 and BH31-22 (approximate geodetic elevation of 39 to 39.5 m).

It is recommended to excavate all fill, organic, and clay material from the roadway down to the underlaying glacial till within the highlighted area presented on the PG6427-2 Permissible Grade Raise Plan in Appendix 2. A small layer of silty clay may be encountered below the peat layer. A field review should be completed to review the soil surface. Any soft areas should be sub excavated and replaced with OPSS Granular B Type II or approved blast stone compacted to a minimum of 98% of the material's SPMDD.

The twin concrete box culvert structures placed on engineered fill overlying an undisturbed soil bearing surface and designed using the bearing resistance values presented in Table 1 Section 5.3 will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively.

Based on the proposed schedule and staging of the project it is recommended to excavate the entire organic peat layer during the initial sanitary sewer installation and backfill with reviewed and approved compactible blast stone material.

**Construction Water Control - Cofferdam**

It is recommended that cofferdams be installed upstream and downstream of the Lafontaine Creek to prevent streamflow into the proposed excavation for the installation of the twin concrete box culverts and municipal services in order to promote worker's safety during the construction program.

It is important to emphasize that streamflow seepage and groundwater infiltration must be diverted away from the excavation towards downstream of the water channel. Consideration should be taken to installing temporary culverts, channels, or pumping systems that are able to sustain the temporary flows of Lafontaine Creek. Systems should be put in place prior to full interruption of the creek flow.

It is recommended that a watertight cofferdam such as sheet piling or sandbags with tarps (temporary cofferdam system) such as Portadam. Due to the proposed depth of excavation, it is expected that a sheet pile system designed under full hydrostatic pressure and in conjunction with design parameters in Section 5.5 above be constructed.

Alternatively, temporary sandbag cofferdams or Portadam can be used to control the stream flows, however, it is expected that most of the flow in the excavation will come from the peat layer. The peat layer should be excavated prior to placement of the dam or fully cut off with sheet piles.

If sheet pile is the preferred option, it is expected that the piling will be fully or partially removed following the project. Full removal of sheet pile usually allows for cost saving and reuse of the material. Partial removal will require the piles to be cut a minimum of 1 m below finish grade and covered with bank material.

The installation staging should consider the construction phases in relation to expected road closure. It is expected that the staging will require the road to remain operational during the work. A soldier pile and lagging road protection shoring is recommended to be used where insufficient space is available to safely slope the excavation and maintain traffic.

Cofferdams should be designed by a specialized contractor engineer with temporary shoring system experience.

**Backfill and Frost Treatment**

Reference should be made to OPSD-803.01 regarding standard frost treatments for backfill and cover of concrete culverts. It is typically recommended that rigid insulation panels are installed below unheated concrete structures or above municipal sewer services with less than 2.1 m of soil coverage to prevent frost penetration and heave of the founding bearing surface. Based on our review of the proposed site servicing plans, 100 mm thick and 1.2 m wide HI-40 rigid insulation panels are to be installed beneath the concrete box culvert and above the underlying municipal services that are within 2.1 m of the proposed finished grades.

It is recommended that the road bank along the Lafontaine crossing be constructed at a maximum slope of 2H:1V. The bank near the waterway should be covered with a minimum of 500 mm of silty clay material. It is expected that the fill material encountered in the nearby boreholes can be used in those areas, where small long term surface settlement is not a concern. The material should be placed in thin lifts and track compacted. The silty clay will provide erosion and water infiltration control once vegetation is reestablished.

**Groundwater**

It is anticipated that the construction program for the concrete box culvert and municipal services will be below the long-term groundwater level. As such, groundwater infiltration will be present during the construction program through the excavation side walls within the fill and peat layers observed in boreholes BH30-22 and BH31-22. Moderate to high groundwater infiltration rates are expected and should be controlled using open sumps at the bottom of the excavation. It is recommended to divert all water infiltration away from the working area at the time of construction to prevent disturbance to the bearing surfaces.

**Dewatering**

It is anticipated that the groundwater infiltration volumes through the open excavation side walls for the construction of the road crossing will range between 150,000 L/day to 225,000 L/day using a temporary water tank cofferdam system at the upstream and downstream sections of the Lafontaine Creek. It is recommended that 3-inch diameter pumps are utilized to control the water influx into the excavation during the construction program. The influx from precipitation should also be considered by the contractor during the excavation.

**Culvert Waterproofing**

It is expected that a portion of the precast concrete box culvert will be submerged within the Lafontaine Creek. As such, it is recommended that the exterior footing and foundation walls of the concrete box culvert are waterproofed to prevent long-term deterioration of the concrete in the form of streamflow erosion. The waterproofing membrane should consist of the Colphene Torch'N Stick or approved equivalent other.

A protection board should be placed over the waterproofing membrane to protect the waterproofing membrane from damage during backfilling operations.

The area between the excavation side walls and concrete box culvert foundation walls should consist of free-draining, non-frost susceptible granular materials such as OPSS Granular A or Granular B Type II. The granular material should be placed in maximum 300 mm loose lifts and compacted to 98% of the material's SPMDD.

## 6.2 Groundwater Control

Based on our observations, it is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations. The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

**Permit to Take Water**

A temporary Ministry of the Environment, Conservation and Parks (MECP) permit to take water (PTTW) may be required for this project if more than 400,000 L/day of ground and/or surface water is to be pumped during the construction phase. A minimum 4 to 5 months should be allowed for completion of the PTTW application package and issuance of the permit by the MECP.

## 6.3 Winter Construction

Precautions must be taken if winter construction is considered for this project.

The subsoil conditions at this site mostly consist of frost susceptible materials. In presence of water and freezing conditions, ice could form within the soil mass. Heaving and settlement upon thawing could occur.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters and tarpaulins or other suitable means.

In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

The trench excavations should be carried out in a manner to avoid the introduction of frozen materials, snow or ice into the trenches. As well, pavement construction is difficult during winter.

The subgrade consists of frost susceptible soils which will experience total and differential frost heaving as the work takes place. Also, the introduction of frost, snow or ice into the pavement materials, which is difficult to avoid, could adversely affect the performance of the pavement structure.

## 6.4 Corrosion Potential and Sulphate

The results of the analytical testing of two (2) soil sample show that the sulphate content is less than 0.1%. This result is indicative that Type 10 (GU) Portland cement (general use cement) would be appropriate. The results of the chloride content and pH indicate that they are not significant factors in creating a corrosive environment for exposed ferrous metals at this site while the resistivity tests yielded results indicative of a non-aggressive corrosive environment.

When a sample comes back with moderate to high chloride content, those high concentrations are linked to winter salt usage for snow clearing by township operations. Concrete structure used in roadways should be constructed C1 exposure class concrete.

## 6.5 Hydraulic Conductivity

**Field Investigation**

Hydraulic conductivity testing was completed at select boreholes outfitted with monitoring wells (BH30-22 to BH34-22) screened within the overburden and bedrock material. Falling head tests (“slug testing”) were completed in accordance with ASTM Standard Test Method D4404 - Field Procedure for Instantaneous Change in Head (Slug) Tests for Determining Hydraulic Properties of Aquifers.

**Hydraulic Conductivity**

Following the completion of the slug testing, the test data was analyzed as per the method set out by Hvorslev (1951). Assumptions inherent in the Hvorslev method include a homogeneous and isotropic aquifer of infinite extent with zero-storage assumption, and a screen length significantly greater than the monitoring well diameter.

The assumption regarding aquifer storage is considered to be appropriate for groundwater flow through the overburden and bedrock aquifer.

The assumption regarding screen length and well diameter is considered to be met based on the screen lengths of 1.5 m and well diameter ranging between 0.032 and 0.058 m.

While the idealized assumptions regarding aquifer extent, homogeneity, and isotropy are not strictly met in this case (or in any real-world situation), it has been our experience that the Hvorslev method produces effective point estimates of hydraulic conductivity in conditions similar to those encountered at the subject site.

The Hvorslev analysis is based on the line of best fit through the field data (hydraulic head recovery vs. time), plotted on a semi-logarithmic scale.

In cases where the initial hydraulic head displacement is known with relative certainty, such as in this case where a physical slug has been introduced/removed, the line of best fit is considered to pass through the origin.

**Results**

Based on testing at the subject site, the hydraulic conductivity values for glacial till ranges between $1.55 \times 10^{-6}$ and $9.97 \times 10^{-6}$ m/s. The results indicate a high conductivity of the glacial till layer. Groundwater infiltration will become very important for excavations extending into glacial till. Infiltration extending into silty material is expected to be negligible. The results from the hydraulic conductivity testing have been included in Appendix 1.

# 7.0 Recommendations

It is recommended that the following be carried out once the master plan and site development are determined:

- Review of the grading plan from a geotechnical perspective.
- Observation of all bearing surfaces prior to the placement of municipal services and road structures
- Sampling and testing of the fill materials.
- Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- Periodic inspection of the installation culvert waterproofing system.
- Observation of all subgrades prior to backfilling and placement of granular pad or lean concrete trench.
- Field density tests to determine the level of compaction achieved.
- Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon request, following the completion of a satisfactory material testing and observation program by Paterson.

# 8.0 Statement of Limitations

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review the grading plan once available and our recommendations when the drawings and specifications are complete.

A geotechnical investigation of this nature is a limited sampling of a site. The recommendations are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around the test locations. The extent of the limited area depends on the soil, bedrock and groundwater conditions, as well the history of the site reflecting natural, construction, and other activities. Should any conditions at the site be encountered which differ from those at the test locations, we request notification immediately in order to permit reassessment of our recommendations.

The recommendations provided in this report are intended for the use of design professionals associated with this project. Contractors bidding on or undertaking the work should examine the factual information contained in this report and the site conditions, satisfy themselves as to the adequacy of the information provided for construction purposes, supplement the factual information if required, and develop their own interpretation of the factual information based on both their and their subcontractors construction methods, equipment capabilities and schedules.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Space Builders Ottawa or their agent(s) is not authorized without review by Paterson Group for the applicability of our recommendations to the altered use of the report.

**Paterson Group Inc.**

LICENSED PROFESSIONAL ENGINEER
March 16, 2023
J. R. VILLENEUVE
100504344
PROVINCE OF ONTARIO

Andre Benoist, EIT

Joey R. Villeneuve, M.A.Sc., P.Eng, ing.

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# APPENDIX 1

SOIL PROFILE AND TEST DATA SHEETS

SYMBOLS AND TERMS

ATTERBERG LIMIT TEST RESULTS

GRAIN SIZE DISTRIBUTION RESULTS

ANALYTICAL TESTING RESULTS

HYDRAULIC CONDUCTIVITY ANALYSIS RESULTS

**patersongroup** Consulting Engineers

9 Auriga Drive, Ottawa, Ontario K2E 7T9

## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 29, 2022

**FILE NO.** PG6427

**HOLE NO.** BH 1-22

| SOIL DESCRIPTION | Bottom depth (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 64.58 |
| Asphaltic concrete | 0.03 | | | | | | |
| **FILL:** Crushed stone with sand | 0.69 | SS | 1 | 75 | 50+ | | |
| **FILL:** Brownsilty sand, trace to some clay | 1.45 | SS | 2 | 54 | 11 | 1 | 63.58 |
| **FILL:** Brown silty sand to sandy silt, trace some gravel, topsoil, cobbles, boulders and plastic | 2.11 | SS | 3 | 36 | 14 | 2 | 62.58 |
| **BEDROCK:** Fair to good quality, grey limestone interbedded with shale | 4.24 | RC | 1 | 100 | 64 | 3 | 61.58 |
| | | RC | 2 | 100 | 81 | 4 | 60.58 |
| End of Borehole | | | | | | | |
| (GWL @ 1.25m - Dec. 6, 2022) | | | | | | | |

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 28, 2022

**FILE NO.** PG6427

**HOLE NO.** BH 2-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 65.27 |
| Asphaltic concrete | 0.03 | | | | | | |
| **FILL:** Crushed stone with sand | 0.60 | SS | 1 | 75 | 50+ | | |
| **FILL:** Brown silty clay, some topsoil | 0.91 | | | | | 1 | 64.27 |
| **GLACILA TILL:** Dense, brown silty sand to sandy silt with gravel, cobbles and boulders, trace clay | 1.73 | SS | 2 | 58 | 33 | | |
| | | SS | 3 | 100 | 50+ | | |
| End of Borehole | | | | | | | |

Practical refusal to augering at 1.73m depth.

(BH dry - December 6, 2022)

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

Piezometer Construction

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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 28, 2022

**FILE NO.** PG6427

**HOLE NO.** BH 3-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % | Piezometer Construction |
|---|---|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 65.69 | | |
| Asphaltic concrete 0.03 | | | | | | | | | |
| **FILL:** Crushed stone with sand 0.69 | | SS | 1 | 75 | 50+ | | | | |
| Compact, brown **SILTY SAND** 1.45 | | SS | 2 | 50 | 11 | 1 | 64.69 | | |
| **GLACIAL TILL:** Very dense, brown silty sand to sandy silt wiht gravel, cobbles, boulders and rock fragments 1.98 | | SS | 3 | 100 | 50+ | | | | |
| End of Borehole | | | | | | | | | |
| Practical refusal to augering at 1.98m depth. | | | | | | | | | |
| (BH dry - December 6, 2022) | | | | | | | | | |

20 40 60 80 100
**Shear Strength (kPa)**
▲ Undisturbed △ Remoulded

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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 28, 2022

**FILE NO.** PG6427

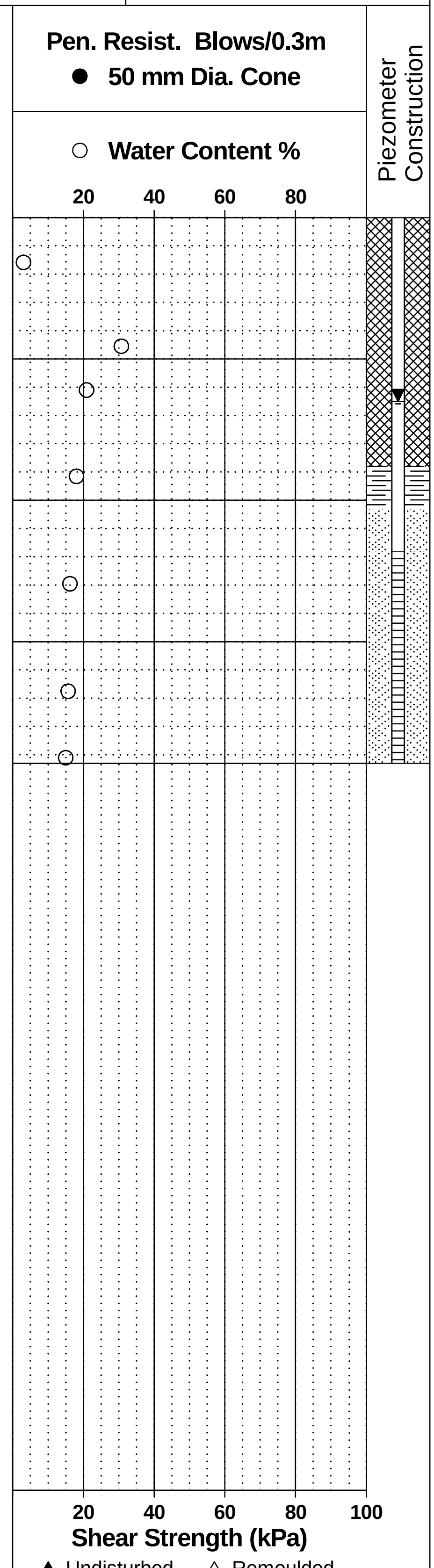
**HOLE NO.** BH 4-22

| SOIL DESCRIPTION | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | 0 | 66.01 |
| Asphaltic concrete (0.03) | | | | | | |
| **FILL:** Crushed stone with sand (0.60) | SS | 1 | 67 | 47 | | |
| **FILL:** Dark brown silty clay, some sand (1.07) | SS | 2 | 67 | 11 | 1 | 65.01 |
| **GLACIAL TILL:** Loose, dark grey silty sand to sandy silt with gravel, trace to some clay (2.21) | SS | 3 | 58 | 7 | 2 | 64.01 |
| **GLACIAL TILL:** Compact, sand and gravel with cobbles, boulders and rock fragments | SS | 4 | 33 | 28 | 3 | 63.01 |
| | SS | 5 | 42 | 27 | | |
| (3.86) | SS | 6 | 100 | 50 | | |

End of Borehole

Practical refusal to augering at 3.86m depth.

(GWL @ 1.30m - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 28, 2022

**FILE NO.** PG6427

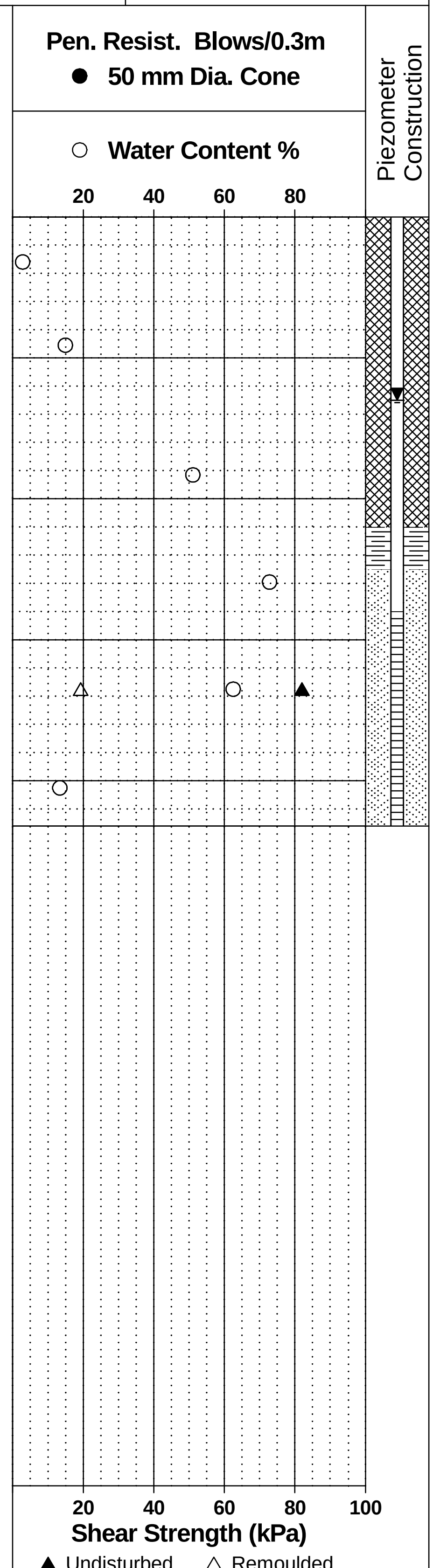
**HOLE NO.** BH 5-22

| SOIL DESCRIPTION | Strata depth (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 66.50 |
| Asphaltic concrete | 0.03 | | | | | | |
| **FILL:** Crushed stone with sand | 0.51 | SS | 1 | 75 | 50+ | | |
| Compact, brown **SILTY SAND,** trace clay | 1.45 | SS | 2 | 58 | 15 | 1 | 65.50 |
| Very stiff to stiff, brown **SILTY CLAY** | | SS | 3 | 67 | 3 | 2 | 64.50 |
| | | SS | 4 | 75 | 2 | | |
| - grey by 3.0m depth | 3.73 | G | 5 | | | 3 | 63.50 |
| **GLACIAL TILL:** Loose, grey silty sand to sandy silt with gravel, trace clay, occasional cobbles and boulders | 4.32 | SS | 6 | 32 | 8 | 4 | 62.50 |

End of Borehole

Practical refusal to augering at 4.32m depth.

(GWL @ 1.30m - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Road Rehabilitation Program
St-Jean Street, City of Clarence-Rockland, Ontario

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger **DATE** November 28, 2022

**FILE NO.** PG6427

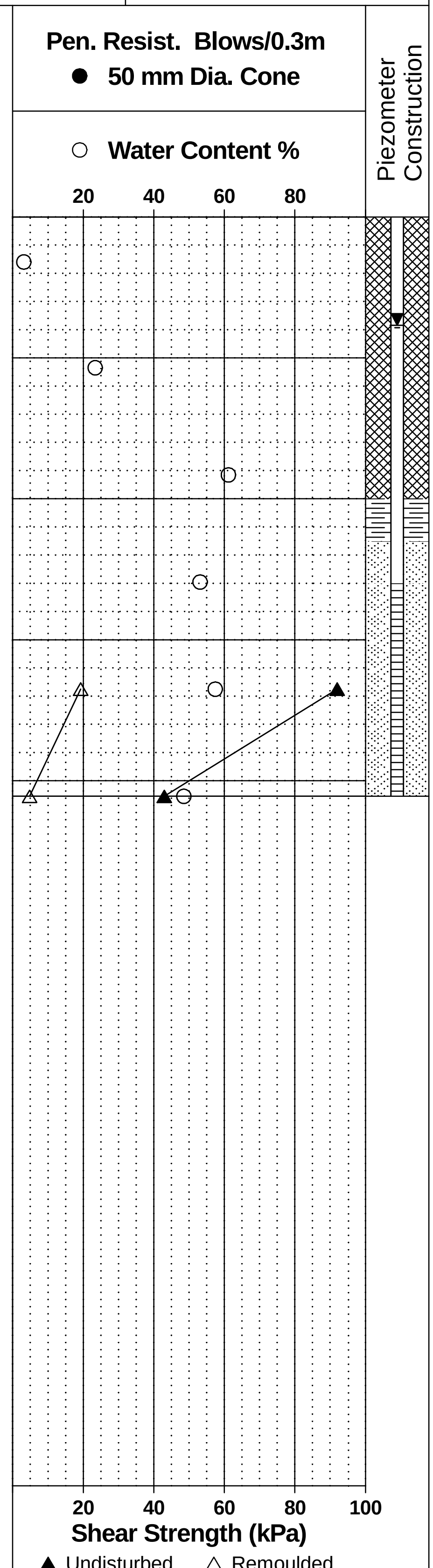
**HOLE NO.** BH 6-22

| SOIL DESCRIPTION | Depth of change (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| Asphaltic concrete | 0.03 | | | | |
| **FILL:** Crushed stone with sand | 0.79 | SS | 1 | 67 | 50+ |
| **TOPSOIL** | 0.81 | | | | |
| Brown **SILTY CLAY,** trace to some clay | 1.45 | SS | 2 | 54 | 6 |
| Very stiff to stiff, brown **SILTY CLAY** | | SS | 3 | 88 | 4 |
| | | SS | 4 | 83 | 2 |
| | | G | 5 | | |
| - firm and grey by 3.7m depth | 4.11 | G | 6 | | |
| End of Borehole | | | | | |

Practical refusal to augering at 4.11m depth.

(GWL @ 0.77m - Dec. 6, 2022)

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 66.62 |
| 1 | 65.62 |
| 2 | 64.62 |
| 3 | 63.62 |
| 4 | 62.62 |



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 28, 2022

**FILE NO.** PG6427

**HOLE NO.** BH 7-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 67.07 |
| Asphaltic concrete | 0.03 | | | | | | |
| **FILL:** Crushed stone with sand | 0.69 | AU | 1 | | | | |
| **FILL:** Brown silty sand to sandy silt, trace to some clay, gravel | 1.37 | SS | 2 | 38 | 11 | 1 | 66.07 |
| Hard to very stiff, brown **SILTY CLAY** | 2.84 | SS | 3 | 58 | 9 | 2 | 65.07 |
| | | SS | 4 | 67 | 5 | | |
| **GLACIAL TILL:** Compact, grey silty sand to sandy silt with gravel, trace to some clay | 2.90 | | | | | | |

End of Borehole

Practical refusal to augering at 2.90m depth.

(GWL @ 1.22m - Dec. 6, 2022)

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 25, 2022

**FILE NO.** PG6427

**HOLE NO.** BH 8-22

| SOIL DESCRIPTION | Depth to base (m) |
|---|---|
| GROUND SURFACE | |
| Asphaltic concrete | 0.03 |
| **FILL:** Crushed stone with sand | 0.69 |
| **TOPSOIL** | 0.81 |
| Loose, brown **SILTY SAND to SANDY SILT** | 1.45 |
| Very stiff to stiff, brown **SILTY CLAY,** trace sand | 1.83 |
| Loose, brown **SILTY SAND,** some clay | 2.21 |
| **GLACIAL TILL:** Very dense, brown silty sand to sandy silt with shale fragments | 2.36 |
| End of Borehole | |

Practical refusal to augering at 2.36m depth.

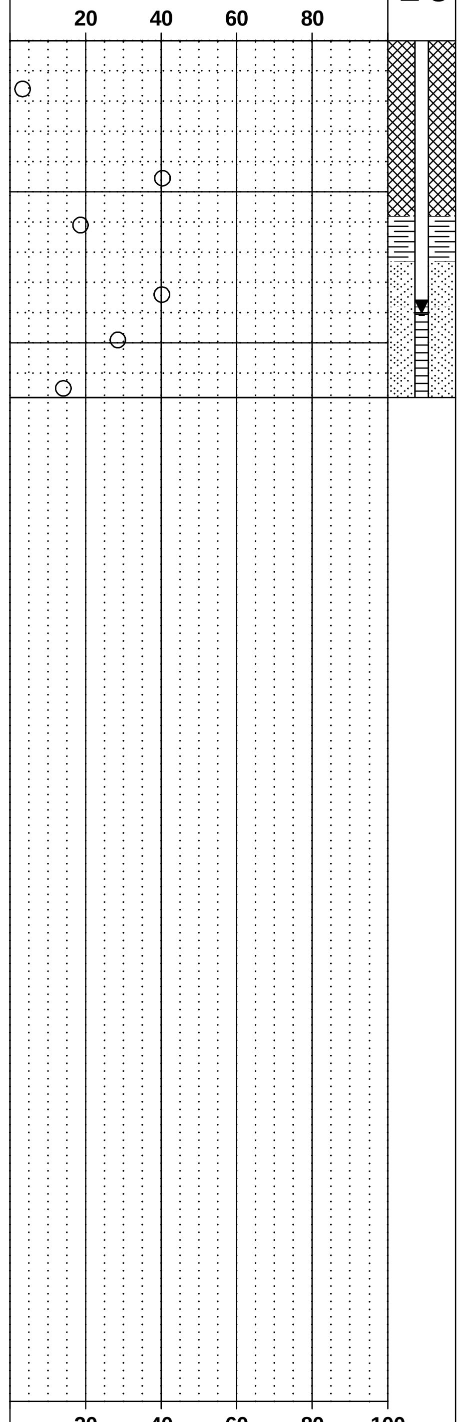
(GWL @ 1.80m - Dec. 6, 2022)

| SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|
| SS | 1 | 75 | 50+ |
| SS | 2 | 42 | 9 |
| SS | 3 | 83 | 4 |
| SS | 4 | 67 | 50+ |

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 67.90 |
| 1 | 66.90 |
| 2 | 65.90 |

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %




Shear Strength (kPa)

▲ Undisturbed △ Remoulded

Piezometer Construction

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 29, 2022

**FILE NO.** PG6427

**HOLE NO.** BH 8A-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % | Piezometer Construction |
|---|---|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 67.92 | | |
| **OVERBURDEN** | | | | | | 1 | 66.92 | | |
| 2.41 | | | | | | 2 | 65.92 | | |
| **BEDROCK:** Excellent to good quality, grey limestone interbedded with shale | | RC | 1 | 100 | 100 | 3 | 64.92 | | |
| | | RC | 2 | 100 | 74 | 4 | 63.92 | | |
| 4.22 | | | | | | | | | |
| End of Borehole | | | | | | | | | |

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**FILE NO.** PG6427

**REMARKS**

**HOLE NO.** BH 9-22

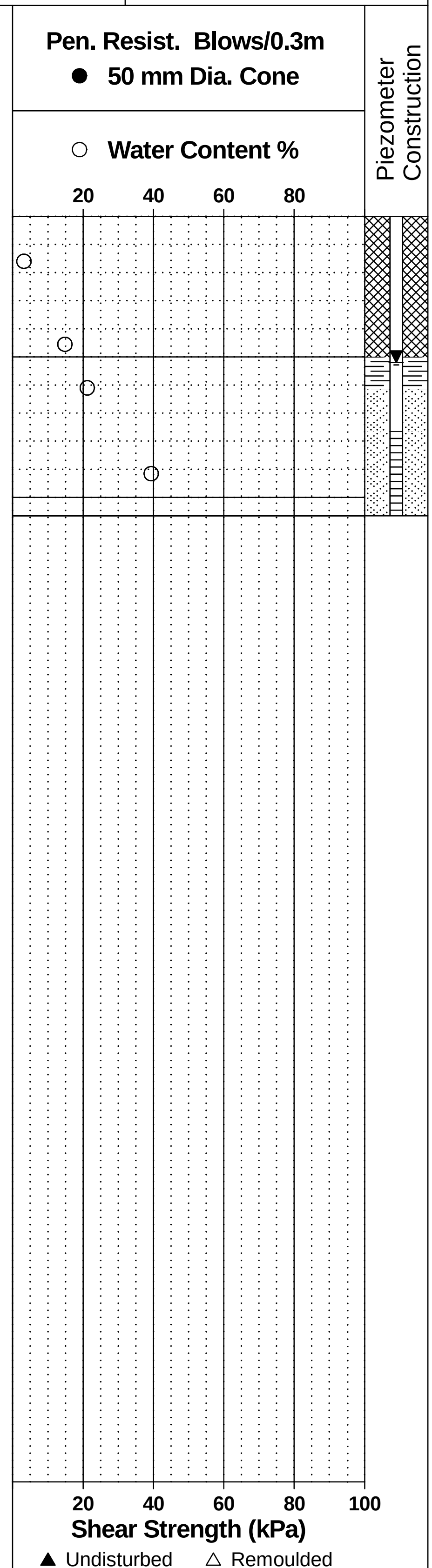
**BORINGS BY** Track-Mount Power Auger **DATE** November 25, 2022

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 68.66 |
| Asphaltic concrete 0.03 | | | | | | | |
| **FILL:** Crushed stone with sand 0.69 | | SS | 1 | 67 | 50+ | | |
| **FILL:** Dark brown silty sand with gravel, trace topsoil 0.99 | | | | | | 1 | 67.66 |
| Loose, dark brown to brown **SILTY SAND to SANDY SILT** 2.13 | | SS | 2 | 75 | 6 | | |
| | | SS | 3 | 62 | 7 | 2 | 66.66 |

End of Borehole

Practical refusal to augering at 2.13m depth.

(GWL @ 1.04m - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 25, 2022

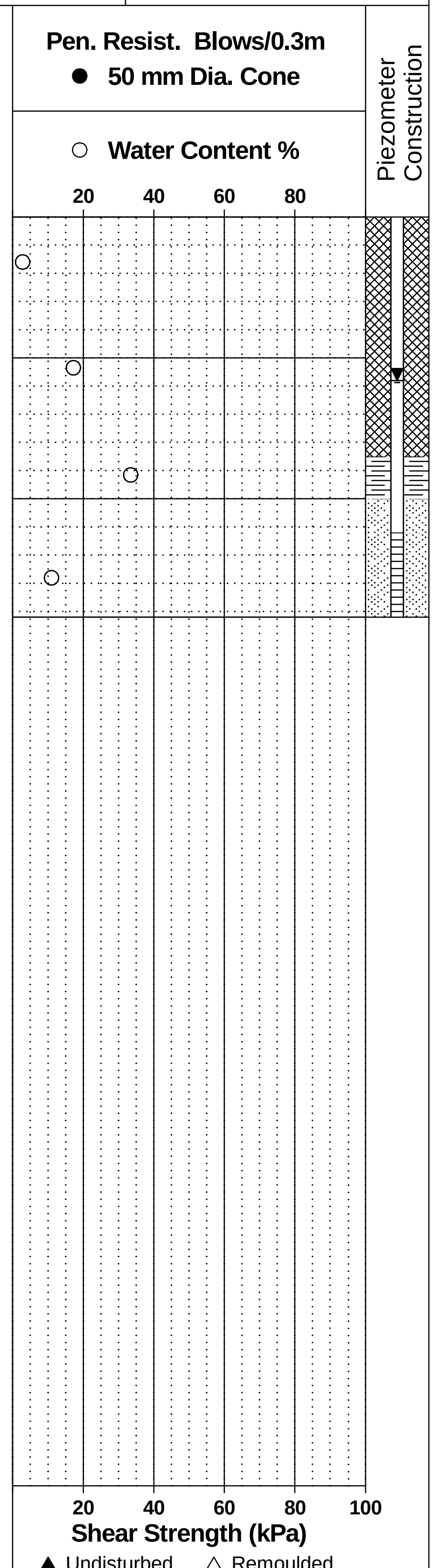
**FILE NO.** PG6427

**HOLE NO.** BH10-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 69.09 |
| Asphaltic concrete 0.03 | | | | | | | |
| **FILL:** Crushed stone with sand 0.69 | | SS | 1 | 75 | 50+ | | |
| **FILL:** Dark brown silty sand to sandy silt with gravel, some crushed stone, trace topsoil 1.45 | | SS | 2 | 33 | 7 | 1 | 68.09 |
| Very stiff, brown **SILTY CLAY** with sand 2.21 | | SS | 3 | 71 | 6 | 2 | 67.09 |
| **GLACIAL TILL:** Loose, grey silty sand to sandy silt with gravel, some clay, occasional cobbles and boulders 2.84 | | SS | 4 | 57 | 9 | | |
| End of Borehole | | | | | | | |

Practical refusal to augering at 2.84m depth.

(GWL @ 1.16m - Dec. 6, 2022)



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 25, 2022

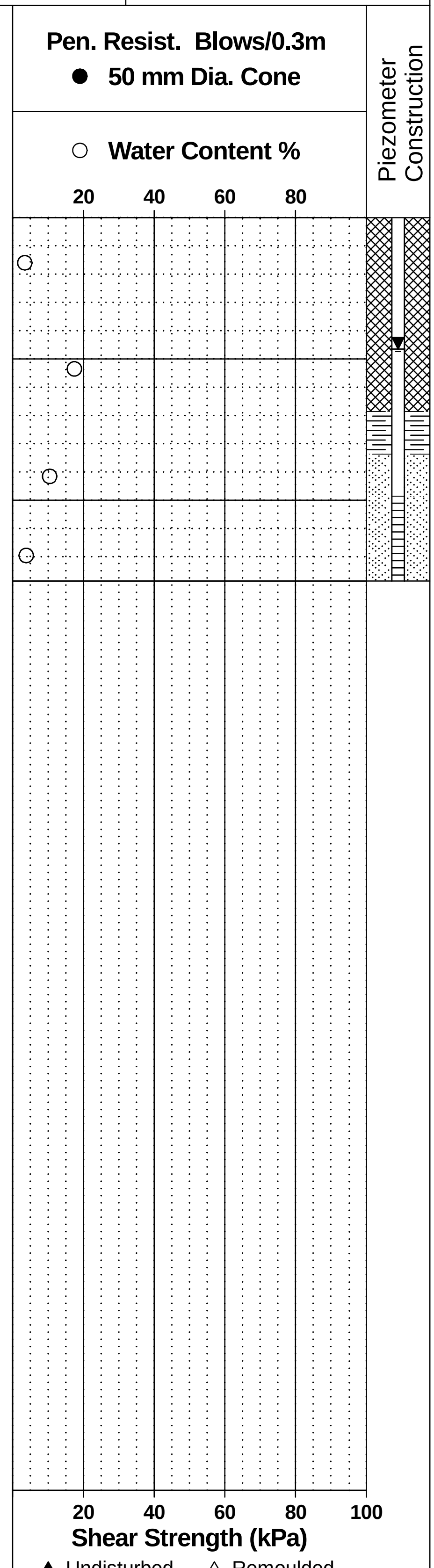
**FILE NO.** PG6427

**HOLE NO.** BH11-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 69.29 |
| Asphaltic concrete 0.03 | | | | | | | |
| **FILL:** Crushed stone with sand 0.69 | | SS | 1 | 75 | 50+ | | |
| Very stiff, brown **SILTY CLAY,** some to trace sand 1.22 | | SS | 2 | 33 | 8 | 1 | 68.29 |
| **GLACIAL TILL:** Compact, brown silty sand to sandy silt with gravel, cobbesl, trace clay | | SS | 3 | 67 | 10 | 2 | 67.29 |
| 2.57 | | SS | 4 | 50 | 50+ | | |
| End of Borehole | | | | | | | |

Practical refusal to augering at 2.57m depth.

(GWL @ 0.93m - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 25, 2022

**FILE NO.** PG6427

**HOLE NO.** BH12-22

| SOIL DESCRIPTION | Depth to bottom of layer (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 70.62 |
| Asphaltic concrete | 0.05 | | | | | | |
| **FILL:** Crushed stone with sand | 0.69 | SS | 1 | 83 | 50+ | | |
| **FILL:** Brown silty clay with sand and gravel, trace crushed stone | 1.07 | | | | | 1 | 69.62 |
| **GLACIAL TILL:** Compact, brown silty sand to sandy silt with gravel, cobbles and shale fragments | 1.93 | SS | 2 | 42 | 13 | | |
| | | SS | 3 | 91 | 50+ | | |
| End of Borehole | | | | | | | |

Practical refusal to augering at 1.93m depth.

(BH dry - December 6, 2022)

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100
**Shear Strength (kPa)**
▲ Undisturbed △ Remoulded

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 25, 2022

**FILE NO.** PG6427

**HOLE NO.** BH13-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % | Piezometer Construction |
|---|---|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 73.74 | | |
| Asphaltic concrete 0.05 | | | | | | | | | |
| **FILL:** Crushed stone with sand 0.69 | | SS | 1 | 67 | 18 | | | | |
| **GLACIAL TILL:** Dense, reddish brown silty sand to sandy silt with gravel, cobbles, boulders and rock fragments 1.52 | | SS | 2 | 75 | 40 | 1 | 72.74 | | |
| End of Borehole<br><br>Practical refusal to augering at 1.52m depth.<br><br>(BH dry - December 6, 2022) | | | | | | | | | |

20 40 60 80 100
**Shear Strength (kPa)**
▲ Undisturbed △ Remoulded

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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger **DATE** November 25, 2022

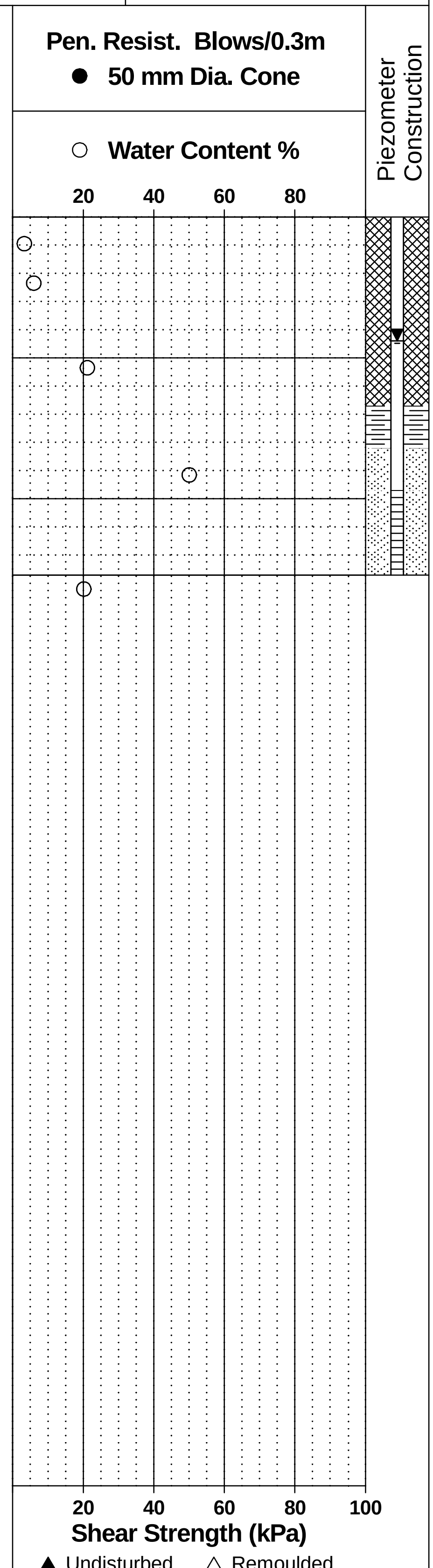
**FILE NO.** PG6427

**HOLE NO.** BH14-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 74.20 |
| Asphaltic concrete 0.05 | | | | | | | |
| **FILL:** Crushed stone with sand 0.69 | | SS | 1 | 83 | 50+ | | |
| **GLACIAL TILL:** Very dense, reddish brownsilty sand to sandy silt with gravel, cobbles and boulders | | SS | 2 | 75 | 50+ | 1 | 73.20 |
| | | SS | 3 | 67 | 19 | 2 | 72.20 |
| 2.54 | | SS | 4 | 50 | 50+ | | |
| End of Borehole | | | | | | | |

Practical refusal to augering at 2.54m depth.

(GWL @ 0.88m - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 25, 2022

**FILE NO.** PG6427

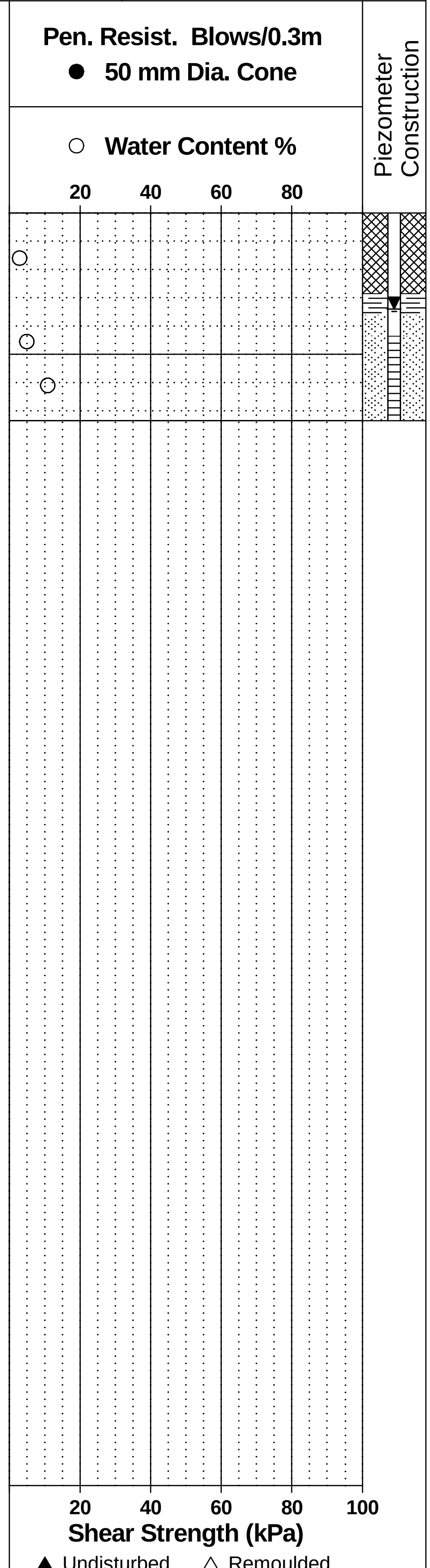
**HOLE NO.** BH15-22

| SOIL DESCRIPTION | Depth (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 74.73 |
| Asphaltic concrete | 0.03 | | | | | | |
| **FILL:** Crushed stone with sand | 0.84 | SS | 1 | 83 | 42 | | |
| **GLACIAL TILL:** Dense, brown silty sand to sandy silt with gravel, cobbles and boulders | 1.47 | SS | 2 | 42 | 33 | 1 | 73.73 |

End of Borehole

Practical refusal to augering at 1.47m depth.

(GWL @ 0.68m - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

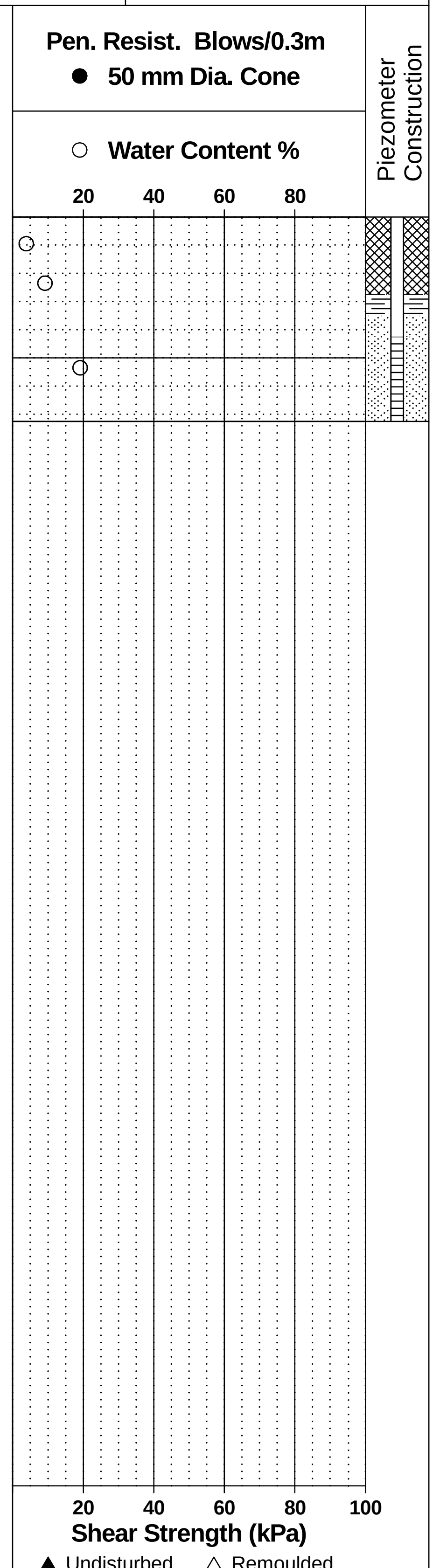
**FILE NO.** PG6427

**REMARKS**

**HOLE NO.** BH16-22

**BORINGS BY** Track-Mount Power Auger **DATE** November 24, 2022

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 75.99 |
| Asphaltic concrete 0.05 | | | | | | | |
| **FILL:** Crushed stone with sand 0.53 | | SS | 1 | 67 | 43 | | |
| **GLACIAL TILL:** Dense, dark brown silty sand to sandy silt, some sand and shale fragments 1.45 | | SS | 2 | 100 | 33 | 1 | 74.99 |
| End of Borehole<br><br>Practical refusal to augering at 1.45m depth.<br><br>(BH dry - December 6, 2022) | | | | | | | |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

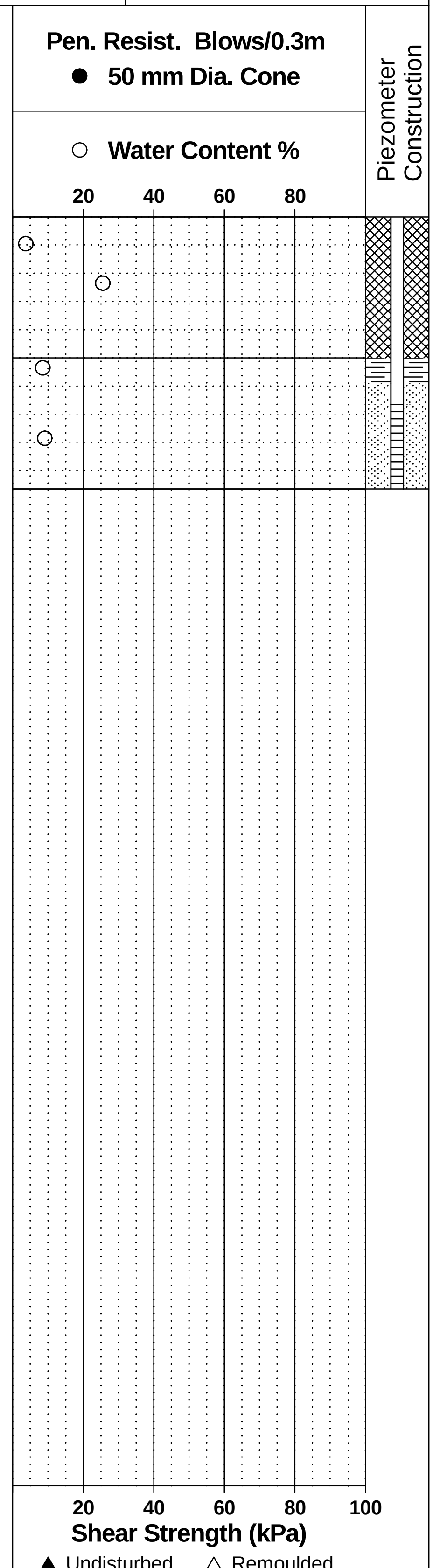
**BORINGS BY** Track-Mount Power Auger

**DATE** November 24, 2022

**FILE NO.** PG6427

**HOLE NO.** BH17-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 76.92 |
| Asphaltic concrete 0.05 | | | | | | | |
| **FILL:** Crushed stone with sand 0.46 | | SS | 1 | 67 | 50+ | | |
| **GLACIAL TILL:** Reddish brown silty sand to sandy silt, some gravel 0.69 | | | | | | | |
| **GLACIAL TILL:** Compact, dark brown silty sand to sandy silt, some gravel, cobbles, boulders and shale fragments | | SS | 2 | 75 | 23 | 1 | 75.92 |
| | | SS | 3 | 100 | 50+ | | |
| 1.93 | | | | | | | |
| End of Borehole<br><br>Practical refusal to augering at 1.93m depth.<br><br>(BH dry - December 6, 2022) | | | | | | | |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 24, 2022

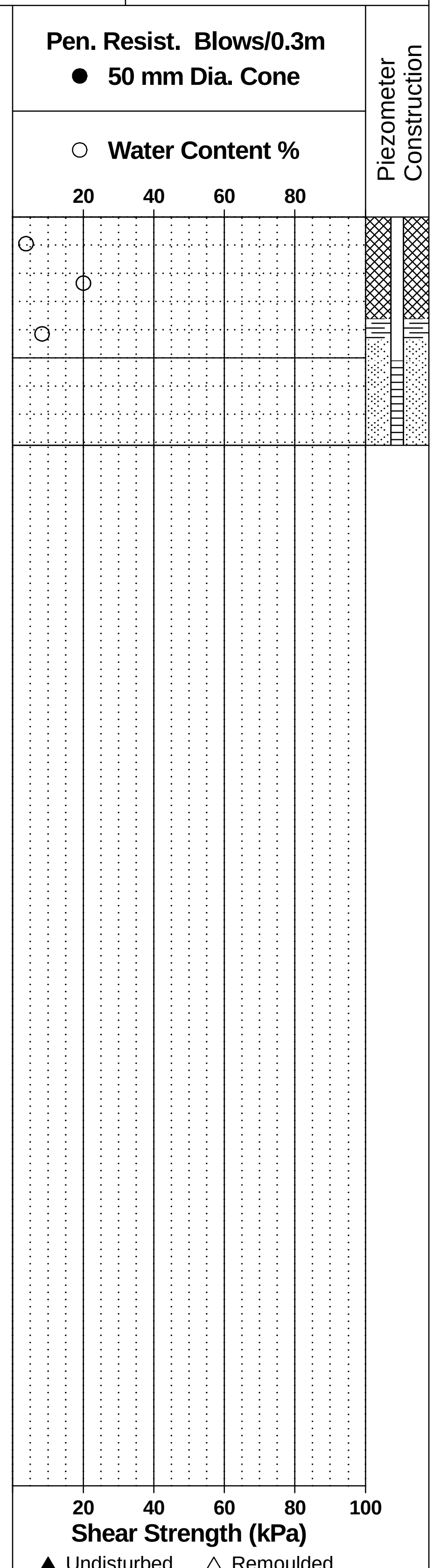
**FILE NO.** PG6427

**HOLE NO.** BH18-22

| SOIL DESCRIPTION | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | 0 | 77.25 |
| Asphaltic concrete (to 0.05) | | | | | | |
| **FILL:** Crushed stone with sand (to 0.53) | SS | 1 | 79 | 50+ | | |
| **GLACIAL TILL:** Very dense, reddish brown silty sand to sandy silt, some gravel, cobbles and boulders (to 1.62) | SS | 2 | 80 | 50+ | 1 | 76.25 |
| | SS | 3 | 0 | 50+ | | |
| End of Borehole | | | | | | |

Practical refusal to augering at 1.62m depth.

(BH dry - December 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 24, 2022

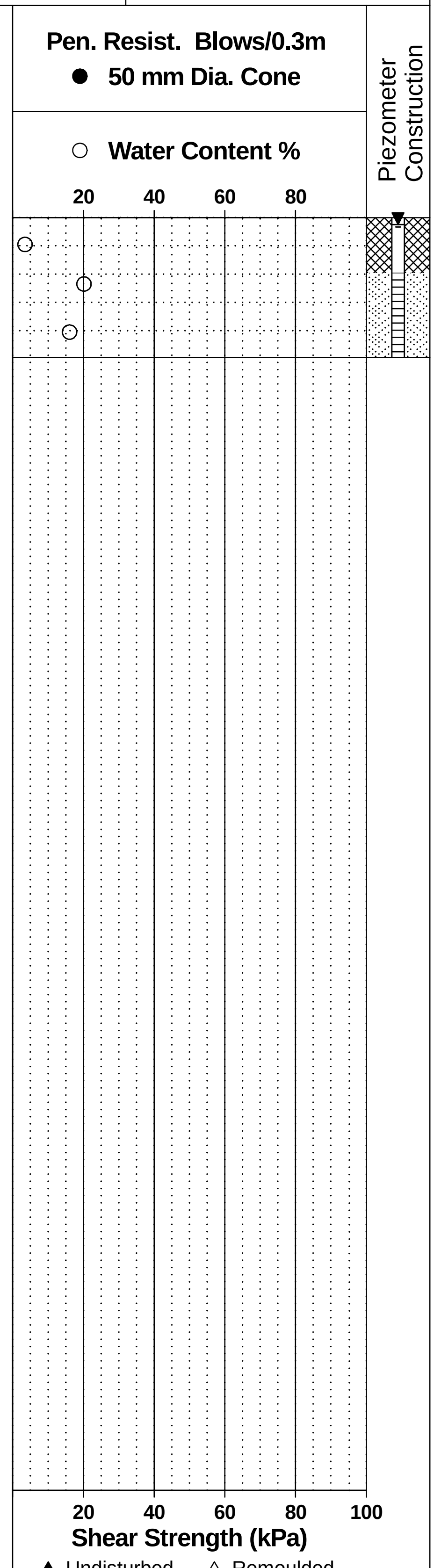
**FILE NO.** PG6427

**HOLE NO.** BH19-22

| SOIL DESCRIPTION | Depth of layer bottom (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 77.45 |
| Asphaltic concrete | 0.05 | | | | | | |
| **FILL:** Crushed stone with sand | 0.46 | SS | 1 | 75 | 50+ | | |
| **GLACIAL TILL:** Very dense, brown silty sand to sandy silt with gravel, cobbles and boulders | 0.99 | SS | 2 | 100 | 50+ | | |
| End of Borehole | | | | | | | |

Practical refusal to augering at 0.99m depth.

(GWL @ 0.05m - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 24, 2022

**FILE NO.** PG6427

**HOLE NO.** BH20-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 76.83 |
| Asphaltic concrete 0.03 | | SS | 1 | 100 | 50+ | | |
| **FILL;** Crushed stone with sand 0.69 | | | | | | | |
| **FILL:** Reddish brown silty sand to sandy silt with gravel, trace clay 0.91 | | SS | 2 | 45 | 17 | 1 | 75.83 |
| **GLACIAL TILL:** Comapct, dark brown silty sand to sandy silt with gravel, cobbles and boudlers 1.47 | | | | | | | |
| End of Borehole | | | | | | | |

Practical refusal to augering at 1.47m depth.

(GWL @ 0.05m - Dec. 6, 2022)

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

Piezometer Construction

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 24, 2022

**FILE NO.** PG6427

**HOLE NO.** BH21-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % | Piezometer Construction |
|---|---|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 76.13 | | |
| Asphaltic concrete 0.05 | | | | | | | | | |
| **FILL:** Crushed stone with sand 0.30 | | SS | 1 | 50 | 24 | | | | |
| **FILL:** Dark brown silty sand to sandy silt with gravel, clay and topsoil 0.69 | | | | | | | | | |
| **GLACIAL TILL:** Very dense, dark brown silty sand to sandy silt, some gravel, cobbles and boulders 1.52 | | SS | 2 | 93 | 50+ | 1 | 75.13 | | |
| End of Borehole | | | | | | | | | |
| Practical refusal to augering at 1.52m depth. | | | | | | | | | |
| (BH dry - December 6, 2022) | | | | | | | | | |

Chart axis: 20 40 60 80 100
**Shear Strength (kPa)**
▲ Undisturbed △ Remoulded

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger **DATE** November 24, 2022

**FILE NO.** PG6427

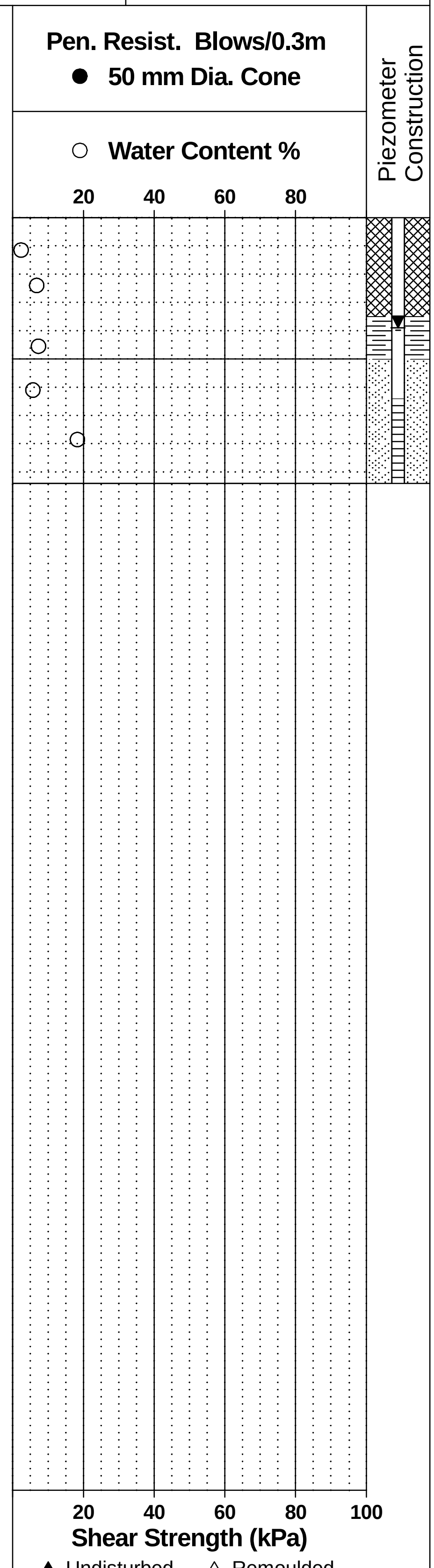
**HOLE NO.** BH22-22

| SOIL DESCRIPTION | Depth of base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 74.81 |
| Asphaltic concrete | 0.10 | | | | | | |
| **FILL:** Crushed stone with sand | 0.30 | SS | 1 | 75 | 50+ | | |
| **FILL:** Brown silty sand | 0.84 | | | | | | |
| **FILL:** Dark grey silty sand to sandy silt with gravel | 1.45 | SS | 2 | 58 | 27 | 1 | 73.81 |
| **GLACIAL TILL:** Very dense, brown silty sand to sandy silt with gravel, cobbles and boulders, trace clay | 1.88 | SS | 3 | 100 | 50+ | | |

End of Borehole

Practical refusal to augering at 1.88m depth.

(GWL @ 0.78m - Dec. 6, 2022)



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

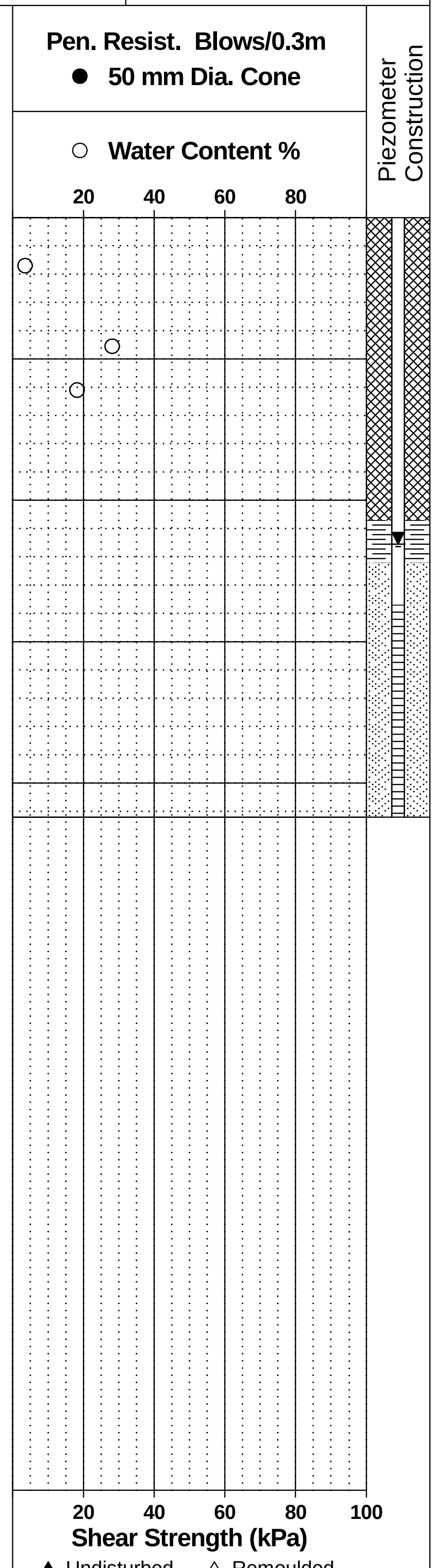
**DATE** November 24, 2022

**FILE NO.** PG6427

**HOLE NO.** BH23-22

| SOIL DESCRIPTION | Bottom depth (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| Asphaltic concrete | 0.08 | | | | |
| **FILL:** Crushed stone with sand | 0.30 | SS | 1 | 58 | 10 |
| **FILL:** Brown silty sand, some topsoil | 0.69 | | | | |
| **GLACIAL TILL:** Compact, reddish brown silty sand to sandy silt, some gravel and rock fragments | 1.52 | SS | 2 | 67 | 19 |
| **BEDROCK:** Poor quality, dark grey shale interbedded with grey limestone | 2.82 | RC | 1 | 88 | 29 |
| **BEDROCK:** Good to excellent quality, grey dolostone and limestone interbedded with dark grey shale | 4.24 | RC | 2 | 100 | 92 |
| End of Borehole | | | | | |
| (GWL @ 2.31m - Dec. 6, 2022) | | | | | |

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 73.71 |
| 1 | 72.71 |
| 2 | 71.71 |
| 3 | 70.71 |
| 4 | 69.71 |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 23, 2022

**FILE NO.** PG6427

**HOLE NO.** BH24-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) | Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content % | Piezometer Construction |
|---|---|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 71.63 | | |
| Asphaltic concrete 0.08 | | | | | | | | | |
| **FILL:** Crushed stone with sand and gravel 0.69 | | SS | 1 | 75 | 20 | | | | |
| **GLACIAL TILL:** Compact, dark brown to grey silty sand to sandy silt with gravel and rock fragments 1.62 | | SS | 2 | 70 | 10 | 1 | 70.63 | | |
| End of Borehole<br><br>Practical refusal to augering at 1.62m depth.<br><br>(GWL @ 0.10m - Dec. 6, 2022) | | | | | | | | | |

Water Content % axis: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 23, 2022

**FILE NO.** PG6427

**HOLE NO.** BH25-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| Asphaltic concrete | 0.08 | | | | |
| **FILL:** Crushed stone with sand | 0.69 | SS | 1 | 54 | 18 |
| **FILL:** Reddish brown silty sand to sandy silt with gravel | 1.14 | SS | 2 | 77 | 50+ |
| **GLACIAL TILL:** Very dense, brown silty sand to sandy silt with gravel | 1.27 | | | | |
| **BEDROCK:** Poor to fair quality, grey limestone interbedded with grey dolostone and dark grey shale | 4.27 | RC | 1 | 68 | 29 |
| | | RC | 2 | 97 | 69 |
| End of Borehole | | | | | |
| (BH dry - December 6, 2022) | | | | | |

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 71.24 |
| 1 | 70.24 |
| 2 | 69.24 |
| 3 | 68.24 |
| 4 | 67.24 |

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 23, 2022

**FILE NO.** PG6427

**HOLE NO.** BH26-22

| SOIL DESCRIPTION | Depth of base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| Asphaltic concrete | 0.08 | | | | |
| **FILL:** Crushed stone with sand | 0.60 | SS | 1 | 67 | 40 |
| **FILL:** Brown silty sand | 0.69 | | | | |
| **GLACIAL TILL:** Compact, brown silty sand to sandy silt with gravel, some clay, occasional cobbles and boulders | 4.60 | SS | 2 | 62 | 23 |
| | | SS | 3 | 83 | 8 |
| | | SS | 4 | 12 | 21 |
| | | SS | 5 | 42 | 10 |
| | | SS | 6 | 42 | 50+ |

End of Borehole

Practical refusal to augering at 4.60m depth.

(GWL @ 1.60m - Dec. 6, 2022)

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 68.85 |
| 1 | 67.85 |
| 2 | 66.85 |
| 3 | 65.85 |
| 4 | 64.85 |

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

Piezometer Construction

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

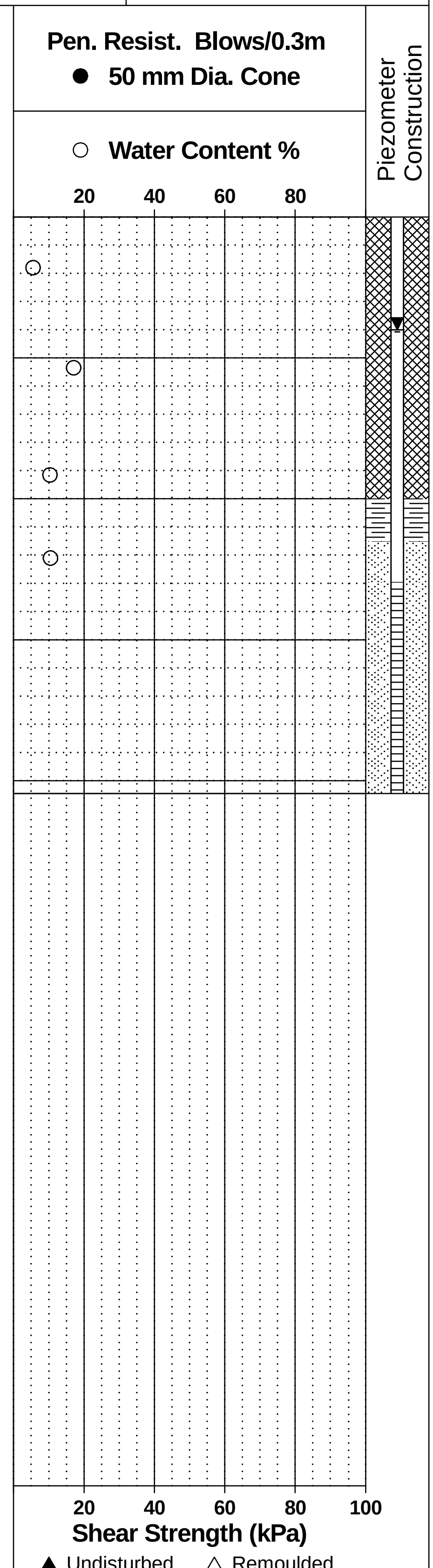
**BORINGS BY** Track-Mount Power Auger

**DATE** November 17, 2022

**FILE NO.** PG6427

**HOLE NO.** BH27-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 66.63 |
| Asphaltic concrete (to 0.10) | | | | | | | |
| **FILL:** Crushed stone, some sand, trace topsoil (to 0.46) | | SS | 1 | 54 | 10 | | |
| **GLACIAL TILL:** Loose to dense, brown silty sand to sandy silt with gravel, clay, cobbles and boulders (to 2.64) | | SS | 2 | 17 | 5 | 1 | 65.63 |
| | | SS | 3 | 25 | 30 | 2 | 64.63 |
| | | SS | 4 | 80 | 50+ | | |
| **BEDROCK:** Excellent quality, dark grey shale interbedded with limestone (to 4.09) | | RC | 1 | 100 | 90 | 3 | 63.63 |
| | | | | | | 4 | 62.63 |
| End of Borehole | | | | | | | |
| (GWL @ 0.80m - Dec. 6, 2022) | | | | | | | |



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**FILE NO.** PG6427

**REMARKS**

**HOLE NO.** BH28-22

**BORINGS BY** Track-Mount Power Auger **DATE** November 17, 2022

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 63.41 |
| Asphaltic concrete | 0.08 | | | | | | |
| **FILL:** Crushed stone with gravel, trace sand | 0.46 | SS | 1 | 67 | 10 | | |
| **FILL:** Brown silty sand to sandy silt with gravel, some topsoil | 0.91 | | | | | 1 | 62.41 |
| **GLACIAL TILL:** Very dense, reddish brown silty sand to sandy silt with gravel, cobbles and boulders | 1.88 | SS | 2 | 75 | 5 | | |
| | | SS | 3 | 80 | 50+ | | |
| | | | | | | 2 | 61.41 |
| **BEDROCK:** Fair to good quality, dark grey shale interbedded with grey limestone | 4.09 | RC | 1 | 100 | 69 | | |
| | | RC | 2 | 100 | 73 | 3 | 60.41 |
| | | | | | | 4 | 59.41 |
| End of Borehole | | | | | | | |
| (GWL @ 1.80m - Dec. 6, 2022) | | | | | | | |

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 17, 2022

**FILE NO.** PG6427

**HOLE NO.** BH29-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| Asphaltic concrete | 0.10 | | | | |
| **FILL:** Crushed stone with gravel, some sand | 0.69 | SS | 1 | 83 | 50+ |
| **FILL:** Brown to grey silty sand to sandy silt with gravel, occasional cobbles, trace clay | 1.22 | SS | 2 | 67 | 14 |
| **GLACIAL TILL:** Very dense, light brown silty sand to sandy silt with gravel, cobbles and boulders | 1.62 | SS | 3 | 100 | 50+ |
| **BEDROCK:** Fair to good quality, dark grey shale interbedded with grey limestone | 4.27 | RC | 1 | 100 | 65 |
| | | RC | 2 | 100 | 77 |
| End of Borehole | | | | | |
| (GWL @ 2.15m - Dec. 6, 2022) | | | | | |

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 49.50 |
| 1 | 48.50 |
| 2 | 47.50 |
| 3 | 46.50 |
| 4 | 45.50 |

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

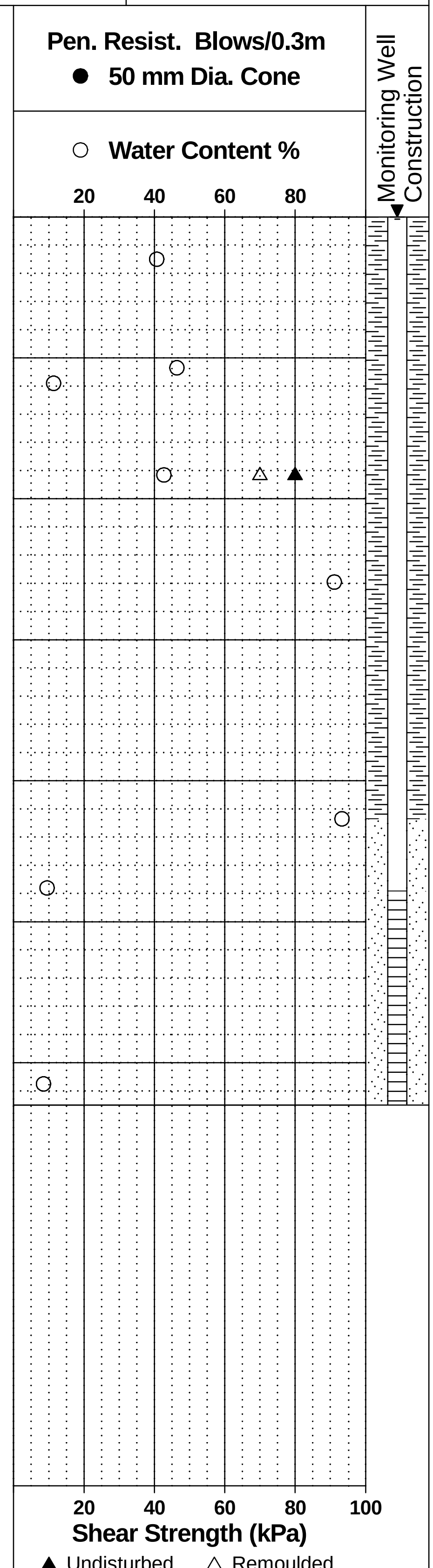
| | |
|---|---|
| **DATUM** Geodetic | **FILE NO.** PG6427 |
| **REMARKS** | **HOLE NO.** BH30-22 |
| **BORINGS BY** Track-Mount Power Auger | **DATE** November 15, 2022 |

| SOIL DESCRIPTION | Strata depth (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 43.99 |
| **TOPSOIL** | 0.25 | SS | 1 | 4 | 3 | | |
| **FILL:** Brown silty clay, some topsoil, organics | | SS | 2 | 42 | 2 | 1 | 42.99 |
| | 2.21 | SS | 3 | 4 | P | 2 | 41.99 |
| **PEAT** | | SS | 4 | 50 | P | 3 | 40.99 |
| | 4.01 | SS | 5 | 42 | P | 4 | 39.99 |
| Firm, grey **SILTY CLAY to CLAYEY SILT,** trace gravel | 4.50 | SS | 6 | 10 | 7 | | |
| **GLACIAL TILL:** Very dense, grey silty sand to sandy silt with gravel, cobbles and boulders, trace clay | | SS | 7 | 93 | 50+ | 5 | 38.99 |
| | | SS | 8 | 80 | 50+ | 6 | 37.99 |
| | 6.30 | SS | 9 | 100 | 50+ | | |

End of Borehole

Practical refusal to augering at 6.30m depth.

(GWL at 0.16m above ground surface - Dec. 6, 2022)



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 15, 2022

**FILE NO.** PG6427

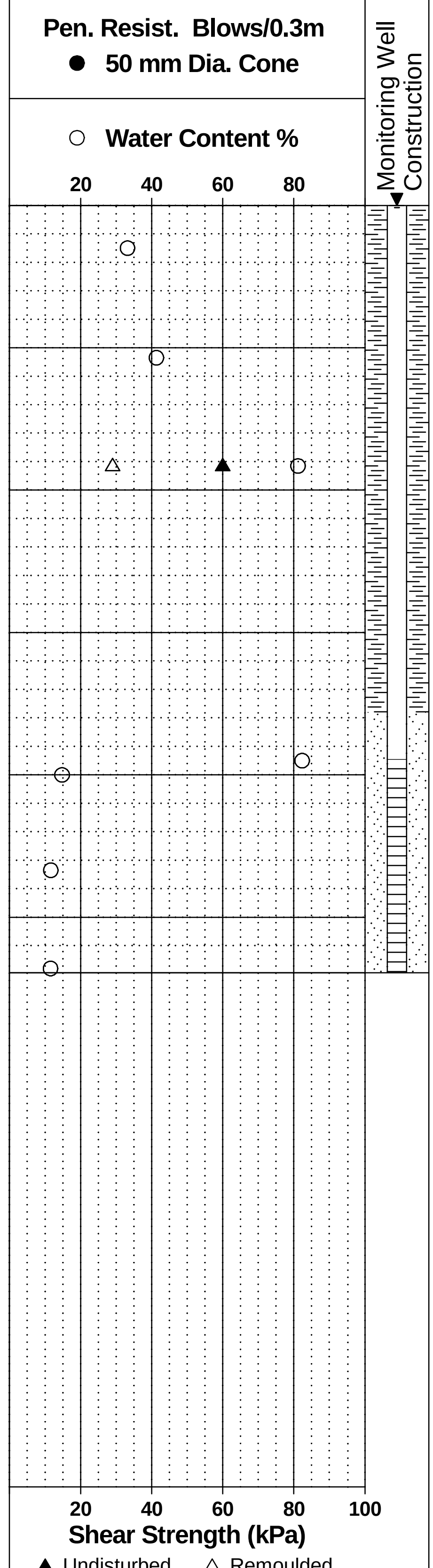
**HOLE NO.** BH31-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 44.05 |
| **TOPSOIL** | 0.33 | SS | 1 | 50 | 5 | | |
| **FILL:** Brown silty clay, some topsoil, organics, trace wood | | SS | 2 | 58 | 4 | 1 | 43.05 |
| | 2.21 | SS | 3 | 42 | P | 2 | 42.05 |
| **PEAT** | | SS | 4 | 67 | P | 3 | 41.05 |
| | 3.83 | SS | 5 | 4 | 1 | | |
| **GLACIAL TILL:** Very dense, brown sandy gravel with cobbles and boulders | | SS | 6 | 56 | 50+ | 4 | 40.05 |
| | | SS | 7 | 75 | 50+ | 5 | 39.05 |
| | 5.39 | SS | 8 | 100 | 50+ | | |

End of Borehole

Practical refusal to augering at 5.39m depth.

(GWL at 0.04m above ground surface - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 15, 2022

**FILE NO.** PG6427

**HOLE NO.** BH32-22

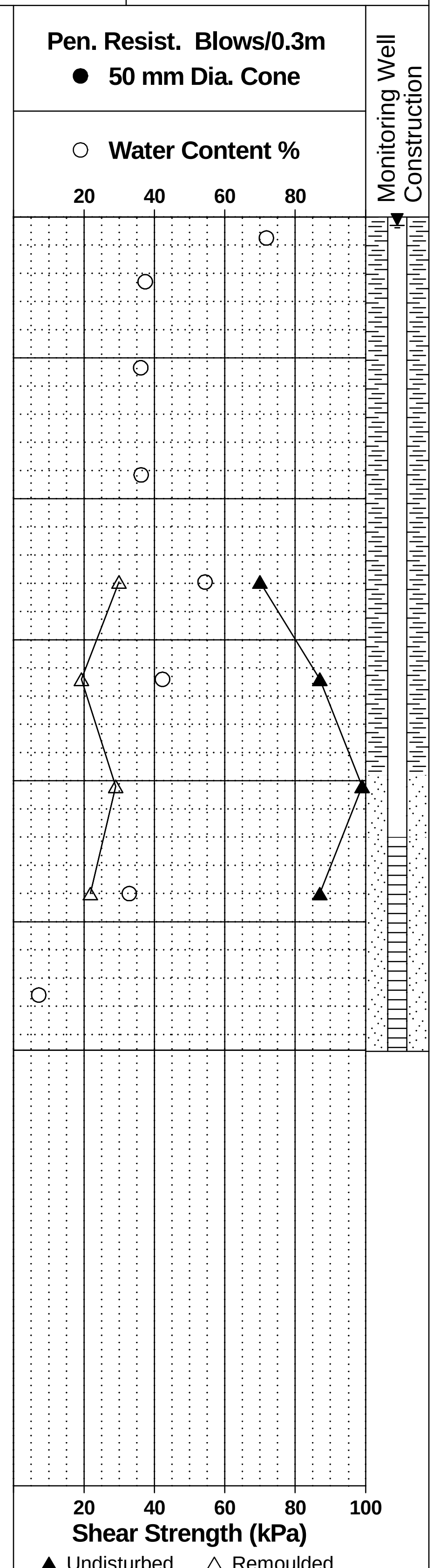
| SOIL DESCRIPTION | Layer bottom (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| **TOPSOIL** | 0.30 | SS | 1 | 50 | 3 |
| Hard to very stiff, brown **SILTY CLAY**<br>- stiff and grey by 3.1m depth<br>- increasing silt content by 3.7m depth. | 5.16 | SS | 2 | 100 | 12 |
| | | SS | 3 | 100 | 10 |
| | | SS | 4 | 100 | P |
| | | G | 5 | | |
| | | G | 6 | | |
| **GLACIAL TILL:** Very dense, grey silty sand to sandy silt with gravel, cobbles and boulders | 5.92 | SS | 7 | 93 | 50+ |

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 44.54 |
| 1 | 43.54 |
| 2 | 42.54 |
| 3 | 41.54 |
| 4 | 40.54 |
| 5 | 39.54 |

End of Borehole

Practical refusal to augering at 5.92m depth.

(GWL @ 0.06m - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 17, 2022

**FILE NO.** PG6427

**HOLE NO.** BH33-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 47.78 |
| **FILL:** Crushed stone with gravel, some sand, trace organics | | AU | 1 | | | | |
| 0.69 | | | | | | | |
| **GLACIAL TILL:** Loose to compact, brown silty sand to sandy silt with gravel, occasional cobbles and boulders, trace clay | | SS | 2 | 42 | 9 | 1 | 46.78 |
| | | SS | 3 | 54 | 25 | 2 | 45.78 |
| | | SS | 4 | 58 | 32 | | |
| - dense to very dense and grey by 2.2m depth | | SS | 5 | 13 | 50+ | 3 | 44.78 |
| | | SS | 6 | 33 | 26 | 4 | 43.78 |
| | | SS | 7 | 50 | 7 | 5 | 42.78 |
| | | SS | 8 | 0 | 50+ | | |
| 6.10 | | | | | | 6 | 41.78 |

End of Borehole

Practical refusal to augering at 6.10m depth.

(GWL @ 2.49m - Dec. 6, 2022)

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone

○ Water Content %

20 40 60 80

Monitoring Well Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

| **patersongroup** Consulting Engineers<br>9 Auriga Drive, Ottawa, Ontario K2E 7T9 | **SOIL PROFILE AND TEST DATA**<br>**Geotechnical Investigation**<br>**Proposed Road Rehabilitation Program**<br>**St-Jean Street, City of Clarence-Rockland, Ontario** |
|---|---|

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 15, 2022

**FILE NO.** PG6427

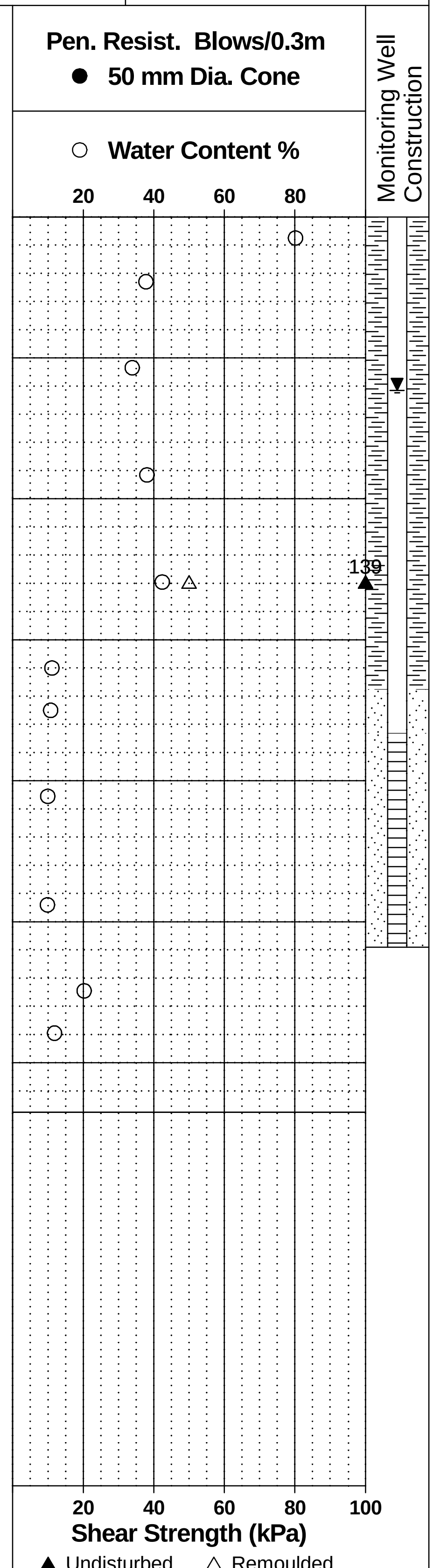
**HOLE NO.** BH34-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 46.22 |
| **TOPSOIL** | 0.28 | SS | 1 | 25 | 4 | | |
| Hard to very stiff, brown **SILTY CLAY** | | SS | 2 | 100 | 15 | 1 | 45.22 |
| | | SS | 3 | 100 | 11 | 2 | 44.22 |
| | 2.92 | SS | 4 | 62 | P | | |
| **GLACIAL TILL:** Compact, brown silty sand to sandy silt with clay, some gravel, cobbles and boulders | | SS | 5 | 100 | 10 | 3 | 43.22 |
| | | SS | 6 | 25 | 12 | 4 | 42.22 |
| | 5.26 | SS | 7 | 83 | 7 | 5 | 41.22 |
| Compact, grey **SILTY SAND** | 5.66 | | | | | | |
| **GLACIAL TILL:** Compact to dense, grey silty sand to sandy silt with clay, gravel, cobbles and boulders | | SS | 8 | 74 | 14 | | |
| | 6.35 | SS | 9 | 0 | 50+ | 6 | 40.22 |

End of Borehole

Practical refusal to augering at 6.35m depth.

(GWL @ 1.23m - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

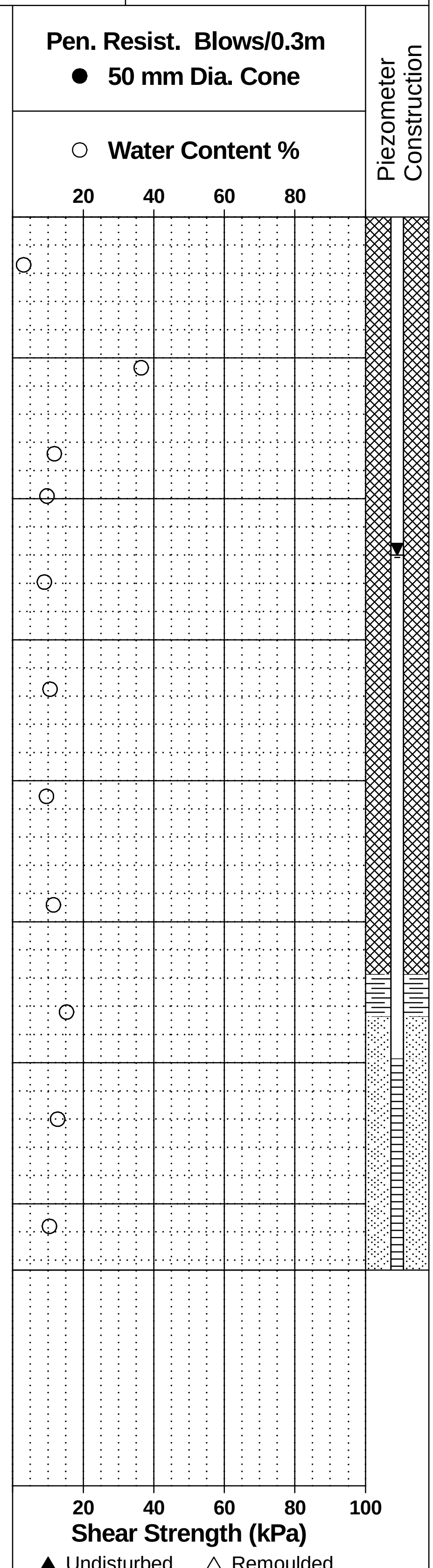
**DATE** November 15, 2022

**FILE NO.** PG6427

**HOLE NO.** BH35-22

| SOIL DESCRIPTION | Strata depth (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| Asphaltic concrete | 0.08 | | | | |
| **FILL:** Crushed stone, trace gravel | 0.69 | SS | 1 | 75 | 33 |
| Hard to very stiff, brown **SILTY CLAY,** trace to some sand | 1.52 | SS | 2 | 67 | 8 |
| **GLACIAL TILL:** Dense, brown silty sand to sandy silt with gravel | 2.21 | SS | 3 | 75 | 49 |
| **GLACIAL TILL:** Compact to loose, grey silty sand to sandy silt with gravel, cobbles and boulders, trace clay<br>- dense by 6.1m depth<br>- some running sand from 5.8 to 6.8m depth | 7.47 | SS | 4 | 46 | 21 |
| | | SS | 5 | 50 | 7 |
| | | SS | 6 | 42 | 9 |
| | | SS | 7 | 42 | 7 |
| | | SS | 8 | 50 | 10 |
| | | SS | 10 | 42 | 42 |
| | | SS | 11 | 50 | 40 |
| End of Borehole<br>(GWL @ 2.40m - Dec. 6, 2022) | | | | | |

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 46.97 |
| 1 | 45.97 |
| 2 | 44.97 |
| 3 | 43.97 |
| 4 | 42.97 |
| 5 | 41.97 |
| 6 | 40.97 |
| 7 | 39.97 |



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 15, 2022

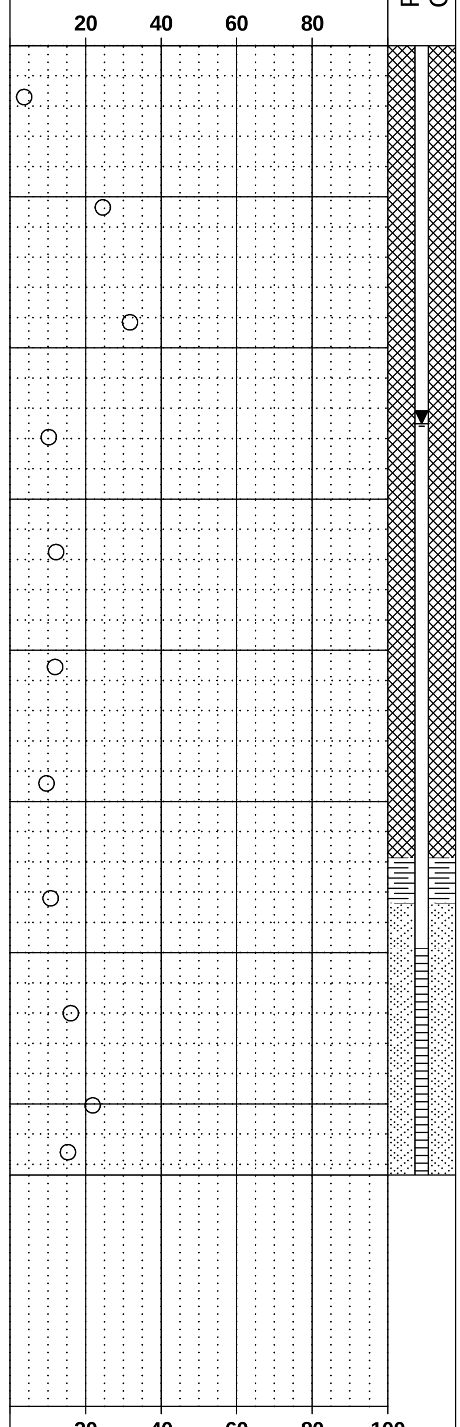
**FILE NO.** PG6427

**HOLE NO.** BH36-22

| SOIL DESCRIPTION | Strata depth (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 47.09 |
| Asphaltic concrete | 0.08 | | | | | | |
| **FILL:** Crushed stone, some sand | 0.76 | SS | 1 | 62 | 37 | | |
| **FILL:** Brown silty clay, trace sand, gravel and crushed stone | 2.21 | SS | 2 | 46 | 12 | 1 | 46.09 |
| | | SS | 3 | 42 | 13 | 2 | 45.09 |
| **GLACIAL TILL:** Compact to dense, brown silty sand to sandy silt with clay, some gravel, cobbles and boulders<br>- loose to compact by 3.7m depth | 6.70 | SS | 4 | 50 | 23 | | |
| | | SS | 5 | 33 | 32 | 3 | 44.09 |
| | | SS | 6 | 54 | 5 | 4 | 43.09 |
| | | SS | 7 | 58 | 24 | 5 | 42.09 |
| | | SS | 8 | 67 | 13 | 6 | 41.09 |
| | | SS | 9 | 38 | 20 | | |
| **GLACIAL TILL:** Compact, grey silty sand to sandy silt, trace gravel, some running sand | 7.00 | | | | | 7 | 40.09 |
| **GLACIAL TILL:** Compact to dense, grey silty sand to sandy silt with gravel, cobbles and rock fragments | 7.47 | SS | 10 | 75 | 28 | | |
| End of Borehole | | | | | | | |

(GWL @ 2.50m - Dec. 6, 2022)

**Pen. Resist. Blows/0.3m**
● 50 mm Dia. Cone
○ Water Content %



**Shear Strength (kPa)**
▲ Undisturbed △ Remoulded

Piezometer Construction

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# SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Road Rehabilitation Program
St-Jean Street, City of Clarence-Rockland, Ontario

| | |
|---|---|
| DATUM | Geodetic |
| REMARKS | |
| BORINGS BY | Track-Mount Power Auger |
| DATE | November 15, 2022 |
| FILE NO. | PG6427 |
| HOLE NO. | BH37-22 |

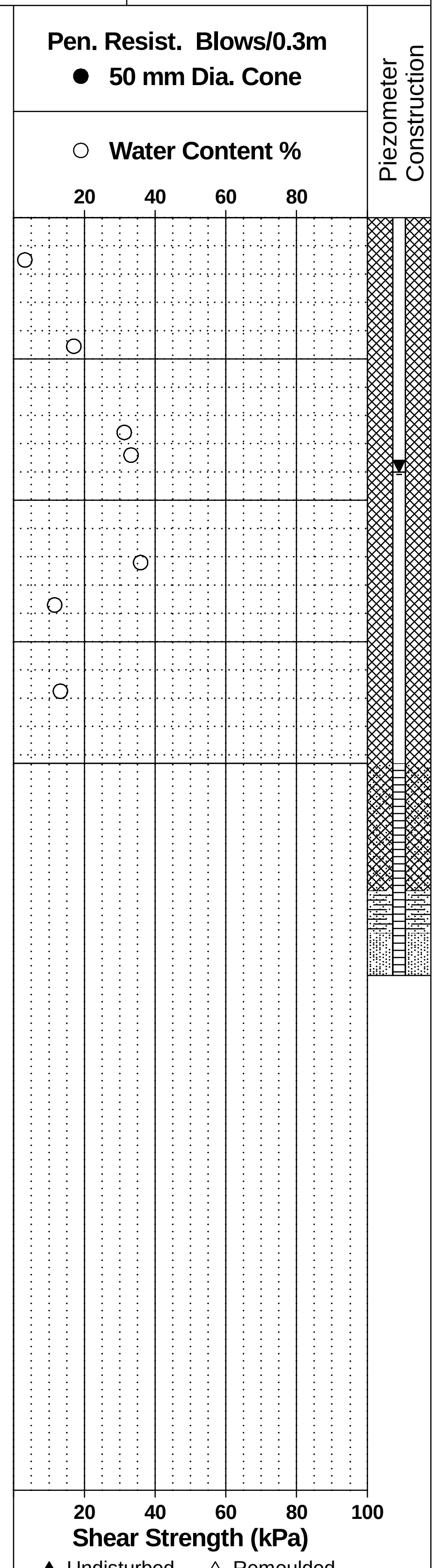
| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| Asphaltic concrete | 0.08 | | | | |
| **FILL:** Crushed stone, some sand | 0.69 | SS | 1 | 67 | 40 |
| **FILL:** Brown silty sand | 0.84 | | | | |
| **FILL:** Brown to grey silty clay, some topsoil, trace wood | 2.06 | SS | 2 | 42 | 10 |
| | | SS | 3 | 50 | 10 |
| **TOPSOIL** | 2.13 | | | | |
| Grey **SILTY CLAY,** trace organics | 2.51 | | | | |
| **GLACIAL TILL:** Compact, brown silty sand to sandy silt, some clay, gravel and cobbles | 2.97 | SS | 4 | 54 | 26 |
| **GLACIAL TILL:** Grey silty clay to clayey silt, some sand and gravel | 3.86 | SS | 5 | 67 | 4 |

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 47.11 |
| 1 | 46.11 |
| 2 | 45.11 |
| 3 | 44.11 |

End of Borehole

Practical refusal to augering at 3.86m depth.

(GWL @ 1.80m - Dec. 6, 2022)



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

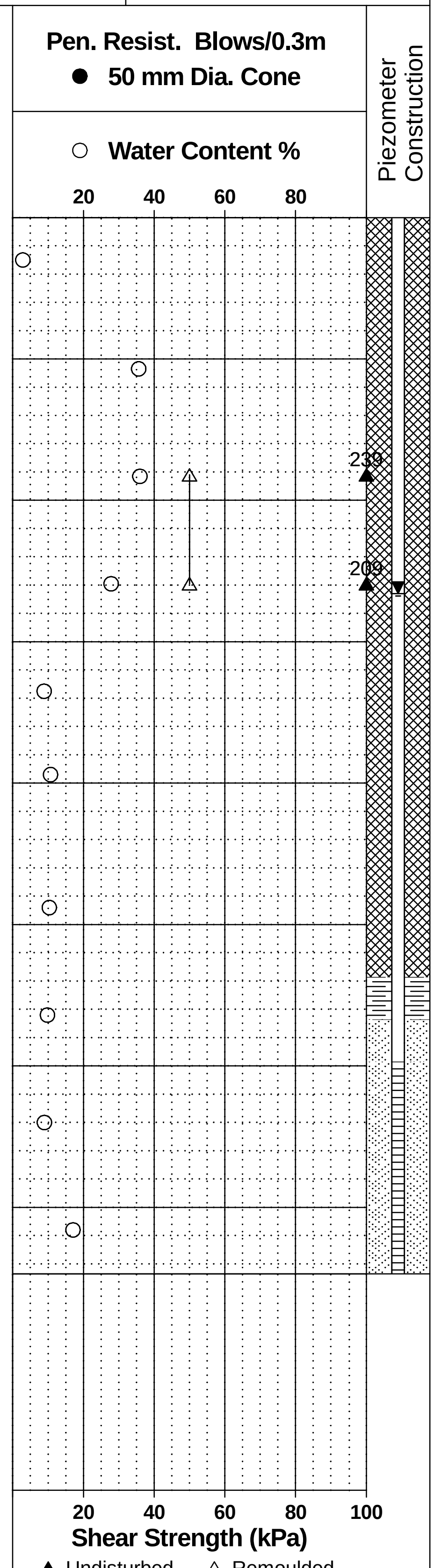
**DATE** November 15, 2022

**FILE NO.** PG6427

**HOLE NO.** BH38-22

| SOIL DESCRIPTION | TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | 0 | 47.14 |
| **FILL:** Crushed stone, some sand | SS | 1 | 75 | 35 | | |
| 0.76 — **FILL:** Grey to brown silty clay, some sand, trace topsoil | SS | 2 | 50 | 10 | 1 | 46.14 |
| 1.37 — Hard to very stiff, brown **SILTY CLAY** | SS | 3 | 67 | P | 2 | 45.14 |
| - increasing silt content with depth | G | 4 | | P | | |
| 3.05 — **GLACIAL TILL:** Dark grey silty clay with sand and gravel | SS | 5 | 12 | 16 | 3 | 44.14 |
| | SS | 6 | 40 | 50+ | 4 | 43.14 |
| | SS | 7 | 12 | 4 | 5 | 42.14 |
| 5.26 — **GLACIAL TILL:** Compact to dense, dark grey silty sand to sandy silt, some clay, gravel, cobbles and boulders | SS | 8 | 25 | 12 | | |
| | SS | 9 | 33 | 11 | 6 | 41.14 |
| | SS | 10 | 42 | 30 | 7 | 40.14 |
| 7.47 — End of Borehole | | | | | | |

(GWL @ 2.66m - Dec. 6, 2022)



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

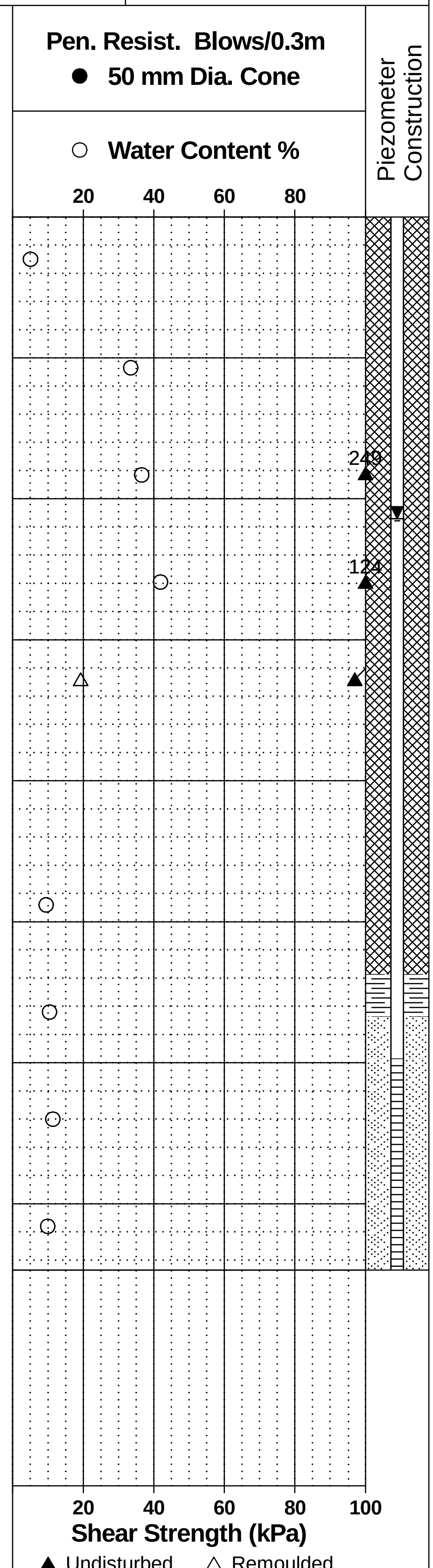
**FILE NO.** PG6427

**REMARKS**

**HOLE NO.** BH39-22

**BORINGS BY** Track-Mount Power Auger **DATE** November 14, 2022

| SOIL DESCRIPTION | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | 0 | 47.14 |
| **FILL:** Crushed stone, some sand | SS | 1 | 50 | 15 | | |
| 0.69 | | | | | | |
| Hard to stiff, brown **SILTY CLAY** | SS | 2 | 71 | 7 | 1 | 46.14 |
| | SS | 3 | 67 | P | 2 | 45.14 |
| | SS | 4 | 75 | P | 3 | 44.14 |
| 3.73 | | | | | | |
| **GLACIAL TILL:** Grey silty clay with sand and gravel | | | | | 4 | 43.14 |
| 4.42 | | | | | | |
| **GLACIAL TILL:** Compact, dark grey silty sand to sandy silt with clay and gravel | SS | 5 | 42 | 25 | 5 | 42.14 |
| | SS | 6 | 17 | 6 | 6 | 41.14 |
| | SS | 7 | 33 | 6 | 7 | 40.14 |
| | SS | 8 | 50 | 17 | | |
| 7.47 | | | | | | |
| End of Borehole | | | | | | |
| (GWL @ 2.14m - Dec. 6, 2022) | | | | | | |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

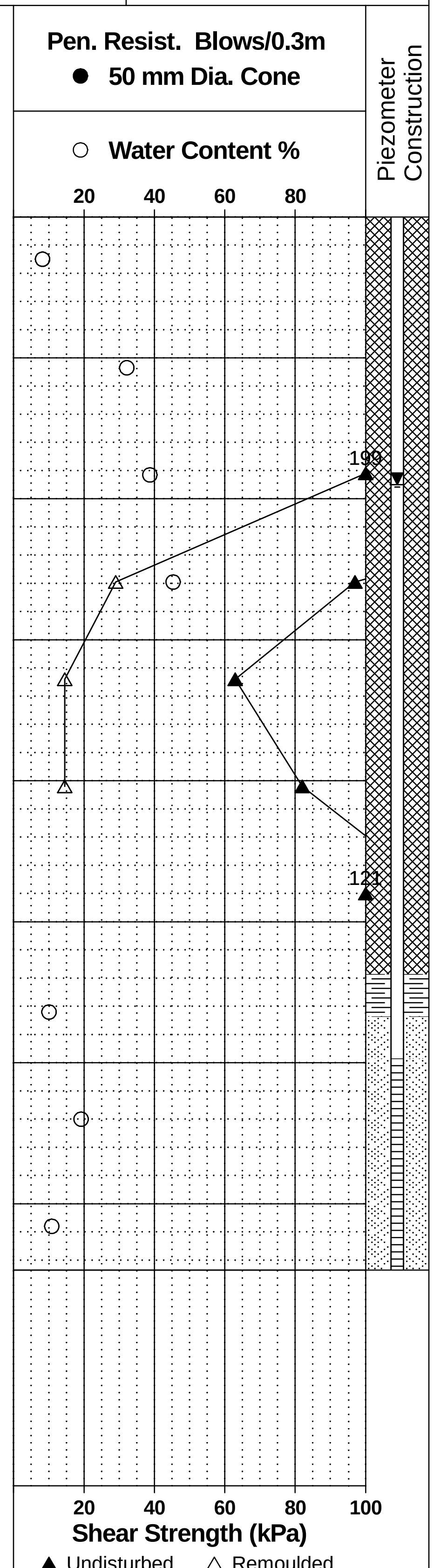
**DATE** November 14, 2022

**FILE NO.** PG6427

**HOLE NO.** BH40-22

| SOIL DESCRIPTION | Depth of strata boundary (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| **FILL:** Crushed stone, some sand | 0.69 | SS | 1 | 50 | 21 |
| Hard to stiff, brown **SILTY CLAY**<br>- stiff to very stiff and grey by 3.0m depth | 5.03 | SS | 2 | 75 | 9 |
| | | SS | 3 | 75 | P |
| | | SS | 4 | 83 | P |
| **GLACIAL TILL:** Dark grey silty sand to sandy silt with clay, some gravel | 7.47 | SS | 5 | 75 | 3 |
| | | SS | 7 | 17 | 12 |
| | | SS | 8 | 100 | 7 |
| End of Borehole<br><br>(GWL @ 1.90m - Dec. 6, 2022) | | | | | |

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 47.11 |
| 1 | 46.11 |
| 2 | 45.11 |
| 3 | 44.11 |
| 4 | 43.11 |
| 5 | 42.11 |
| 6 | 41.11 |
| 7 | 40.11 |



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

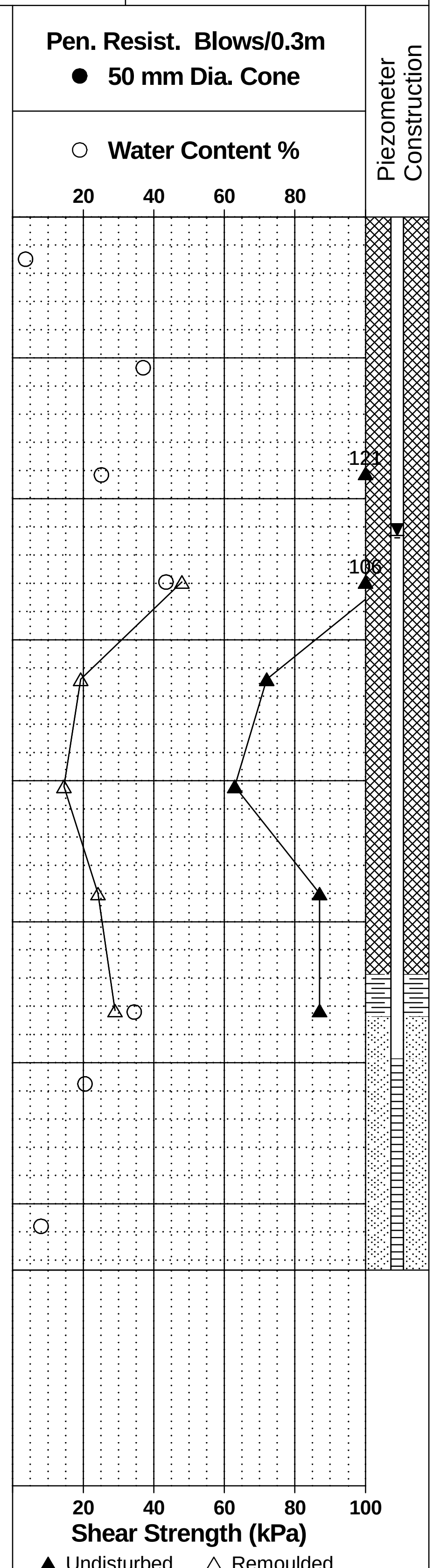
**BORINGS BY** Track-Mount Power Auger

**DATE** November 14, 2022

**FILE NO.** PG6427

**HOLE NO.** BH41-22

| SOIL DESCRIPTION | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | 0 | 48.03 |
| **FILL:** Crushed stone, some sand | SS | 1 | 50 | 33 | | |
| 0.69 | | | | | | |
| Hard to very stiff, brown **SILTY CLAY** | SS | 2 | 58 | 13 | 1 | 47.03 |
| | SS | 3 | 58 | P | 2 | 46.03 |
| - stiff and grey by 3.0m depth | SS | 4 | 67 | P | 3 | 45.03 |
| | | | | | 4 | 44.03 |
| | | | | | 5 | 43.03 |
| - increasing silt content by 5.3m depth | G | 5 | | | | |
| 6.10 | | | | | 6 | 42.03 |
| **GLACIAL TILL:** Very dense to loose, dark grey silty sand to sandy silt with gravel, gravel, cobbles and boulders | SS | 6 | 100 | 50+ | | |
| | SS | 7 | 21 | 8 | 7 | 41.03 |
| 7.47 | | | | | | |
| End of Borehole | | | | | | |
| (GWL @ 2.26m - Dec. 6, 2022) | | | | | | |



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 14, 2022

**FILE NO.** PG6427

**HOLE NO.** BH42-22

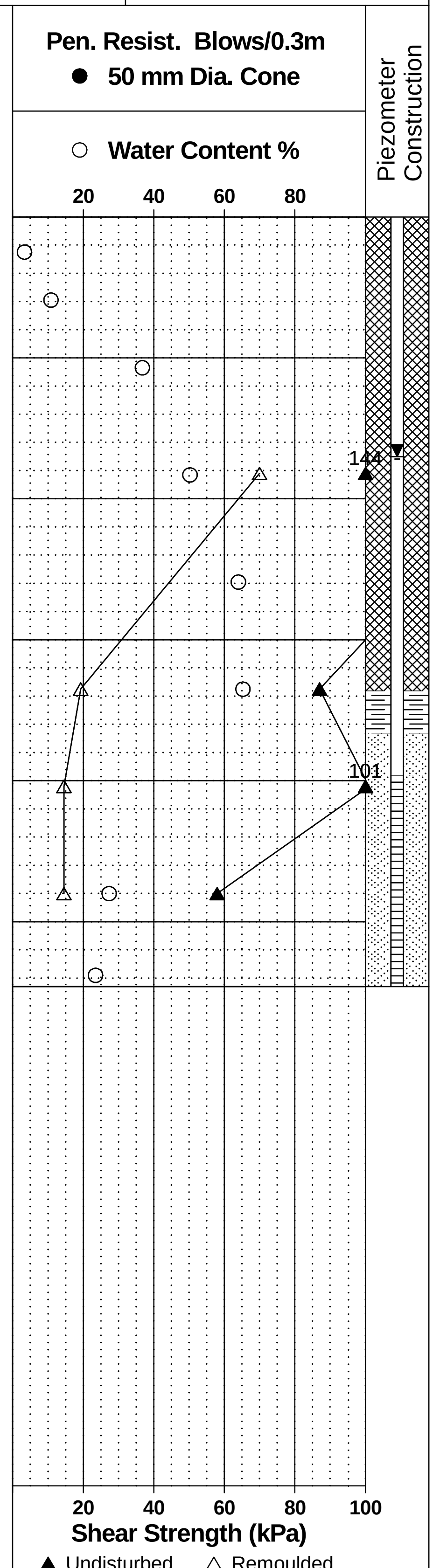
| SOIL DESCRIPTION | Depth of layer base (m) |
|---|---|
| GROUND SURFACE | |
| Asphaltic concrete | 0.05 |
| **FILL:** Crushed stone, trace sand | 0.84 |
| Hard to very stiff, brown **SILTY CLAY**<br>- stiff and grey by 3.0m depth<br>- increasing silt content by 4.6m depth | 5.03 |
| **GLACIAL TILL:** Very dense, dark grey silty sand to sandy silt with clay, gravel, cobbles and boulders | 5.46 |
| End of Borehole | |

Practical refusal to augering at 5.46m depth.

(GWL @ 1.70m - Dec. 6, 2022)

| SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|
| SS | 1 | 67 | 28 |
| SS | 2 | 67 | 6 |
| SS | 3 | 58 | P |
| SS | 4 | 92 | 2 |
| SS | 5 | 92 | P |
| G | 6 | | |
| SS | 7 | 100 | 50+ |

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 48.45 |
| 1 | 47.45 |
| 2 | 46.45 |
| 3 | 45.45 |
| 4 | 44.45 |
| 5 | 43.45 |



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 18, 2022

**FILE NO.** PG6427

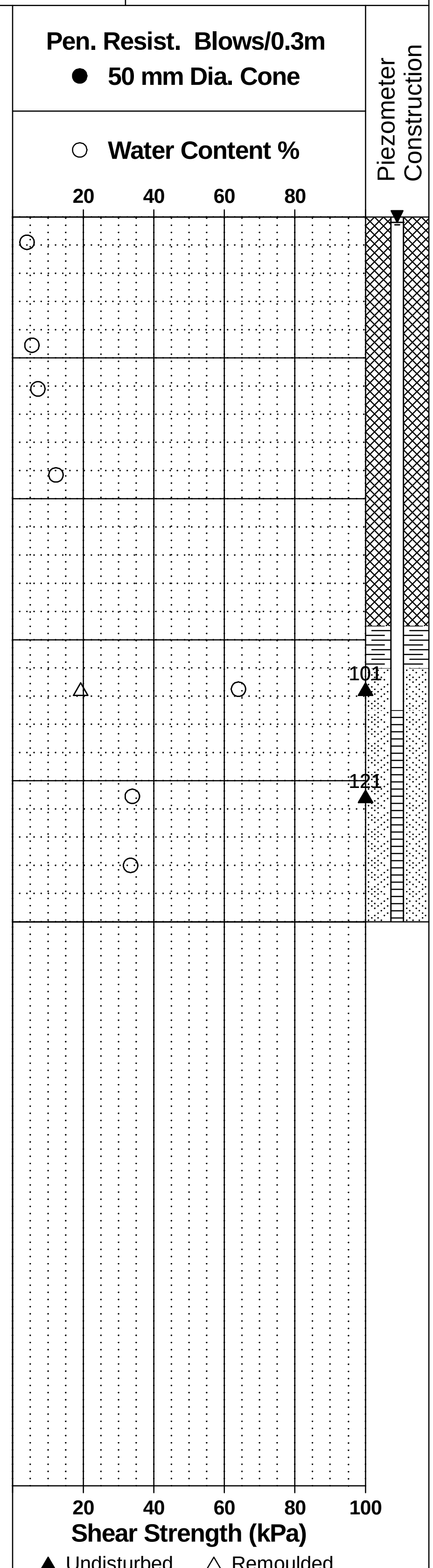
**HOLE NO.** BH43-22

| SOIL DESCRIPTION | Strata depth (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 48.51 |
| Asphaltic concrete | 0.13 | SS | 1 | 100 | 50+ | | |
| **FILL:** Crushed stone with sand | 0.99 | | | | | | |
| **FILL:** Brown silty sand | 1.52 | SS | 2 | 67 | 50+ | 1 | 47.51 |
| Very stiff, grey **SILTY CLAY** | | SS | 3 | 8 | 4 | 2 | 46.51 |
| | | SS | 4 | 92 | 2 | 3 | 45.51 |
| - increasing silt content by 3.7m depth | | SS | 5 | 92 | P | | |
| | 4.50 | SS | 6 | 83 | P | 4 | 44.51 |
| **GLACIAL TILL:** Very dense, dark grey silty clay, some sand, gravel, cobbles and rock fragments | 5.00 | SS | 7 | 100 | 50+ | 5 | 43.51 |

End of Borehole

Practical refusal to augering at 5.00m depth.

(GWL @ 0.04m - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 18, 2022

**FILE NO.** PG6427

**HOLE NO.** BH44-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 48.94 |
| Asphaltic concrete | 0.13 | | | | | | |
| **FILL:** Crushed stone with sand | 0.38 | SS | 1 | 75 | 44 | | |
| **FILL:** Brown silty sand, trace gravel | 1.37 | SS | 2 | 58 | 24 | 1 | 47.94 |
| **FILL:** Dark brown silty sand to sandy silt with gravel | 2.06 | SS | 3 | 46 | 21 | 2 | 46.94 |
| **FILL:** Topsoil, peat, wood and clay | 2.90 | SS | 4 | 42 | 2 | | |
| **GLACIAL TILL:** Dark brown silty sand to sandy silt, some cobbles and rock fragments | 3.68 | SS | 5 | 40 | 4 | 3 | 45.94 |
| **BEDROCK:** Excellent quality, dark grey dolostone | 5.69 | RC | 1 | 100 | 100 | 4 | 44.94 |
| | | RC | 2 | 100 | 95 | 5 | 43.94 |

End of Borehole

(GWL @ 1.47m - Dec. 6, 2022)

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %
20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 18, 2022

**FILE NO.** PG6427

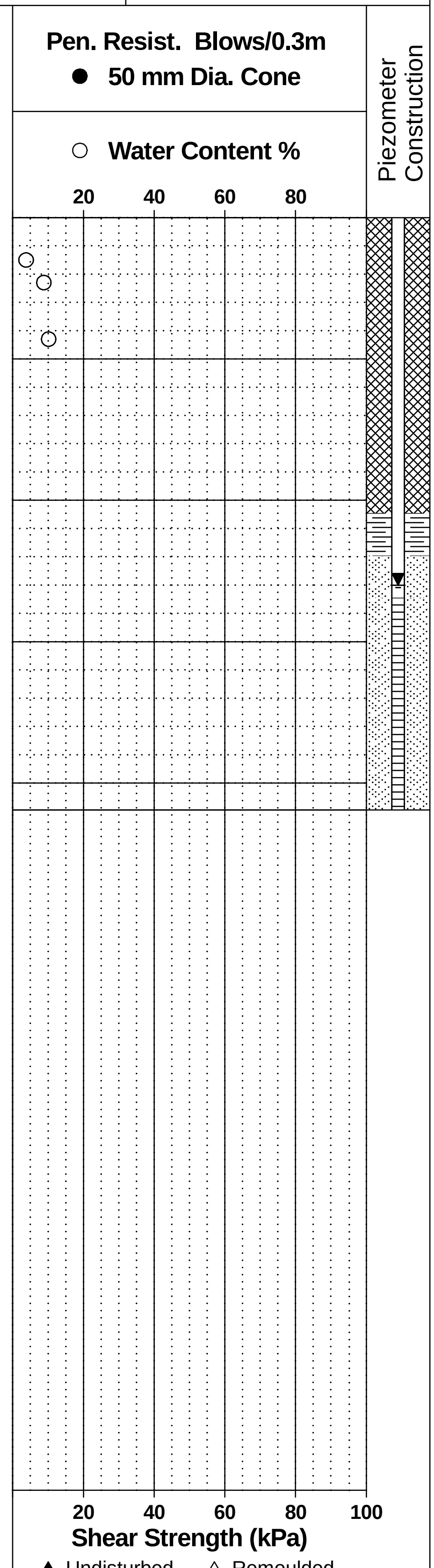
**HOLE NO.** BH45-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| Asphaltic concrete | 0.13 | | | | |
| **FILL:** Crushed stone with sand | 0.25 | SS | 1 | 75 | 15 |
| **FILL:** Brown silty sand | 0.69 | | | | |
| **FILL:** Crushed stone with topsoil, trace to some sand | 1.12 | SS | 2 | 50 | 50+ |
| **BEDROCK:** Poor quality, dark grey shale interbedded with grey dolostone | 2.67 | RC | 1 | 100 | 37 |
| **BEDROCK:** Good quality, grey dolostone | 4.19 | RC | 2 | 100 | 86 |

End of Borehole

(GWL @ 2.60m - Dec. 6, 2022)

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 50.63 |
| 1 | 49.63 |
| 2 | 48.63 |
| 3 | 47.63 |
| 4 | 46.63 |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 18, 2022

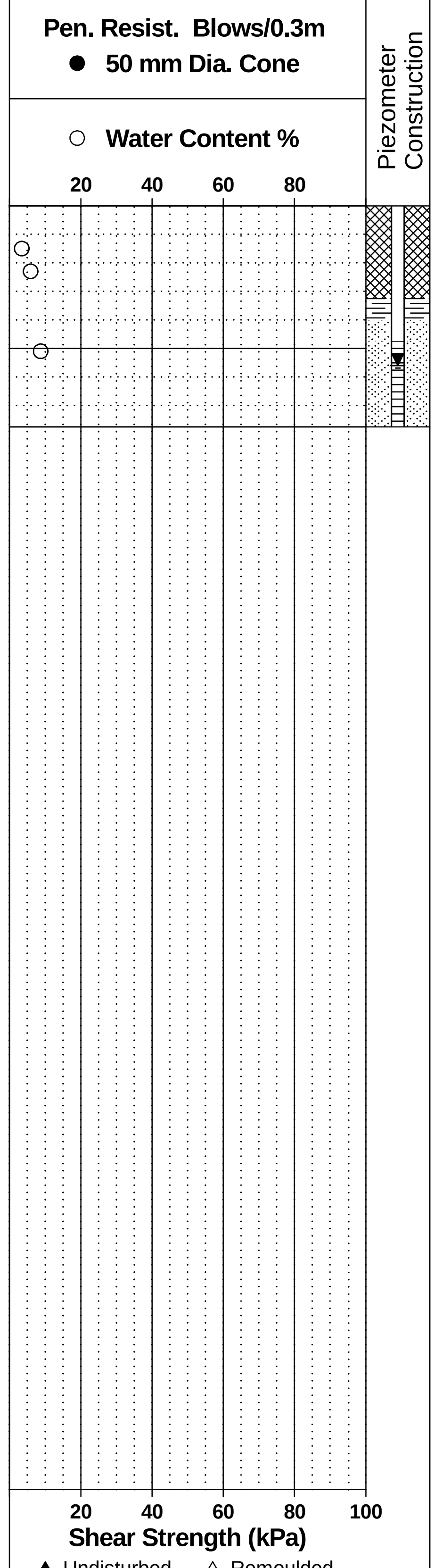
**FILE NO.** PG6427

**HOLE NO.** BH46-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 51.02 |
| Asphaltic concrete | 0.13 | | | | | | |
| **FILL:** Crushed stone with sand | 0.25 | | | | | | |
| **FILL:** Brown silty sand | 0.69 | SS | 1 | 75 | 37 | | |
| **GLACIAL TILL:** Compact, brown silty sand to sandy silt with gravel, cobbles and boulders | 1.55 | SS | 2 | 40 | 16 | 1 | 50.02 |
| End of Borehole | | | | | | | |

Practical refusal to augering at 1.55m depth.

(GWL @ 1.12m - Dec. 6, 2022)



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## SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Proposed Road Rehabilitation Program
St-Jean Street, City of Clarence-Rockland, Ontario

**DATUM** Geodetic

**REMARKS**

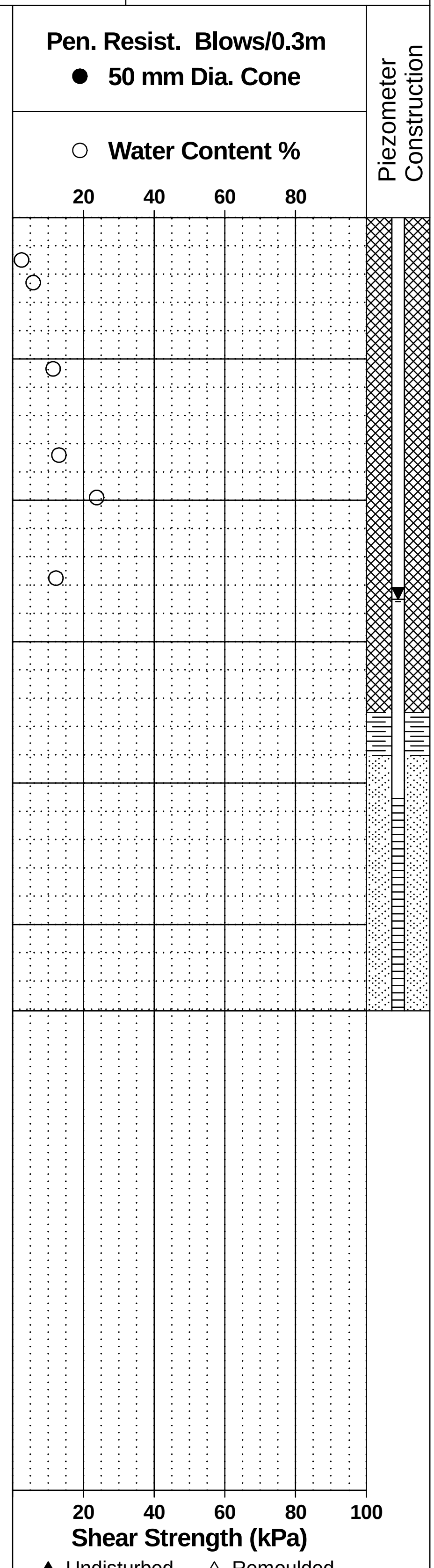
**BORINGS BY** Track-Mount Power Auger

**DATE** November 18, 2022

**FILE NO.** PG6427

**HOLE NO.** BH47-22

| SOIL DESCRIPTION | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 51.28 |
| Asphaltic concrete — 0.13 | | | | | | | |
| **FILL:** Crushed stone with sand — 0.38 | | SS | 1 | 75 | 27 | | |
| **FILL:** Brown silty sand, trace topsoil | | SS | 2 | 67 | 5 | 1 | 50.28 |
| — 1.90 | | SS | 3 | 75 | 3 | | |
| **FILL:** Brown silty sand, trace to some gravel and clay — 2.21 | | | | | | 2 | 49.28 |
| **GLACIAL TILL:** Compact, brown silty sand with gravel and shale fragments — 2.84 | | SS | 4 | 60 | 25 | | |
| **BEDROCK:** Fair quality, grey dolostone — 4.27 | | RC | 1 | 100 | 68 | 3 | 48.28 |
| | | | | | | 4 | 47.28 |
| **BEDROCK:** Poor quality, dark grey shale interbedded with grey dolostone — 5.61 | | RC | 2 | 100 | 32 | 5 | 46.28 |
| End of Borehole | | | | | | | |
| (GWL @ 2.70m - Dec. 6, 2022) | | | | | | | |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

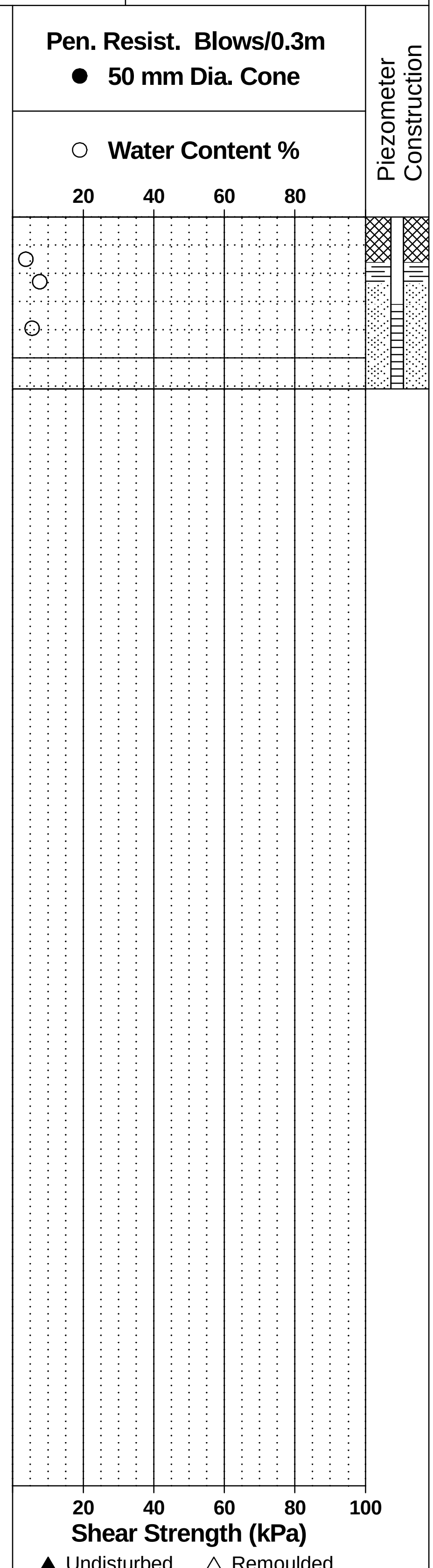
**DATE** November 21, 2022

**FILE NO.** PG6427

**HOLE NO.** BH48-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 52.24 |
| Asphaltic concrete | 0.14 | | | | | | |
| **FILL:** Crushed stone with sand | 0.38 | | | | | | |
| **FILL:** Brown silty sand, trace gravel | 0.69 | SS | 1 | 71 | 20 | | |
| Very dense, brown **SILTY SAND,** some gravel and rock fragments | 1.22 | SS | 2 | 100 | 50+ | 1 | 51.24 |
| End of Borehole | | | | | | | |

Practical refusal to augering at 1.22m depth.



**patersongroup** Consulting Engineers

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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 21, 2022

**FILE NO.** PG6427

**HOLE NO.** BH49-22

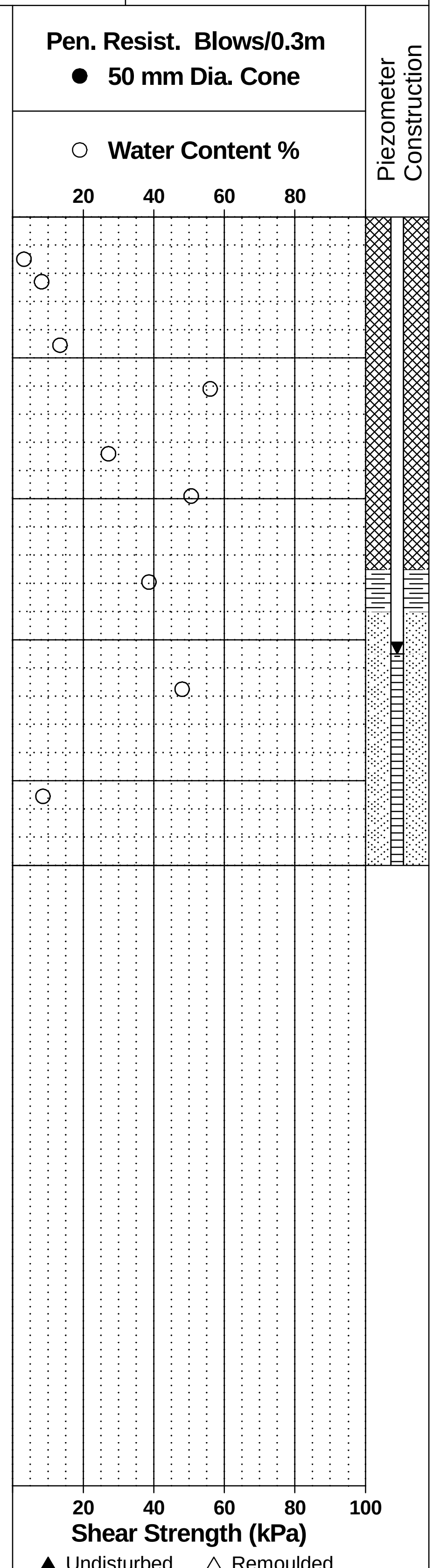
| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| Asphaltic concrete | 0.15 | | | | |
| **FILL:** Crushed stone, some sand | 0.38 | SS | 1 | 75 | 20 |
| **FILL:** Brown silty sand | 1.07 | SS | 2 | 67 | 8 |
| **FILL:** Grey silty clay | 1.37 | | | | |
| **FILL:** Brown silty sand | 1.83 | SS | 3 | 67 | 6 |
| **TOPSOIL** | 2.06 | | | | |
| Stiff to very stiff, grey **SILTY CLAY** | 3.73 | G | 4 | | |
| | | SS | 5 | 83 | P |
| **GLACIAL TILL:** Dense, brown silty sand to sandy silt with gravel, cobbles and boulders, trace clay | 4.60 | SS | 6 | 42 | 39 |
| | | SS | 7 | 0 | 50+ |

End of Borehole

Practical refusal to augering at 4.60m depth.

(GWL @ 3.10m - Dec. 6, 2022)

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 53.02 |
| 1 | 52.02 |
| 2 | 51.02 |
| 3 | 50.02 |
| 4 | 49.02 |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 22, 2022

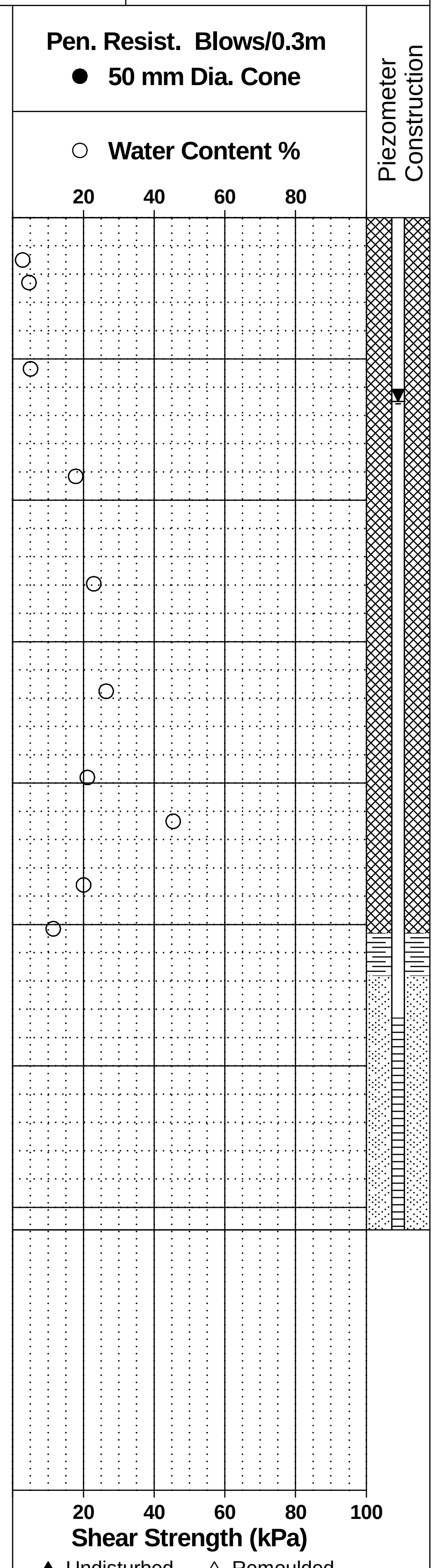
**FILE NO.** PG6427

**HOLE NO.** BH50-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| Asphaltic concrete | 0.15 | | | | |
| **FILL:** Crushed stone with sand | 0.25 | | | | |
| **FILL:** Light brown silty sand | 0.69 | SS | 1 | 75 | 34 |
| Loose to compact, reddish brown to brown **SILTY SAND** | 4.11 | SS | 2 | 58 | 10 |
| | | SS | 3 | 67 | 6 |
| | | SS | 4 | 83 | 9 |
| | | SS | 5 | 83 | 5 |
| | | SS | 6 | 83 | 18 |
| **GLACIAL TILL:** Compact, grey silty sand to sandy silt with gravel, cobbles and boulders<br>- running sand from 4.9 to 5.5m depth | 6.53 | SS | 7 | 46 | 26 |
| | | RC | 1 | 16 | |
| **BEDROCK:** Good quality, grey dolostone interbedded with dark grey shale | 7.16 | RC | 2 | 100 | 84 |
| End of Borehole | | | | | |

(GWL @ 1.30m - Dec. 6, 2022)

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 54.18 |
| 1 | 53.18 |
| 2 | 52.18 |
| 3 | 51.18 |
| 4 | 50.18 |
| 5 | 49.18 |
| 6 | 48.18 |
| 7 | 47.18 |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 21, 2022

**FILE NO.** PG6427

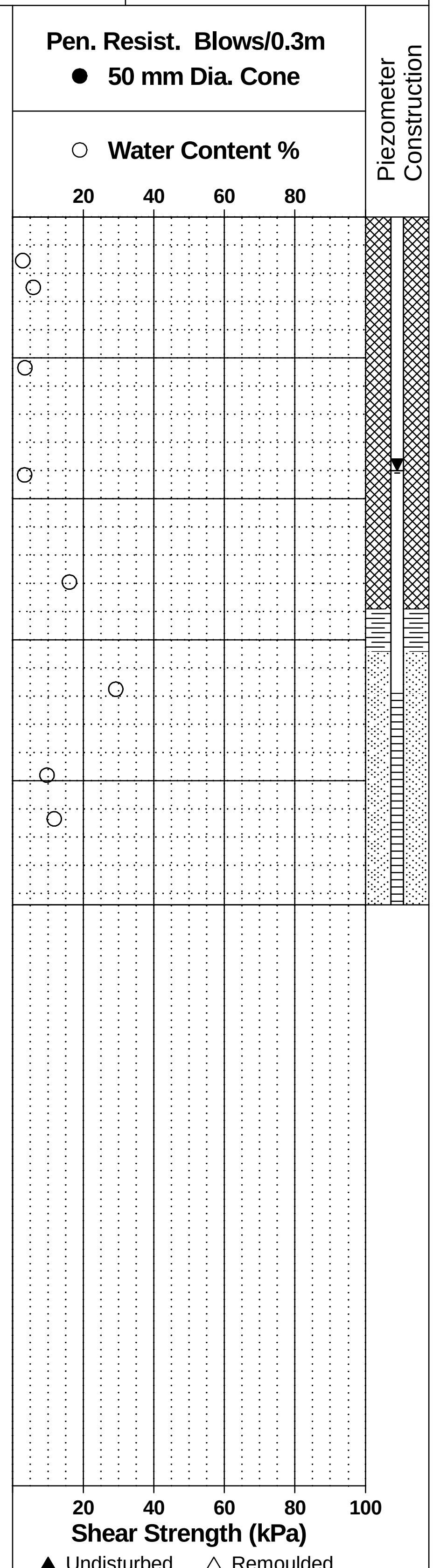
**HOLE NO.** BH51-22

| SOIL DESCRIPTION | Layer bottom depth (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| **GROUND SURFACE** | | | | | |
| Asphaltic concrete | 0.18 | | | | |
| **FILL:** Crushed stone with sand | 0.38 | SS | 1 | 75 | 50+ |
| Compact to loose, light brown **SILTY SAND** | 3.73 | SS | 2 | 79 | 14 |
| | | SS | 3 | 75 | 5 |
| | | SS | 4 | 67 | 6 |
| | | SS | 5 | 67 | 6 |
| **GLACIAL TILL:** Dense, dark grey silty sand to sandy silt with gravel, cobbles and boulders, trace clay | 4.88 | SS | 6 | 75 | 36 |
| | | SS | 7 | 100 | 50+ |
| End of Borehole | | | | | |

Practical refusal to augering at 4.88m depth.

(GWL @ 1.80m - Dec. 6, 2022)

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 54.66 |
| 1 | 53.66 |
| 2 | 52.66 |
| 3 | 51.66 |
| 4 | 50.66 |



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 21, 2022

**FILE NO.** PG6427

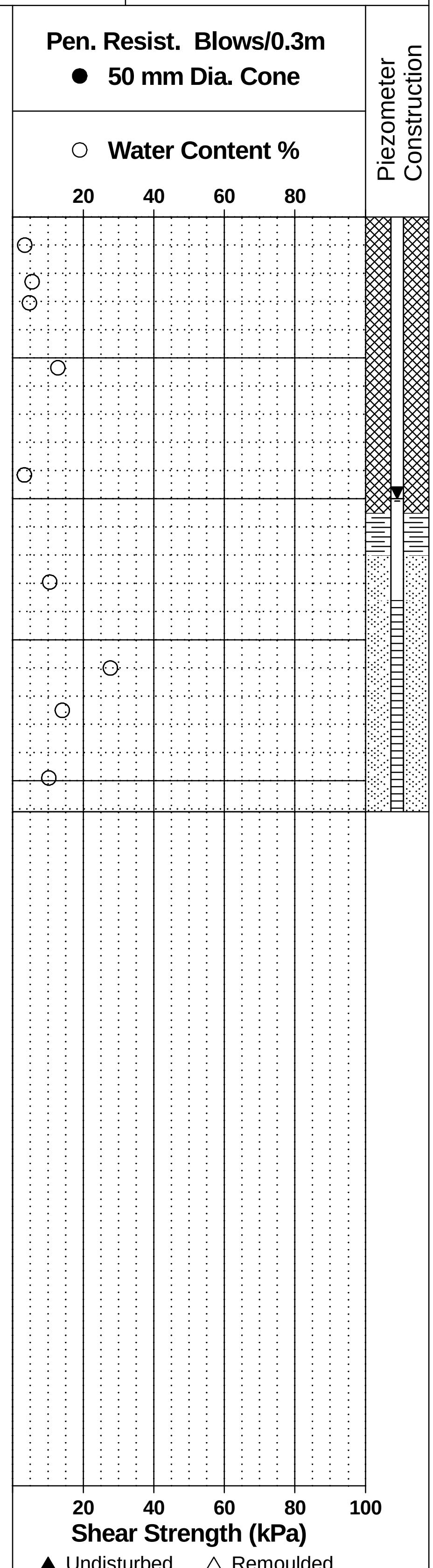
**HOLE NO.** BH52-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | 0 | 54.80 |
| Asphaltic concrete | 0.15 | | | | | | |
| **FILL:** Crushed stone with sand | 0.38 | SS | 1 | 75 | 50+ | | |
| **FILL:** Brown silty sand | 0.69 | | | | | | |
| **FILL:** Crushed stone with sand and gravel | 0.76 | | | | | | |
| **TOPSOIL** | 0.81 | SS | 2 | 67 | 8 | 1 | 53.80 |
| Liise, light brown **SILTY SAND** | 3.58 | SS | 3 | 75 | 6 | 2 | 52.80 |
| | | SS | 4 | 67 | 5 | 3 | 51.80 |
| | | SS | 5 | 75 | 4 | | |
| **GLACIAL TILL:** Very dense, grey silty sand to sandy silt with gravel, cobbles and boulders, some clay | 4.22 | SS | 6 | | 50+ | 4 | 50.80 |

End of Borehole

Practical refusal to augering at 4.22m depth.

(GWL @ 2.00m - Dec. 6, 2022)



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## SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

**DATE** November 21, 2022

**FILE NO.** PG6427

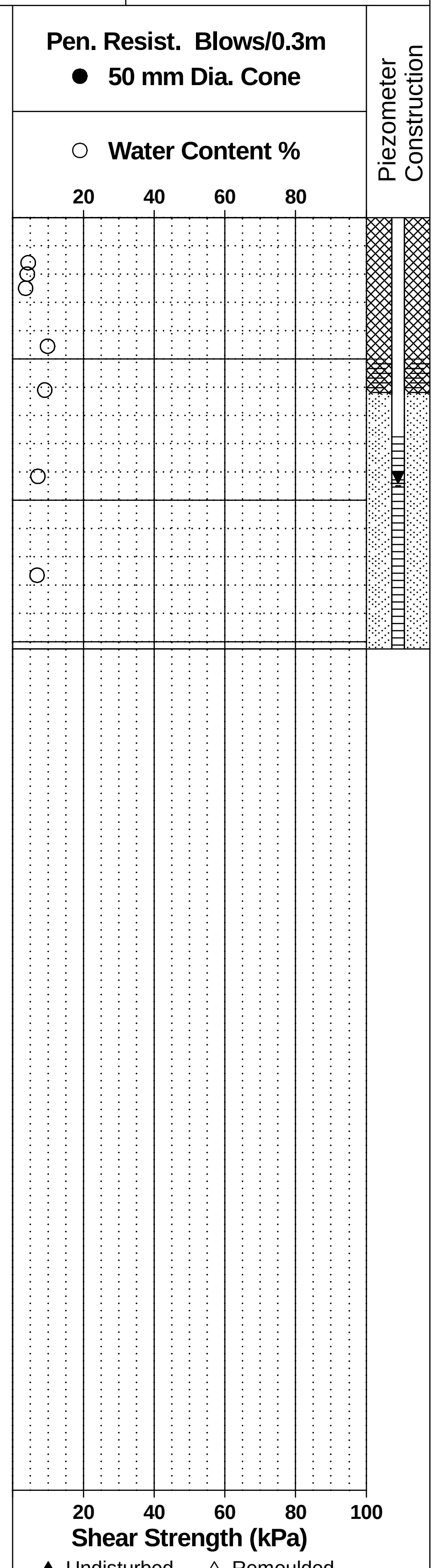
**HOLE NO.** BH53-22

| SOIL DESCRIPTION | Depth to base (m) | STRATA PLOT | SAMPLE TYPE | SAMPLE NUMBER | % RECOVERY | N VALUE or RQD | DEPTH (m) | ELEV. (m) |
|---|---|---|---|---|---|---|---|---|
| GROUND SURFACE | | | | | | | 0 | 55.55 |
| Asphaltic concrete | 0.16 | | | | | | | |
| **FILL:** Crushed stone with sand | 0.38 | | | | | | | |
| **FILL:** Brown silty sand | 0.53 | | SS | 1 | 75 | 50+ | | |
| **FILL:** Crushed stone with sand | 0.69 | | | | | | | |
| **FILL:** Brown silty sand, some wood | 1.14 | | SS | 2 | 75 | 7 | 1 | 54.55 |
| Compact, light brown **SILTY SAND** | 2.21 | | SS | 3 | 67 | 10 | 2 | 53.55 |
| **GLACIAL TILL:** Very dense, brown silty sand to sandy silt with gravel, cobbles and boulders, trace clay | 3.05 | | SS | 4 | 53 | 50+ | 3 | 52.55 |

End of Borehole

Practical refusal to augering at 3.05m depth.

(GWL @ 1.88m - Dec. 6, 2022)



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# SOIL PROFILE AND TEST DATA

**Geotechnical Investigation**
**Proposed Road Rehabilitation Program**
**St-Jean Street, City of Clarence-Rockland, Ontario**

**DATUM** Geodetic

**REMARKS**

**BORINGS BY** Track-Mount Power Auger

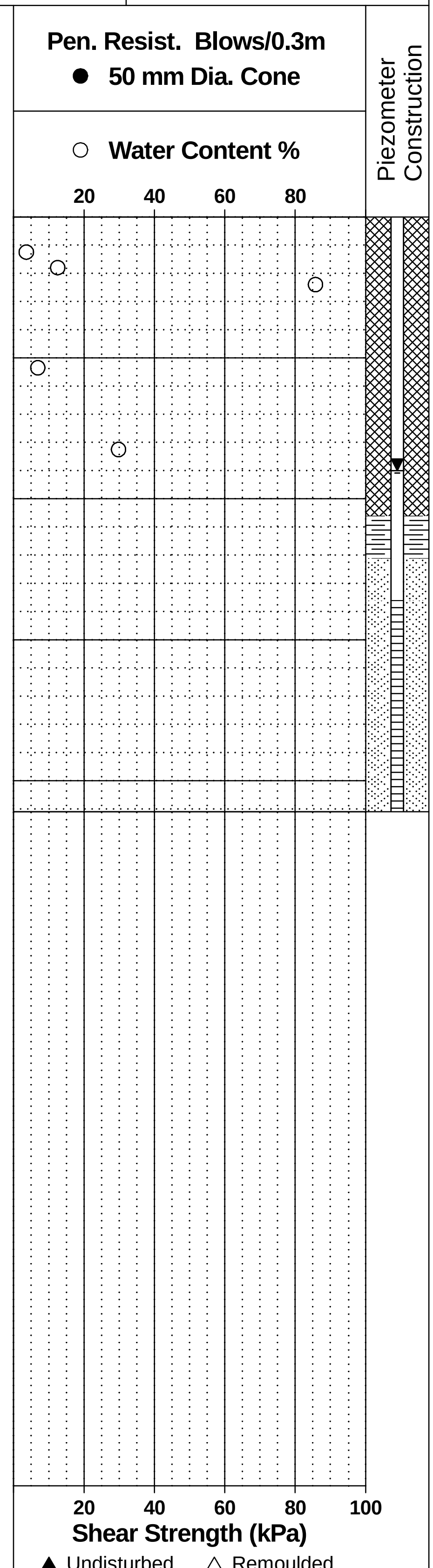
**DATE** November 22, 2022

**FILE NO.** PG6427

**HOLE NO.** BH54-22

| SOIL DESCRIPTION | Depth to base (m) | SAMPLE TYPE | NUMBER | % RECOVERY | N VALUE or RQD |
|---|---|---|---|---|---|
| GROUND SURFACE | | | | | |
| Asphaltic concrete | 0.10 | | | | |
| **FILL:** Crushed stone with sand | 0.30 | SS | 1 | 75 | 21 |
| **FILL:** Brown silty sand | 0.53 | | | | |
| **TOPSOIL** | 0.76 | | | | |
| Loose, light brown **SILTY SAND** | 1.45 | SS | 2 | 83 | 8 |
| **GLACIAL TILL:** Very dense, brown silty sand to sandy silt, some gravel, cobbles and boulders, trace clay | 1.98 | RC<br>SS | 2<br>3 | 100<br>40 | 85<br>50+ |
| **BEDROCK:** Fair to good quality, grey dolostone and limestone interbedded with dark grey shale | 4.22 | RC | 1 | 100 | 65 |
| End of Borehole | | | | | |
| (GWL @ 1.80m - Dec. 6, 2022) | | | | | |

| DEPTH (m) | ELEV. (m) |
|---|---|
| 0 | 54.43 |
| 1 | 53.43 |
| 2 | 52.43 |
| 3 | 51.43 |
| 4 | 50.43 |



# SYMBOLS AND TERMS

## SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

| | | |
|---|---|---|
| Desiccated | - | having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc. |
| Fissured | - | having cracks, and hence a blocky structure. |
| Varved | - | composed of regular alternating layers of silt and clay. |
| Stratified | - | composed of alternating layers of different soil types, e.g. silt and sand or silt and clay. |
| Well-Graded | - | Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution). |
| Uniformly-Graded | - | Predominantly of one grain size (see Grain Size Distribution). |

The standard terminology to describe the relative strength of cohesionless soils is the compactness condition, usually inferred from the results of the Standard Penetration Test (SPT) ‘N’ value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm. An SPT N value of “P” denotes that the split-spoon sampler was pushed 300 mm into the soil without the use of a falling hammer.

| Compactness Condition | ‘N’ Value | Relative Density % |
|---|---|---|
| Very Loose | <4 | <15 |
| Loose | 4-10 | 15-35 |
| Compact | 10-30 | 35-65 |
| Dense | 30-50 | 65-85 |
| Very Dense | >50 | >85 |

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory shear vane tests, unconfined compression tests, or occasionally by the Standard Penetration Test (SPT). Note that the typical correlations of undrained shear strength to SPT N value (tabulated below) tend to underestimate the consistency for sensitive silty clays, so Paterson reviews the applicable split spoon samples in the laboratory to provide a more representative consistency value based on tactile examination.

| Consistency | Undrained Shear Strength (kPa) | ‘N’ Value |
|---|---|---|
| Very Soft | <12 | <2 |
| Soft | 12-25 | 2-4 |
| Firm | 25-50 | 4-8 |
| Stiff | 50-100 | 8-15 |
| Very Stiff | 100-200 | 15-30 |
| Hard | >200 | >30 |

## SYMBOLS AND TERMS (continued)

## SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity, $S_t$, is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil. The classes of sensitivity may be defined as follows:

| | |
|---|---|
| Low Sensitivity: | $S_t < 2$ |
| Medium Sensitivity: | $2 < S_t < 4$ |
| Sensitive: | $4 < S_t < 8$ |
| Extra Sensitive: | $8 < S_t < 16$ |
| Quick Clay: | $S_t > 16$ |

## ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NQ or larger size core. However, it can be used on smaller core sizes, such as BQ, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

| **RQD %** | **ROCK QUALITY** |
|---|---|
| 90-100 | Excellent, intact, very sound |
| 75-90 | Good, massive, moderately jointed or sound |
| 50-75 | Fair, blocky and seamy, fractured |
| 25-50 | Poor, shattered and very seamy or blocky, severely fractured |
| 0-25 | Very poor, crushed, very severely fractured |

## SAMPLE TYPES

| | | |
|---|---|---|
| SS | - | Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT)) |
| TW | - | Thin wall tube or Shelby tube, generally recovered using a piston sampler |
| G | - | "Grab" sample from test pit or surface materials |
| AU | - | Auger sample or bulk sample |
| WS | - | Wash sample |
| RC | - | Rock core sample (Core bit size BQ, NQ, HQ, etc.). Rock core samples are obtained with the use of standard diamond drilling bits. |

## SYMBOLS AND TERMS (continued)

### PLASTICITY LIMITS AND GRAIN SIZE DISTRIBUTION

| | | |
|---|---|---|
| WC% | - | Natural water content or water content of sample, % |
| LL | - | Liquid Limit, % (water content above which soil behaves as a liquid) |
| PL | - | Plastic Limit, % (water content above which soil behaves plastically) |
| PI | - | Plasticity Index, % (difference between LL and PL) |
| Dxx | - | Grain size at which xx% of the soil, by weight, is of finer grain sizes<br>These grain size descriptions are not used below 0.075 mm grain size |
| D10 | - | Grain size at which 10% of the soil is finer (effective grain size) |
| D60 | - | Grain size at which 60% of the soil is finer |
| Cc | - | Concavity coefficient = $(D30)^2$ / (D10 x D60) |
| Cu | - | Uniformity coefficient = D60 / D10 |

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: 1 < Cc < 3 and Cu > 4
Well-graded sands have: 1 < Cc < 3 and Cu > 6
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay (more than 10% finer than 0.075 mm or the #200 sieve)

### CONSOLIDATION TEST

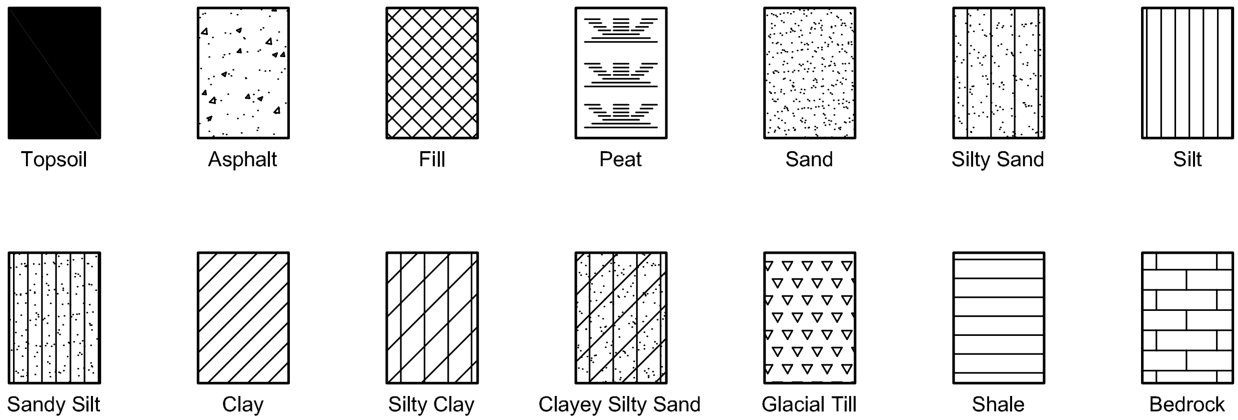
| | | |
|---|---|---|
| $p'_o$ | - | Present effective overburden pressure at sample depth |
| $p'_c$ | - | Preconsolidation pressure of (maximum past pressure on) sample |
| Ccr | - | Recompression index (in effect at pressures below $p'_c$) |
| Cc | - | Compression index (in effect at pressures above $p'_c$) |
| OC Ratio | | Overconsolidaton ratio = $p'_c / p'_o$ |
| Void Ratio | | Initial sample void ratio = volume of voids / volume of solids |
| Wo | - | Initial water content (at start of consolidation test) |

### PERMEABILITY TEST

| | | |
|---|---|---|
| k | - | Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test. |

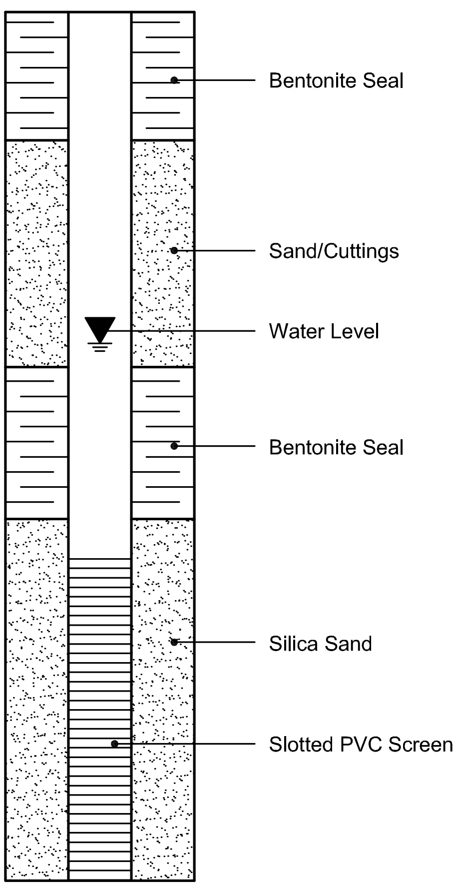
# SYMBOLS AND TERMS (continued)

## STRATA PLOT

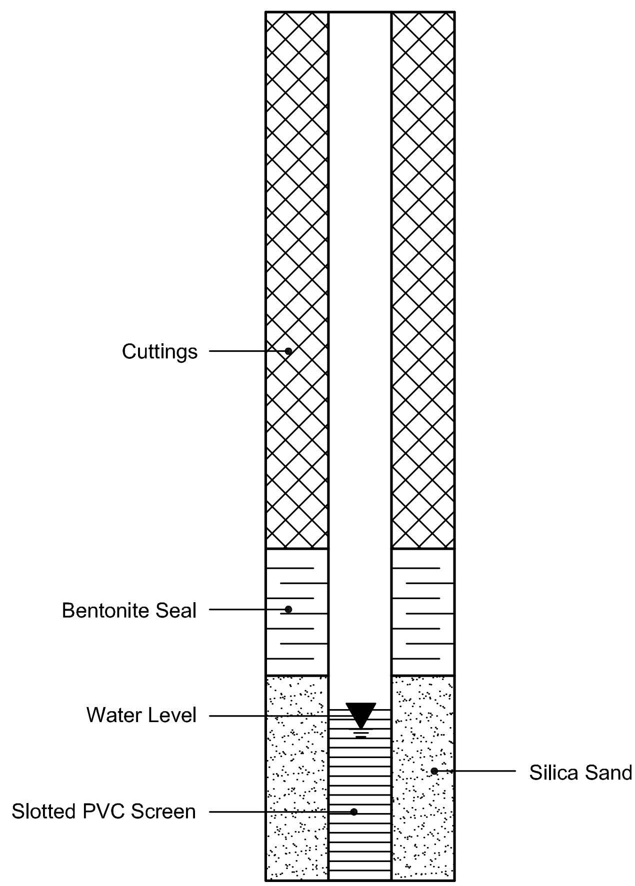


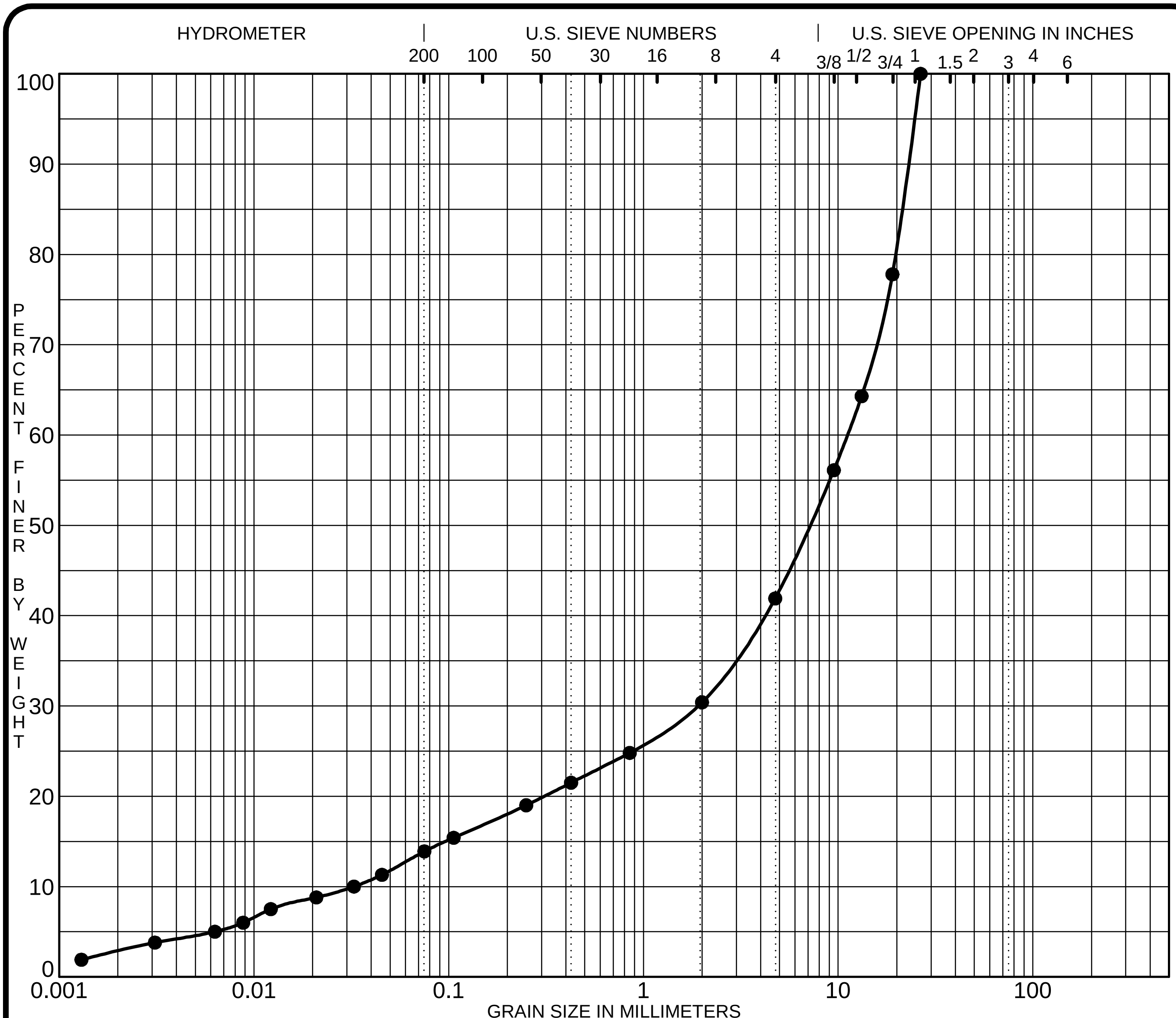

## MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION




PIEZOMETER CONSTRUCTION






| SILT OR CLAY | SAND | | | GRAVEL | | COBBLES |
|---|---|---|---|---|---|---|
| | fine | medium | coarse | fine | coarse | |

| | Specimen Identification | | Classification | MC% | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | BH 4-22 | SS4 | | | | | | 9.77 | 340.8 |
| ⊠ | | | | | | | | | |
| ▲ | | | | | | | | | |
| ★ | | | | | | | | | |

| | Specimen Identification | | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | BH 4-22 | SS4 | 26.50 | 11.11 | 1.881 | 0.0326 | 58.1 | 28.0 | 13.9 | |
| ⊠ | | | | | | | | | | |
| ▲ | | | | | | | | | | |
| ★ | | | | | | | | | | |

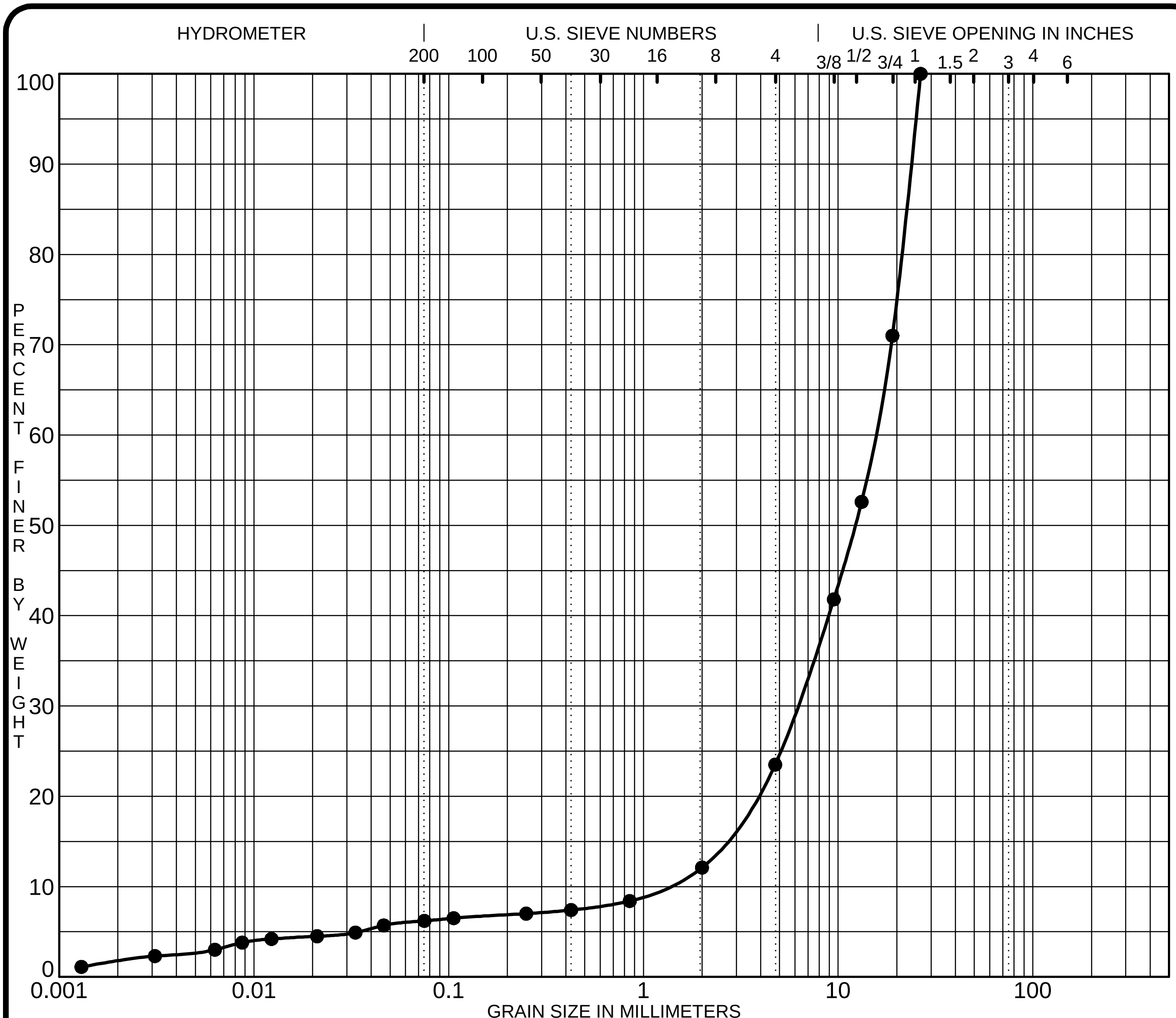
CLIENT **Space Builders (Ottawa) Ltd.** FILE NO. **PG6427**

PROJECT **Geotechnical Investigation - Proposed Road Rehabilitation Program** DATE **28 Nov 22**


**patersongroup** **Consulting Engineers**

**9 Auriga Drive, Ottawa, Ontario K2E 7T9**


# GRAIN SIZE DISTRIBUTION




| SILT OR CLAY | SAND | | | GRAVEL | | COBBLES |
|---|---|---|---|---|---|---|
| | fine | medium | coarse | fine | coarse | |

| | Specimen Identification | | Classification | MC% | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | **BH33-22** | **SS6** | | | | | | **1.96** | **12.4** |
| ⌧ | | | | | | | | | |
| ▲ | | | | | | | | | |
| ★ | | | | | | | | | |

| | Specimen Identification | | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | **BH33-22** | **SS6** | **26.50** | **15.28** | **6.076** | **1.2306** | **76.5** | **17.3** | **6.2** | |
| ⌧ | | | | | | | | | | |
| ▲ | | | | | | | | | | |
| ★ | | | | | | | | | | |

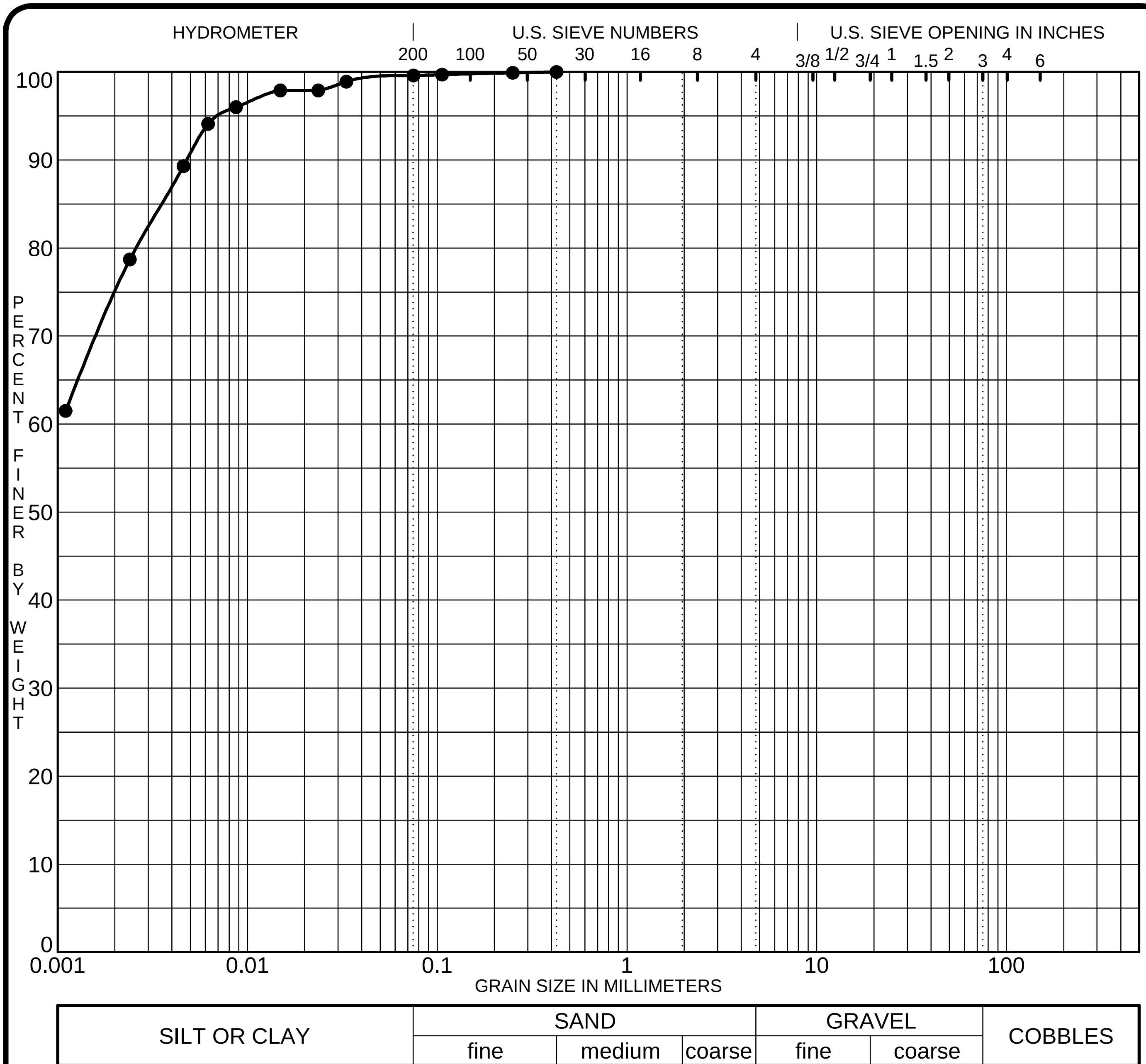
CLIENT **Space Builders (Ottawa) Ltd.**
FILE NO. **PG6427**

PROJECT **Geotechnical Investigation - Proposed Road Rehabilitation Program**
DATE **17 Nov 22**

**patersongroup** **Consulting Engineers**

**9 Auriga Drive, Ottawa, Ontario K2E 7T9**

# GRAIN SIZE DISTRIBUTION




| | Specimen Identification | | Classification | MC% | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | BH34-22 | SS2 | | | | | | | |
| ⌧ | | | | | | | | | |
| ▲ | | | | | | | | | |
| ★ | | | | | | | | | |

| | Specimen Identification | | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | BH34-22 | SS2 | 0.43 | | | | 0.0 | 0.4 | 99.6 | |
| ⌧ | | | | | | | | | | |
| ▲ | | | | | | | | | | |
| ★ | | | | | | | | | | |

CLIENT **Space Builders (Ottawa) Ltd.**

FILE NO. **PG6427**

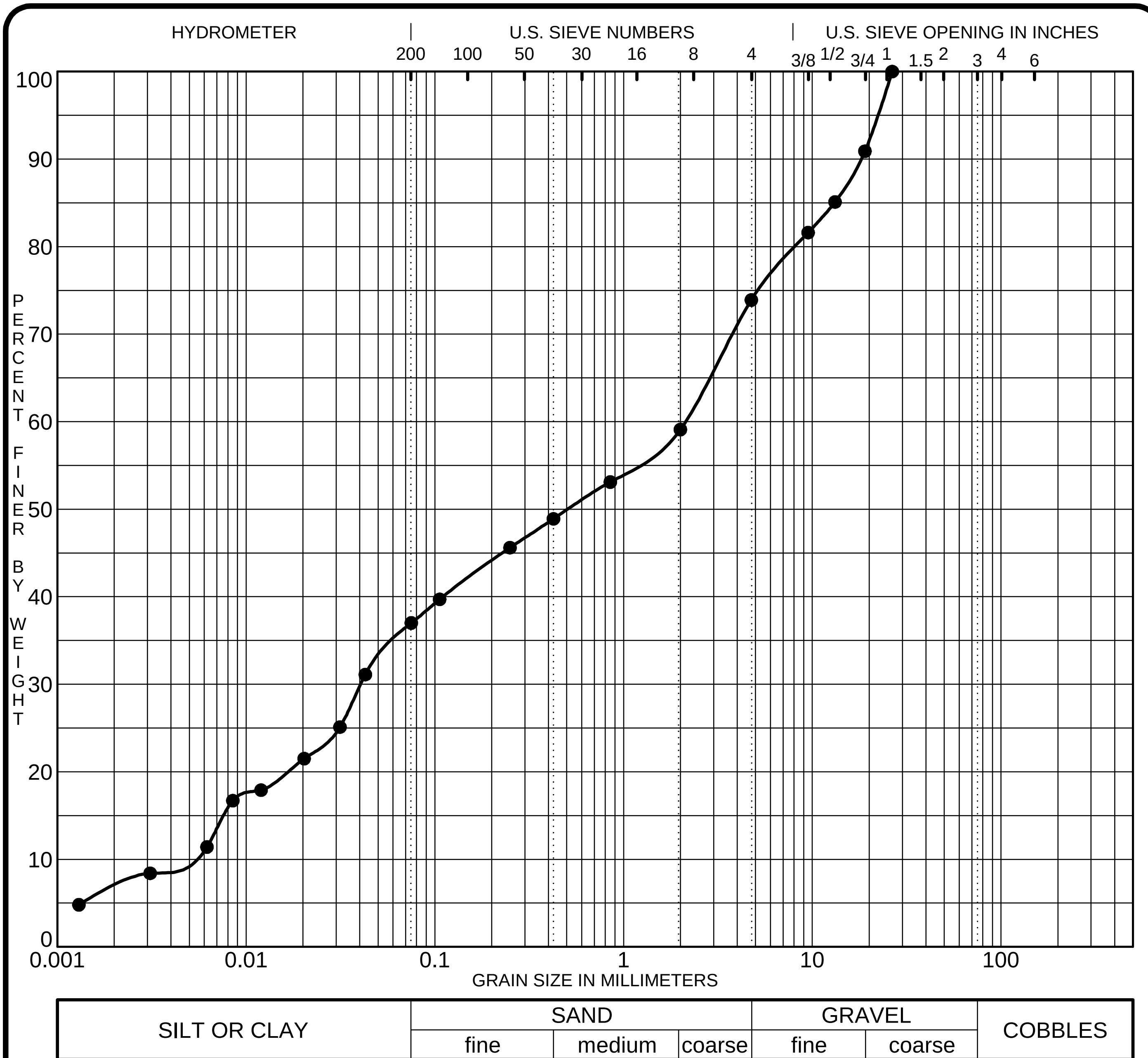
PROJECT **Geotechnical Investigation - Proposed Road Rehabilitation Program**

DATE **15 Nov 22**

**patersongroup** **Consulting Engineers**

**9 Auriga Drive, Ottawa, Ontario K2E 7T9**

# GRAIN SIZE DISTRIBUTION




| | Specimen Identification | | Classification | MC% | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | BH35-22 | SS4 | | | | | | 0.17 | 469.9 |
| ⌧ | | | | | | | | | |
| ▲ | | | | | | | | | |
| ★ | | | | | | | | | |

| | Specimen Identification | | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | BH35-22 | SS4 | 26.50 | 2.11 | 0.040 | 0.0045 | 26.1 | 36.9 | 37.0 | |
| ⌧ | | | | | | | | | | |
| ▲ | | | | | | | | | | |
| ★ | | | | | | | | | | |

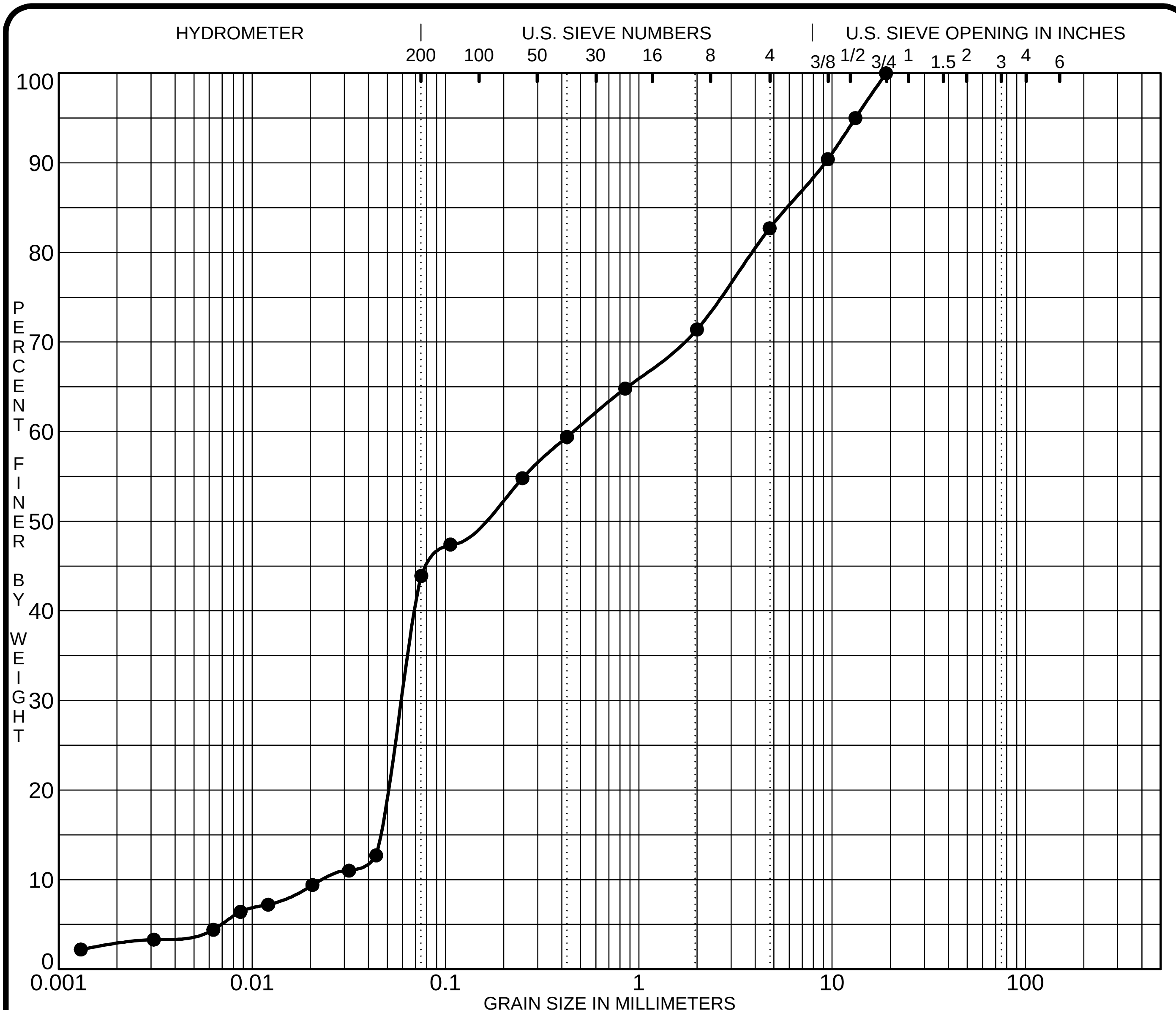
CLIENT **Space Builders (Ottawa) Ltd.**
FILE NO. **PG6427**

PROJECT **Geotechnical Investigation - Proposed Road Rehabilitation Program**
DATE **15 Nov 22**


**patersongroup** **Consulting Engineers**

**9 Auriga Drive, Ottawa, Ontario K2E 7T9**


# GRAIN SIZE DISTRIBUTION




| SILT OR CLAY | SAND | | | GRAVEL | | COBBLES |
|---|---|---|---|---|---|---|
| | fine | medium | coarse | fine | coarse | |

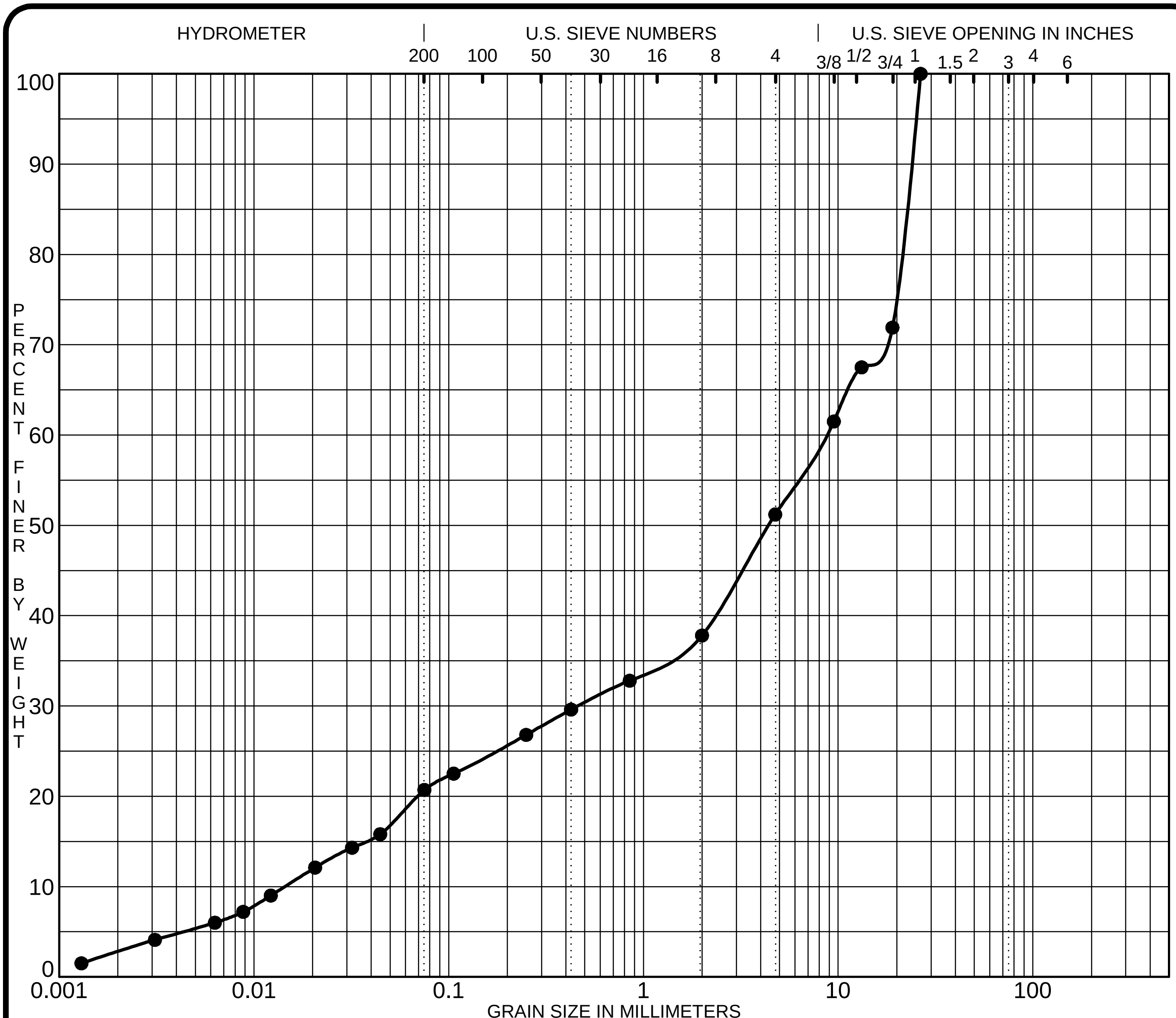
| | Specimen Identification | | Classification | MC% | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | BH36-22 | SS5 | | | | | | 0.31 | 19.0 |
| ⊠ | | | | | | | | | |
| ▲ | | | | | | | | | |
| ★ | | | | | | | | | |

| | Specimen Identification | | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | BH36-22 | SS5 | 19.00 | 0.46 | 0.059 | 0.0241 | 17.3 | 38.8 | 43.9 | |
| ⊠ | | | | | | | | | | |
| ▲ | | | | | | | | | | |
| ★ | | | | | | | | | | |

CLIENT **Space Builders (Ottawa) Ltd.**
FILE NO. **PG6427**
PROJECT **Geotechnical Investigation - Proposed Road Rehabilitation Program**
DATE **15 Nov 22**


**patersongroup** **Consulting Engineers**
**9 Auriga Drive, Ottawa, Ontario K2E 7T9**


# GRAIN SIZE DISTRIBUTION




| SILT OR CLAY | SAND | | | GRAVEL | | COBBLES |
|---|---|---|---|---|---|---|
| | fine | medium | coarse | fine | coarse | |

| | Specimen Identification | | Classification | MC% | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | **BH38-22** | **SS5** | | | | | | **1.73** | **594.5** |
| ⊠ | | | | | | | | | |
| ▲ | | | | | | | | | |
| ★ | | | | | | | | | |

| | Specimen Identification | | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | **BH38-22** | **SS5** | **26.50** | **8.59** | **0.463** | **0.0144** | **48.8** | **30.5** | **20.7** | |
| ⊠ | | | | | | | | | | |
| ▲ | | | | | | | | | | |
| ★ | | | | | | | | | | |

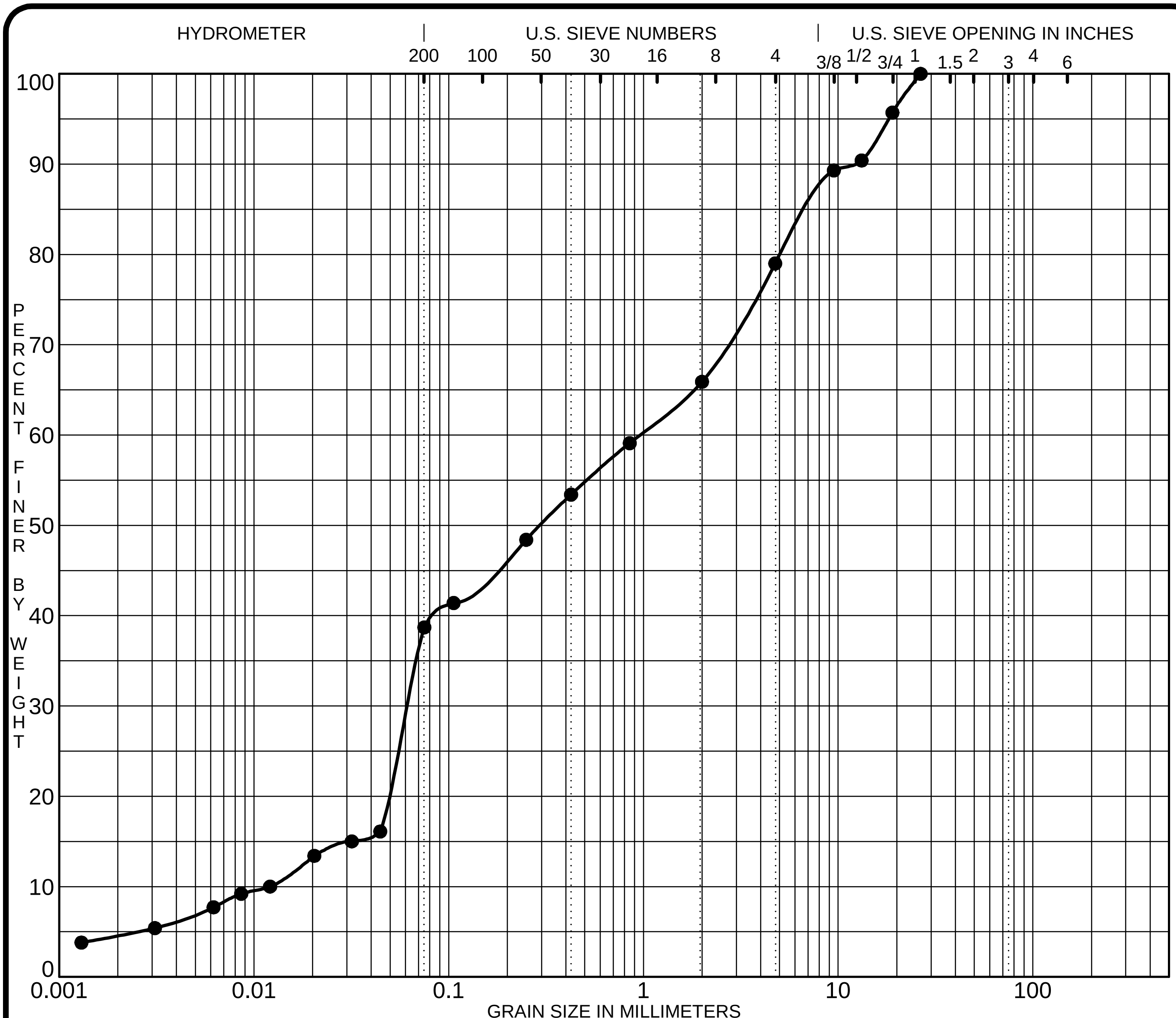
CLIENT **Space Builders (Ottawa) Ltd.** FILE NO. **PG6427**

PROJECT **Geotechnical Investigation - Proposed Road Rehabilitation Program** DATE **15 Nov 22**

**patersongroup** **Consulting Engineers**

**9 Auriga Drive, Ottawa, Ontario K2E 7T9**

# GRAIN SIZE DISTRIBUTION




| SILT OR CLAY | SAND | | | GRAVEL | | COBBLES |
|---|---|---|---|---|---|---|
| | fine | medium | coarse | fine | coarse | |

| | Specimen Identification | | Classification | MC% | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|---|
| ● | **BH42-22** | **SS5** | | | | | | **0.33** | **78.7** |
| ⊠ | | | | | | | | | |
| ▲ | | | | | | | | | |
| ★ | | | | | | | | | |

| | Specimen Identification | | D100 | D60 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|---|---|---|
| ● | **BH42-22** | **SS5** | **26.50** | **0.95** | **0.061** | **0.0121** | **21.0** | **40.3** | **38.7** | |
| ⊠ | | | | | | | | | | |
| ▲ | | | | | | | | | | |
| ★ | | | | | | | | | | |

CLIENT **Space Builders (Ottawa) Ltd.**

FILE NO. **PG6427**

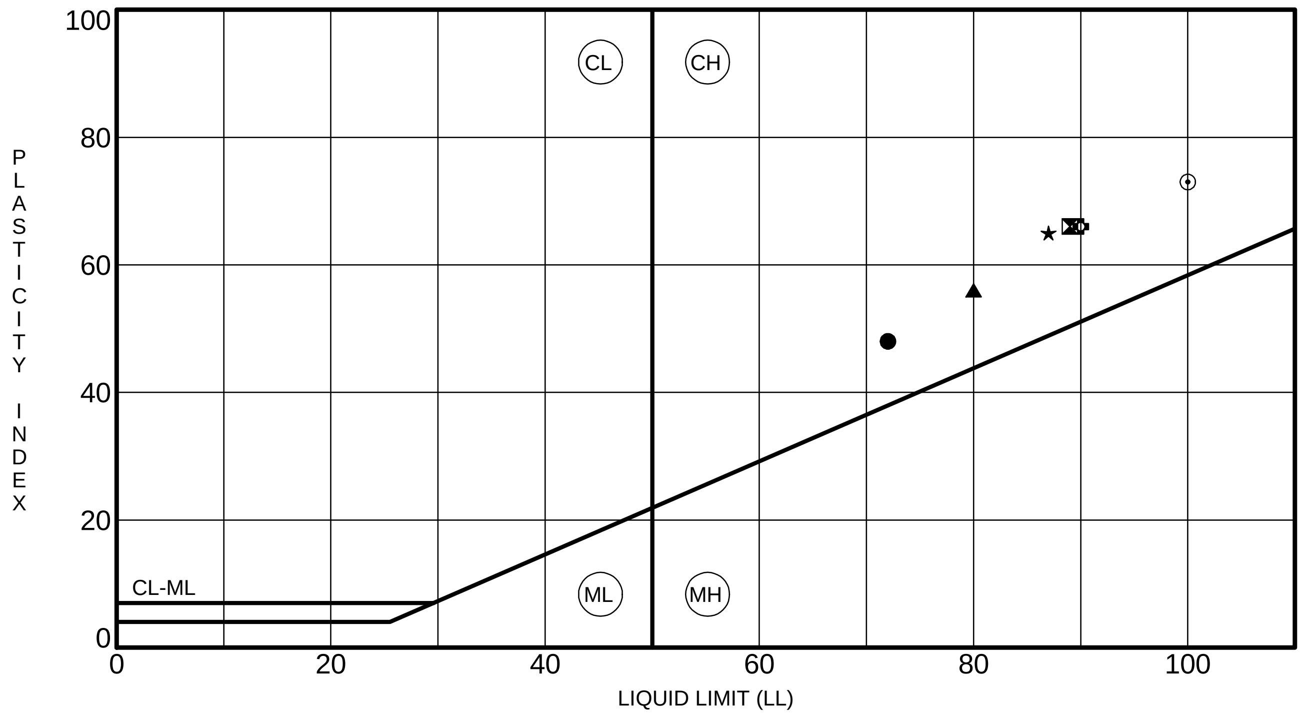
PROJECT **Geotechnical Investigation - Proposed Road Rehabilitation Program**

DATE **14 Nov 22**

**patersongroup** **Consulting Engineers**

**9 Auriga Drive, Ottawa, Ontario K2E 7T9**

# GRAIN SIZE DISTRIBUTION




| | Specimen Identification | | LL | PL | PI | Fines | Classification |
|---|---|---|---|---|---|---|---|
| ● | **BH32-22** | **SS4** | **72** | **24** | **48** | | **CH - Inorganic clay of high plasticity** |
| ⧗ | **BH34-22** | **SS3** | **89** | **23** | **66** | | **CH - Inorganic clay of high plasticity** |
| ▲ | **BH38-22** | **SS3** | **80** | **24** | **56** | | **CH - Inorganic clay of high plasticity** |
| ★ | **BH40-22** | **SS3** | **87** | **22** | **65** | | **CH - Inorganic clay of high plasticity** |
| ⊙ | **BH42-22** | **SS3** | **100** | **27** | **73** | | **CH - Inorganic clay of high plasticity** |
| ✪ | **BH43-22** | **SS4** | **90** | **24** | **66** | | **CH - Inorganic clay of high plasticity** |

CLIENT **Space Builders (Ottawa) Ltd.**

FILE NO. **PG6427**

PROJECT **Geotechnical Investigation - Proposed Road Rehabilitation Program**

DATE **18 Nov 22**


**patersongroup** **Consulting Engineers**

**9 Auriga Drive, Ottawa, Ontario K2E 7T9**


# ATTERBERG LIMITS' RESULTS

PARACEL LABORATORIES LTD.

Certificate of Analysis

**Client:** **Paterson Group Consulting Engineers**

**Client PO: 56368**

**Order #: 2249514**

Report Date: 08-Dec-2022

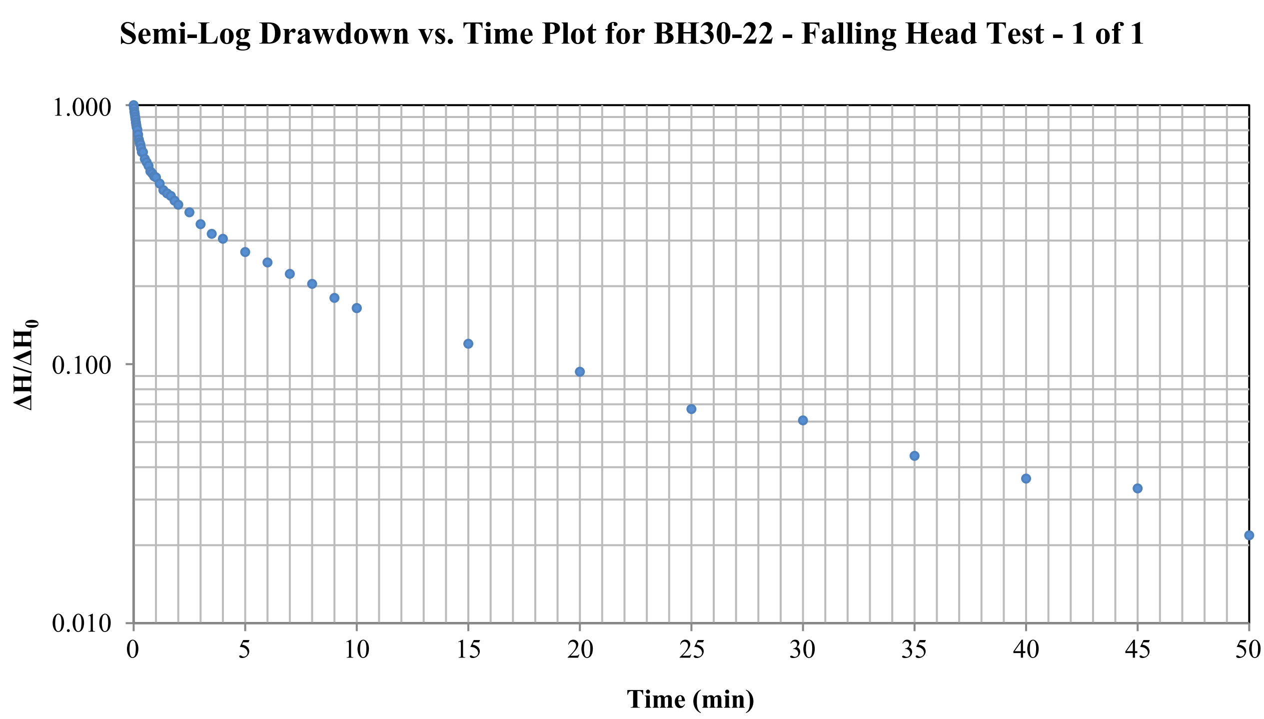
Order Date: 2-Dec-2022

**Project Description: PG6427**

| | **Client ID:** | BH2-22 SS3 | BH36-22 SS3 | - | - | - | - |
|---|---|---|---|---|---|---|---|
| | **Sample Date:** | 28-Nov-22 09:00 | 15-Nov-22 09:00 | - | - | - | - |
| | **Sample ID:** | 2249514-01 | 2249514-02 | - | - | | |
| | **Matrix:** | Soil | Soil | - | - | | |
| | **MDL/Units** | | | | | | |
| **Physical Characteristics** | | | | | | | |
| % Solids | 0.1 % by Wt. | 92.4 | 75.9 | - | - | - | - |
| **General Inorganics** | | | | | | | |
| pH | 0.05 pH Units | 7.34 | 7.52 | - | - | - | - |
| Resistivity | 0.1 Ohm.m | 38.2 | 3.00 | - | - | - | - |
| **Anions** | | | | | | | |
| Chloride | 5 ug/g | 13 | 1720 | - | - | - | - |
| Sulphate | 5 ug/g | 90 | 304 | - | - | - | - |

## Hvorslev Hydraulic Conductivity Analysis

Project: Space Builders - St Jean Street
Test Location: BH30-22
Test: Falling Head - 1 of 1
Date: December 1, 2022




Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F} \frac{1}{t^*} \ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.31086

Well Parameters:

| | | | |
|---|---|---|---|
| L | 1.5 | m | Saturated length of screen or open hole |
| D | 0.0508 | m | Diameter of well |
| $r_c$ | 0.0254 | m | Radius of well |

Data Points (from plot):

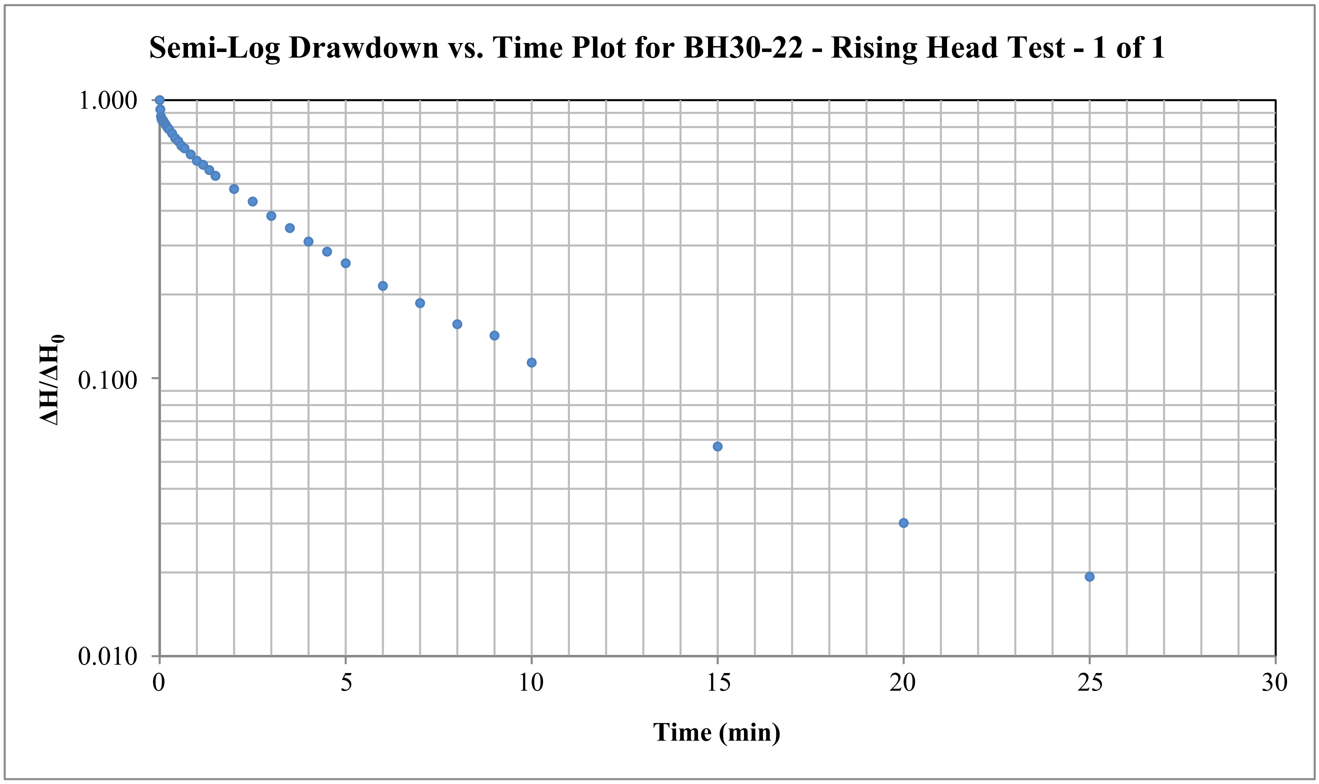
$t^*$: 2.643 minutes $\Delta H^*/\Delta H_0$: 0.37

**Horizontal Hydraulic Conductivity**
**K = 5.50E-06 m/sec**

PATERSON GROUP

# Hvorslev Hydraulic Conductivity Analysis

Project: Space Builders - St Jean Street
Test Location: BH30-22
Test: Rising Head - 1 of 1
Date: December 1, 2022




Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.31086

Well Parameters:

| | | | |
|---|---|---|---|
| L | 1.5 | m | Saturated length of screen or open hole |
| D | 0.0508 | m | Diameter of well |
| $r_c$ | 0.0254 | m | Radius of well |

Data Points (from plot):

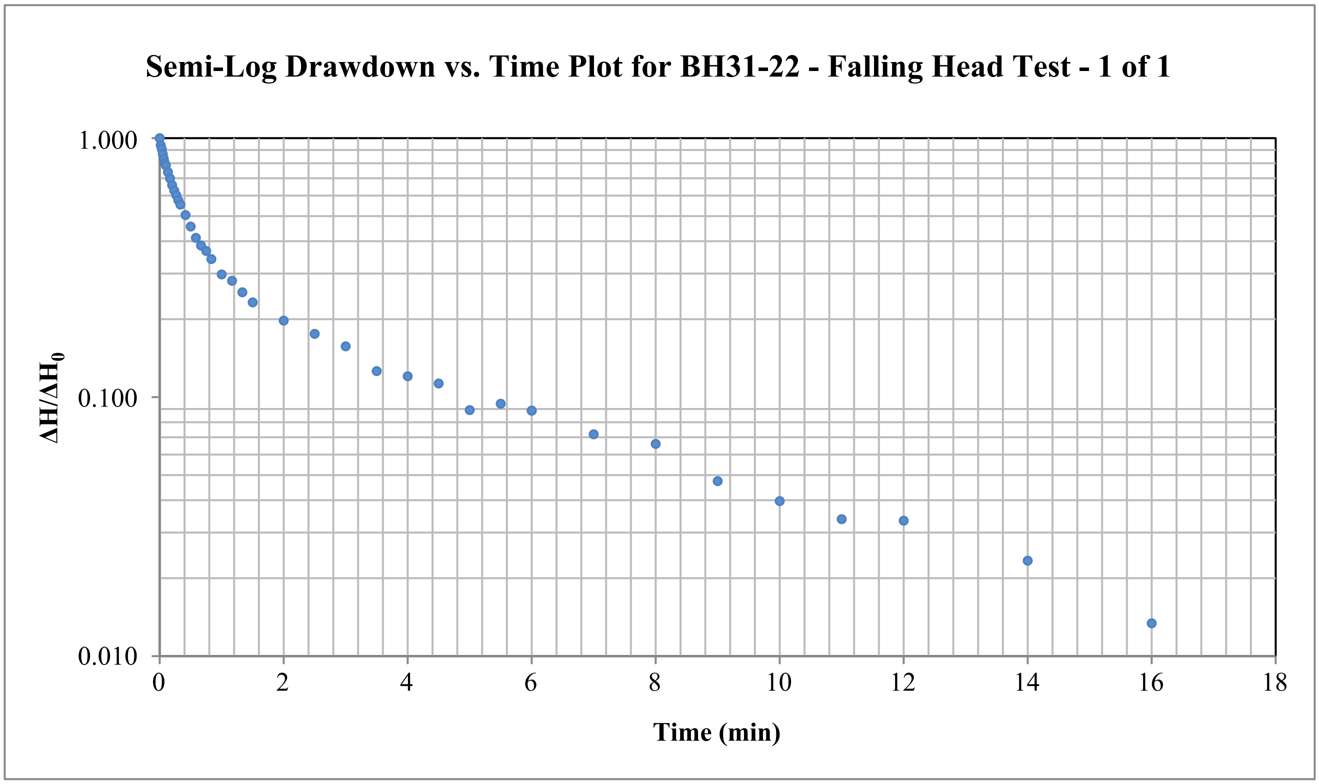
t*: 3.131 minutes $\Delta H^*/\Delta H_0$: 0.37

**Horizontal Hydraulic Conductivity**
**K = 4.64E-06 m/sec**

PATERSON GROUP

## Hvorslev Hydraulic Conductivity Analysis

Project: Space Builders - St Jean Street
Test Location: BH31-22
Test: Falling Head - 1 of 1
Date: December 1, 2022




Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F} \frac{1}{t^*} \ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.31086

Well Parameters:

| | | |
|---|---|---|
| L | 1.5 m | Saturated length of screen or open hole |
| D | 0.0508 m | Diameter of well |
| $r_c$ | 0.0254 m | Radius of well |

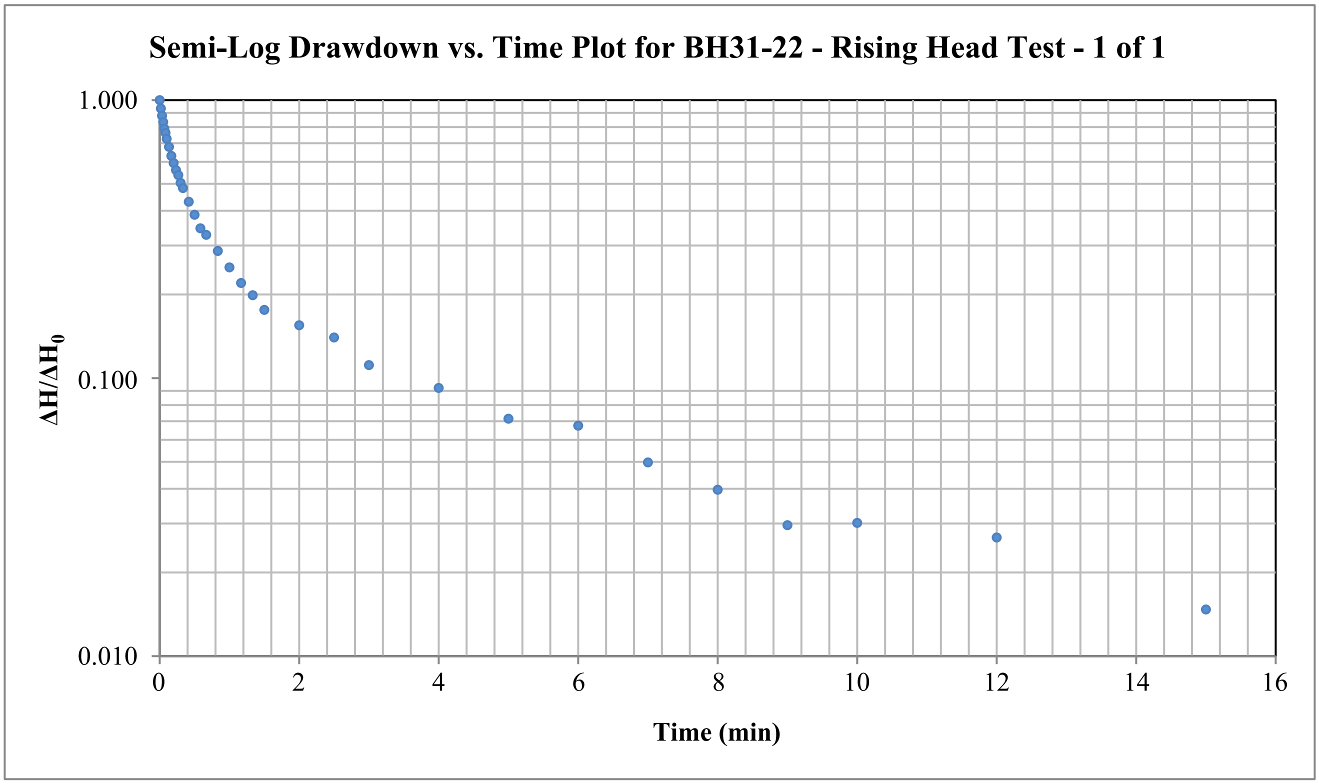
Data Points (from plot):

$t^*$: 0.721 minutes $\Delta H^*/\Delta H_0$: 0.37

**Horizontal Hydraulic Conductivity**
**K = 2.02E-05 m/sec**

## Hvorslev Hydraulic Conductivity Analysis

Project: Space Builders - St Jean Street
Test Location: BH31-22
Test: Rising Head - 1 of 1
Date: December 1, 2022




Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.31086

Well Parameters:

| | | | |
|---|---|---|---|
| L | 1.5 | m | Saturated length of screen or open hole |
| D | 0.0508 | m | Diameter of well |
| $r_c$ | 0.0254 | m | Radius of well |

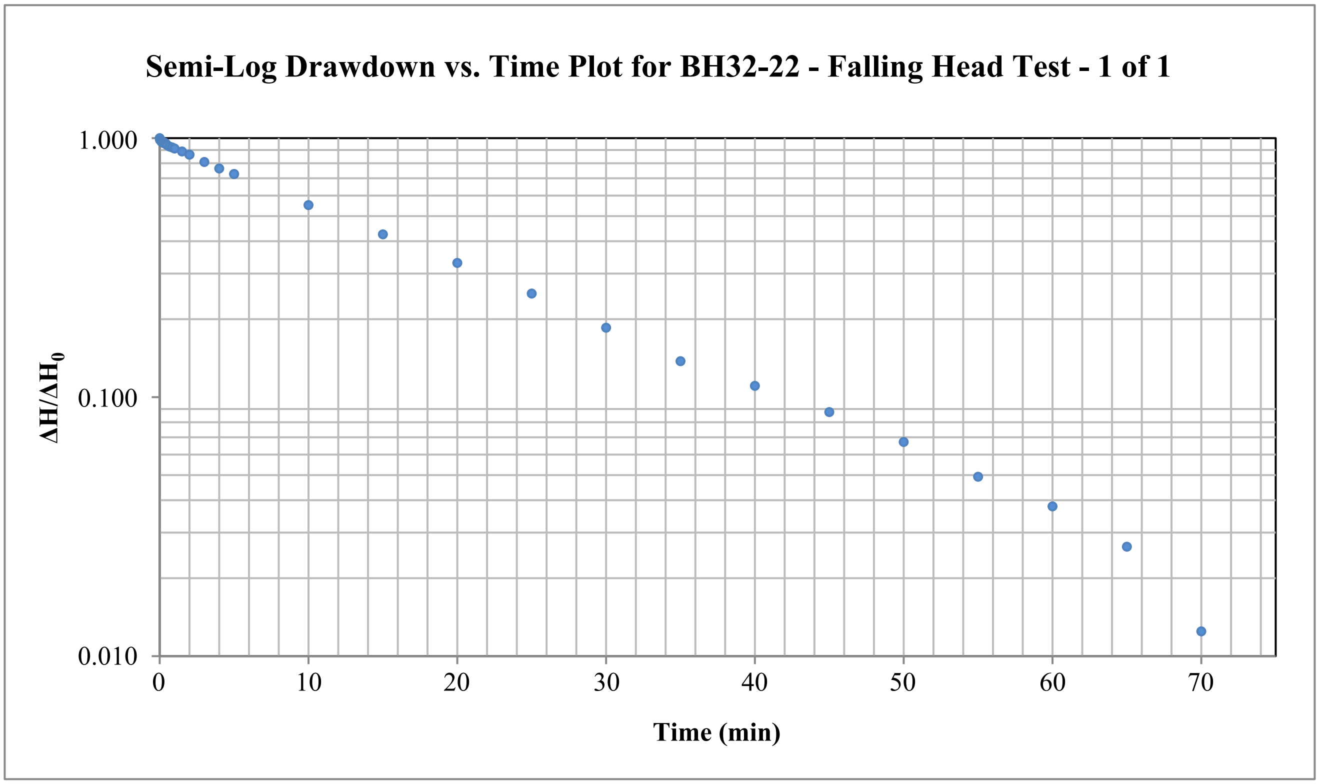
Data Points (from plot):

$t^*$: 0.536 minutes $\Delta H^*/\Delta H_0$: 0.37

**Horizontal Hydraulic Conductivity**
**K = 2.71E-05 m/sec**

## Hvorslev Hydraulic Conductivity Analysis

Project: Space Builders - St Jean Street
Test Location: BH32-22
Test: Falling Head - 1 of 1
Date: December 1, 2022




Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F} \frac{1}{t^*} \ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.31086

Well Parameters:

| | | | |
|---|---|---|---|
| L | 1.5 | m | Saturated length of screen or open hole |
| D | 0.0508 | m | Diameter of well |
| $r_c$ | 0.0254 | m | Radius of well |

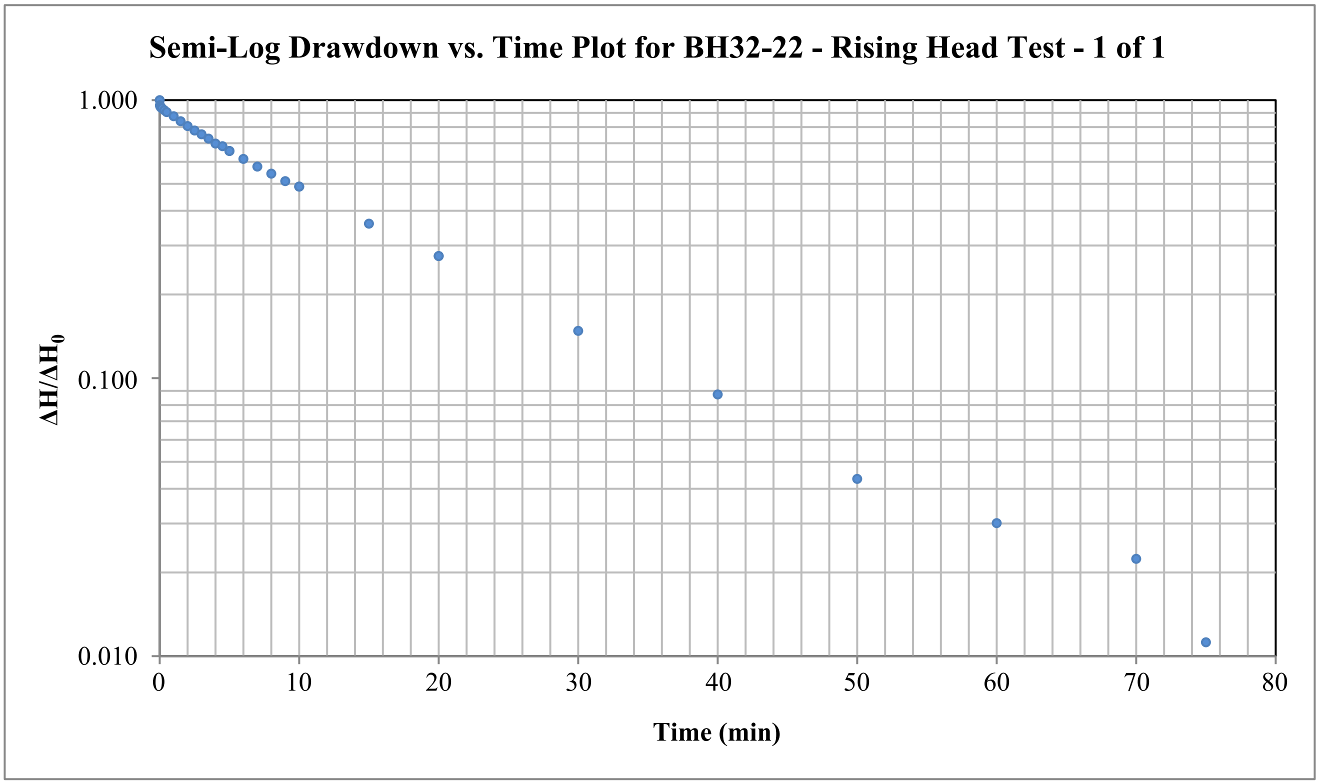
Data Points (from plot):

$t^*$: 17.759 minutes $\Delta H^*/\Delta H_0$: 0.37

**Horizontal Hydraulic Conductivity**
**K = 8.18E-07 m/sec**

**Hvorslev Hydraulic Conductivity Analysis**

Project: Space Builders - St Jean Street
Test Location: BH32-22
Test: Rising Head - 1 of 1
Date: December 1, 2022




Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F} \frac{1}{t^*} \ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.31086

Well Parameters:

| | | | |
|---|---|---|---|
| L | 1.5 | m | Saturated length of screen or open hole |
| D | 0.0508 | m | Diameter of well |
| $r_c$ | 0.0254 | m | Radius of well |

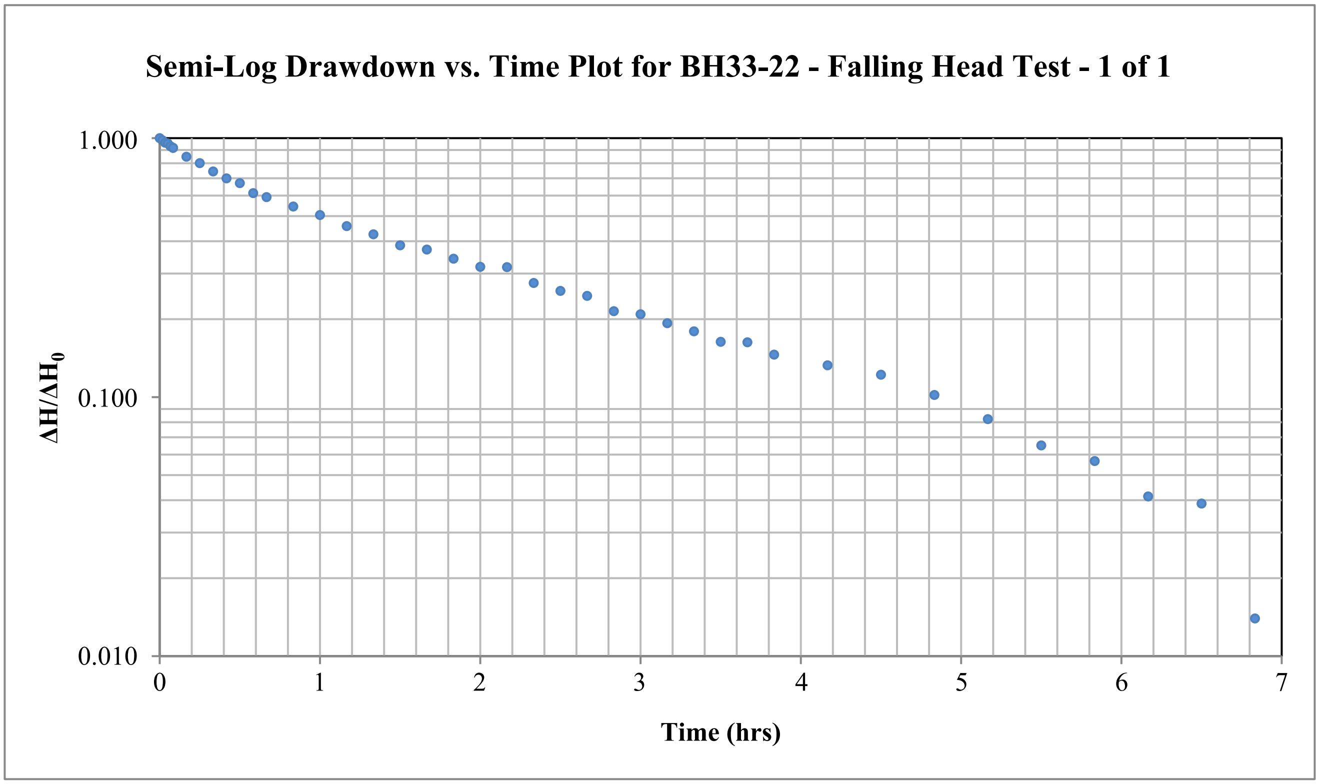
Data Points (from plot):

$t^*$: 14.579 minutes $\Delta H^*/\Delta H_0$: 0.37

**Horizontal Hydraulic Conductivity**
**K = 9.97E-07 m/sec**

## Hvorslev Hydraulic Conductivity Analysis

Project: Space Builders - St Jean Street
Test Location: BH33-22
Test: Falling Head - 1 of 1
Date: December 1, 2022




Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F} \frac{1}{t^*} \ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.31086

Well Parameters:

| | | |
|---|---|---|
| L | 1.5 m | Saturated length of screen or open hole |
| D | 0.0508 m | Diameter of well |
| $r_c$ | 0.0254 m | Radius of well |

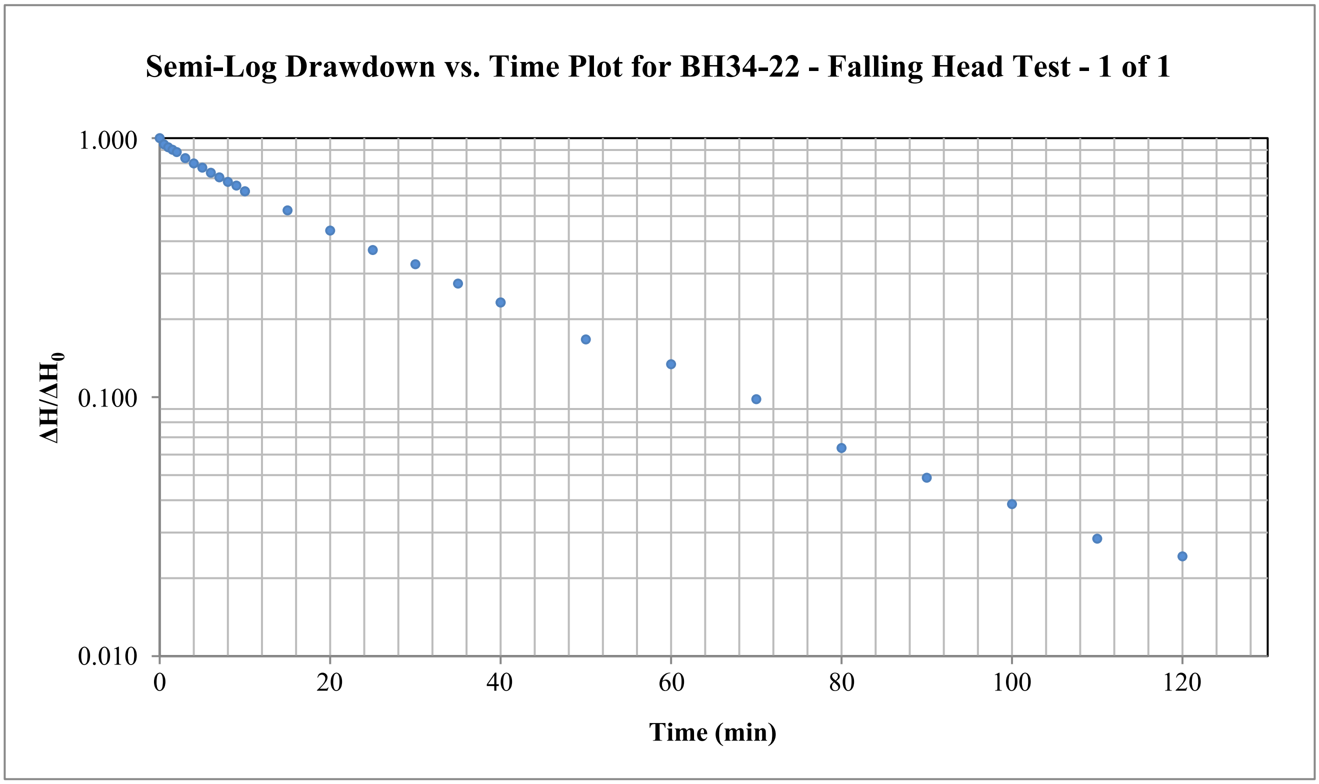
Data Points (from plot):

t*: 93.926 minutes  $\Delta H^*/\Delta H_0$: 0.37

**Horizontal Hydraulic Conductivity**
**K = 1.55E-07 m/sec**

## Hvorslev Hydraulic Conductivity Analysis

Project: Space Builders - St Jean Street
Test Location: BH34-22
Test: Falling Head - 1 of 1
Date: December 1, 2022




Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F}\frac{1}{t^*}\ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.31086

Well Parameters:

| | | | |
|---|---|---|---|
| L | 1.5 | m | Saturated length of screen or open hole |
| D | 0.0508 | m | Diameter of well |
| $r_c$ | 0.0254 | m | Radius of well |

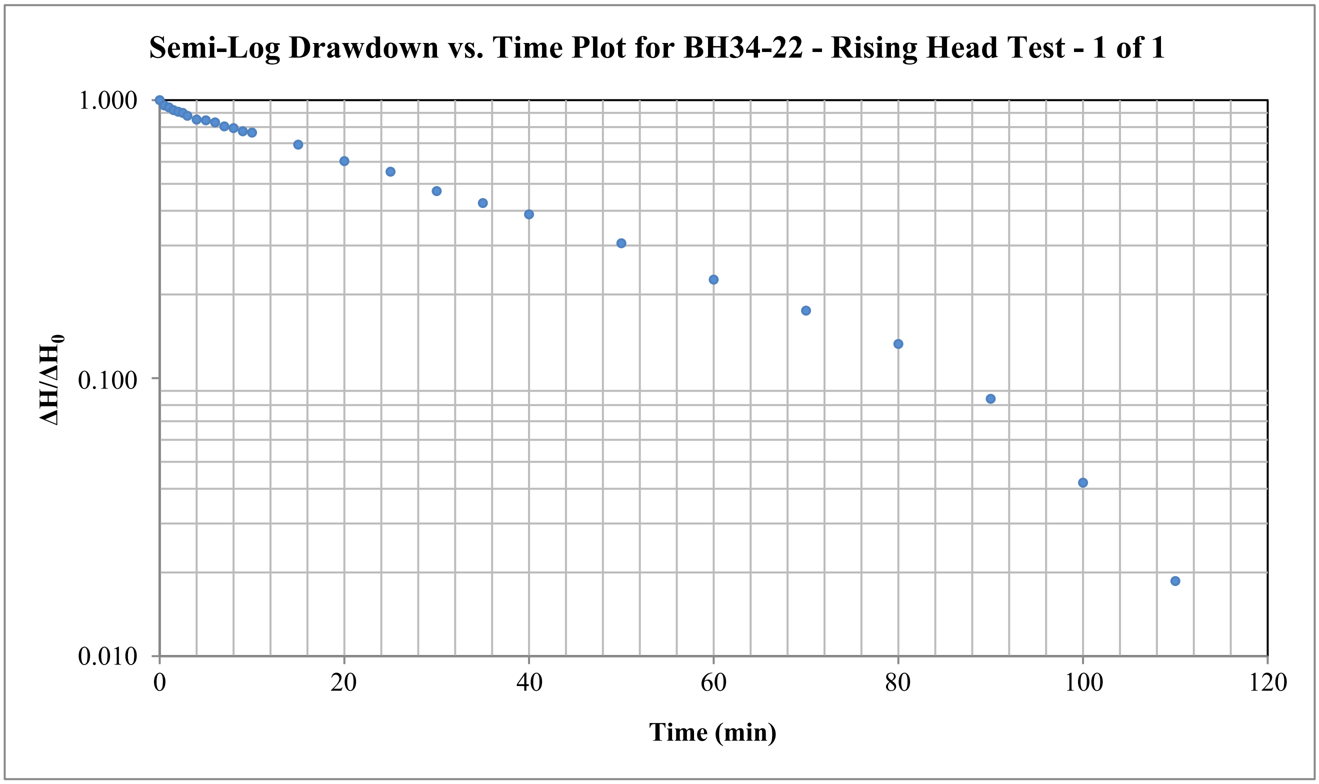
Data Points (from plot):

t*: 24.833 minutes $\Delta H^*/\Delta H_0$: 0.37

**Horizontal Hydraulic Conductivity**
**K = 5.85E-07 m/sec**

# Hvorslev Hydraulic Conductivity Analysis

Project: Space Builders - St Jean Street
Test Location: BH34-22
Test: Rising Head - 1 of 1
Date: December 1, 2022




Hvorslev Horizontal Hydraulic Conductivity

$$K = \frac{\pi r_c^2}{F} \frac{1}{t^*} \ln\left(\frac{\Delta H^*}{\Delta H_0}\right)$$

Hvorslev Shape Factor

$$F = \frac{2\pi L}{\ln\left(\frac{2L}{D}\right)}$$

Valid for L>>D

Hvorslev Shape Factor F: 2.31086

Well Parameters:

| | | | |
|---|---|---|---|
| L | 1.5 | m | Saturated length of screen or open hole |
| D | 0.0508 | m | Diameter of well |
| $r_c$ | 0.0254 | m | Radius of well |

Data Points (from plot):

t*: 40.812 minutes ΔH*/$\Delta H_0$: 0.37

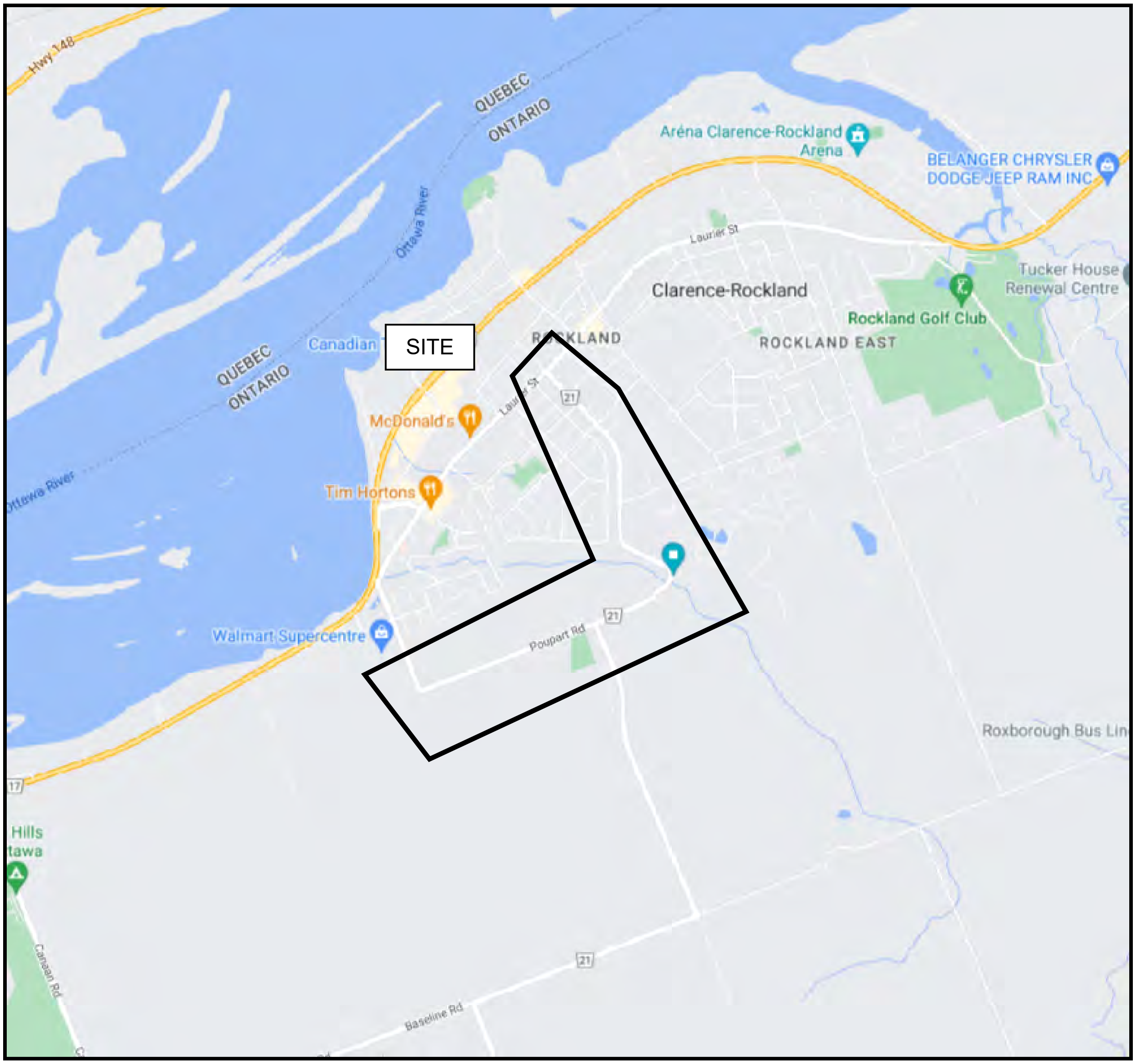
**Horizontal Hydraulic Conductivity**
**K = 3.56E-07 m/sec**

# APPENDIX 2

FIGURE 1 – KEY PLAN

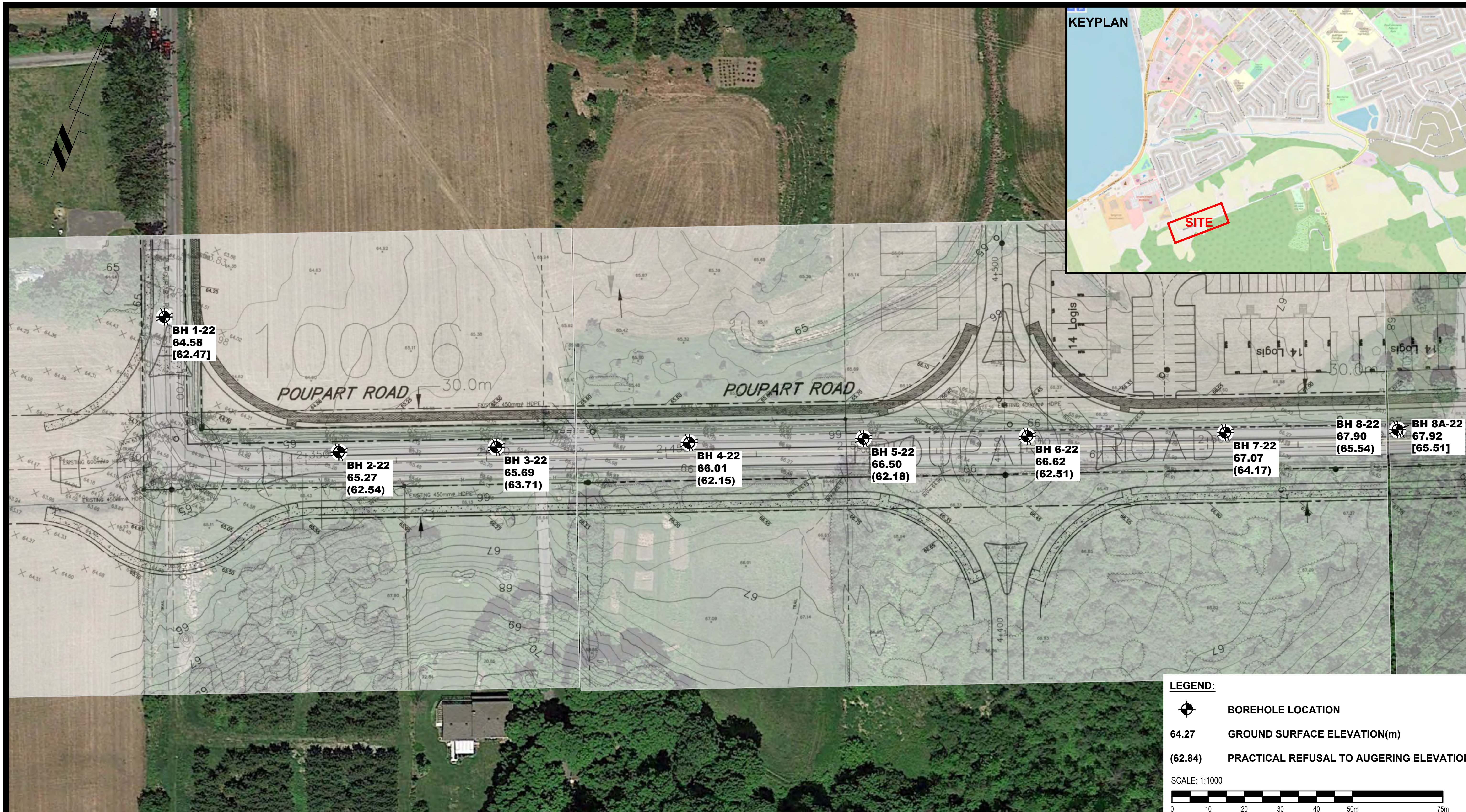
DRAWING PG6427-1 – TEST HOLE LOCATION PLAN

DRAWING PG6427-2 – PERMISSIBLE GRADE RAISE PLAN




# FIGURE 1

## KEY PLAN




PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| 0 | | | |

SPACE BUILDER

GEOTECHNICAL INVESTIGATION - ROAD RECONSTRUCTION
RUE ST JEAN

ROCKLAND, ONTARIO

Title:

# TEST HOLE LOCATION PLAN - PAGE 1

| | |
|---|---|
| Scale: 1:1000 | Date: 12/2022 |
| Drawn by: RCG | Report No.: PG6427 |
| Checked by: JV | Dwg. No.: PG6427-1 |
| Approved by: JV | Revision No.: 0 |

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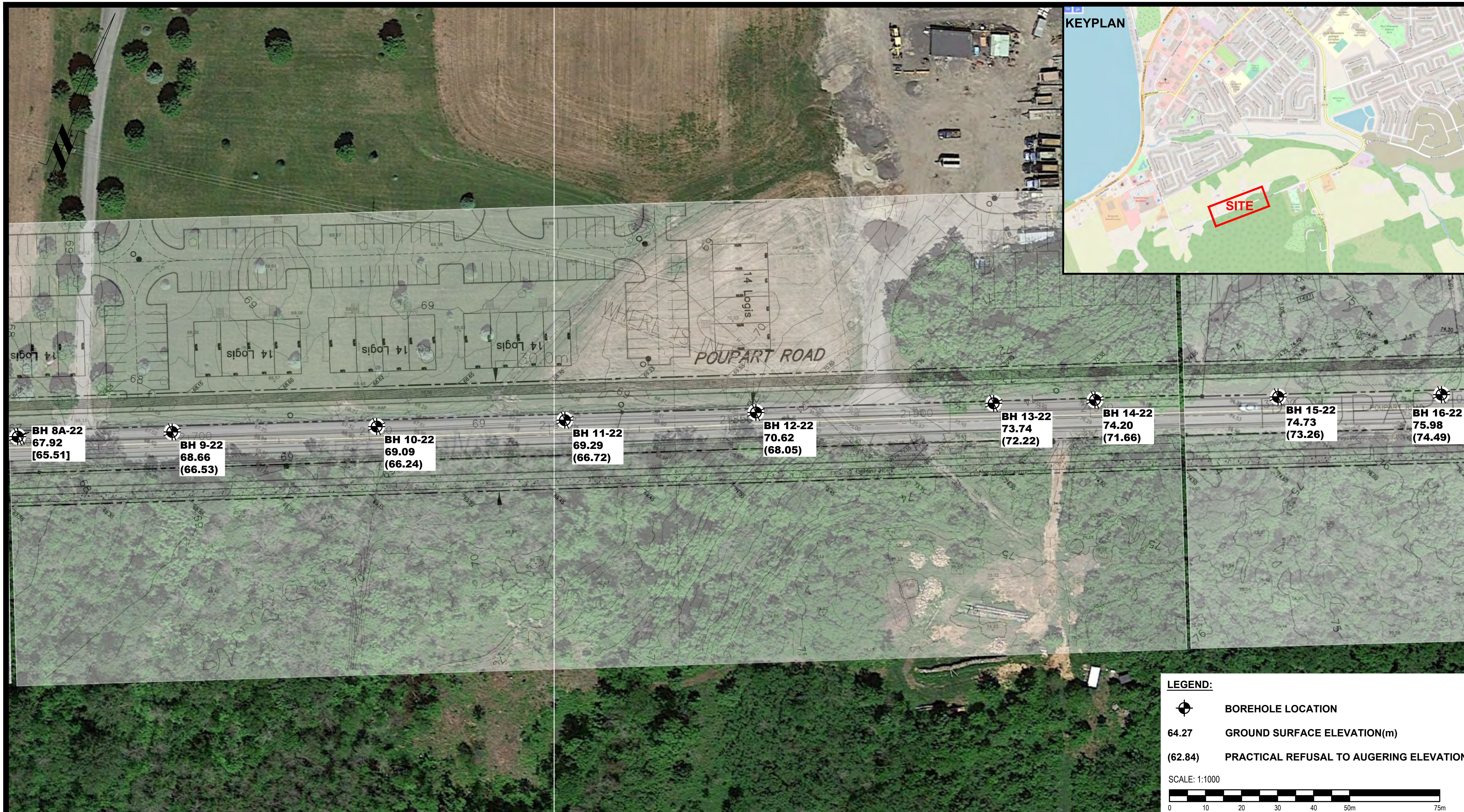


**LEGEND:**

| | |
|---|---|
| ⊕ | BOREHOLE LOCATION |
| 64.27 | GROUND SURFACE ELEVATION(m) |
| (62.84) | PRACTICAL REFUSAL TO AUGERING ELEVATION |

SCALE: 1:1000

0 10 20 30 40 50m 75m

PATERSON GROUP
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K2E 7T9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| 0 | | | |

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GEOTECHNICAL INVESTIGATION - ROAD RECONSTRUCTION
RUE ST JEAN

ROCKLAND, ONTARIO

Title:

# TEST HOLE LOCATION PLAN - PAGE 2

| | |
|---|---|
| Scale: 1:1000 | Date: 12/2022 |
| Drawn by: RCG | Report No.: PG6427 |
| Checked by: JV | Dwg. No.: PG6427-1 |
| Approved by: JV | Revision No.: 0 |

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**PATERSON GROUP**

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| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| 0 | | | |

SPACE BUILDER

GEOTECHNICAL INVESTIGATION - ROAD RECONSTRUCTION
RUE ST JEAN

ROCKLAND, ONTARIO

Title:

# TEST HOLE LOCATION PLAN - PAGE 3

| | |
|---|---|
| Scale: 1:1000 | Date: 12/2022 |
| Drawn by: RCG | Report No.: PG6427 |
| Checked by: JV | Dwg. No.: PG6427-1 |
| Approved by: JV | Revision No.: 0 |

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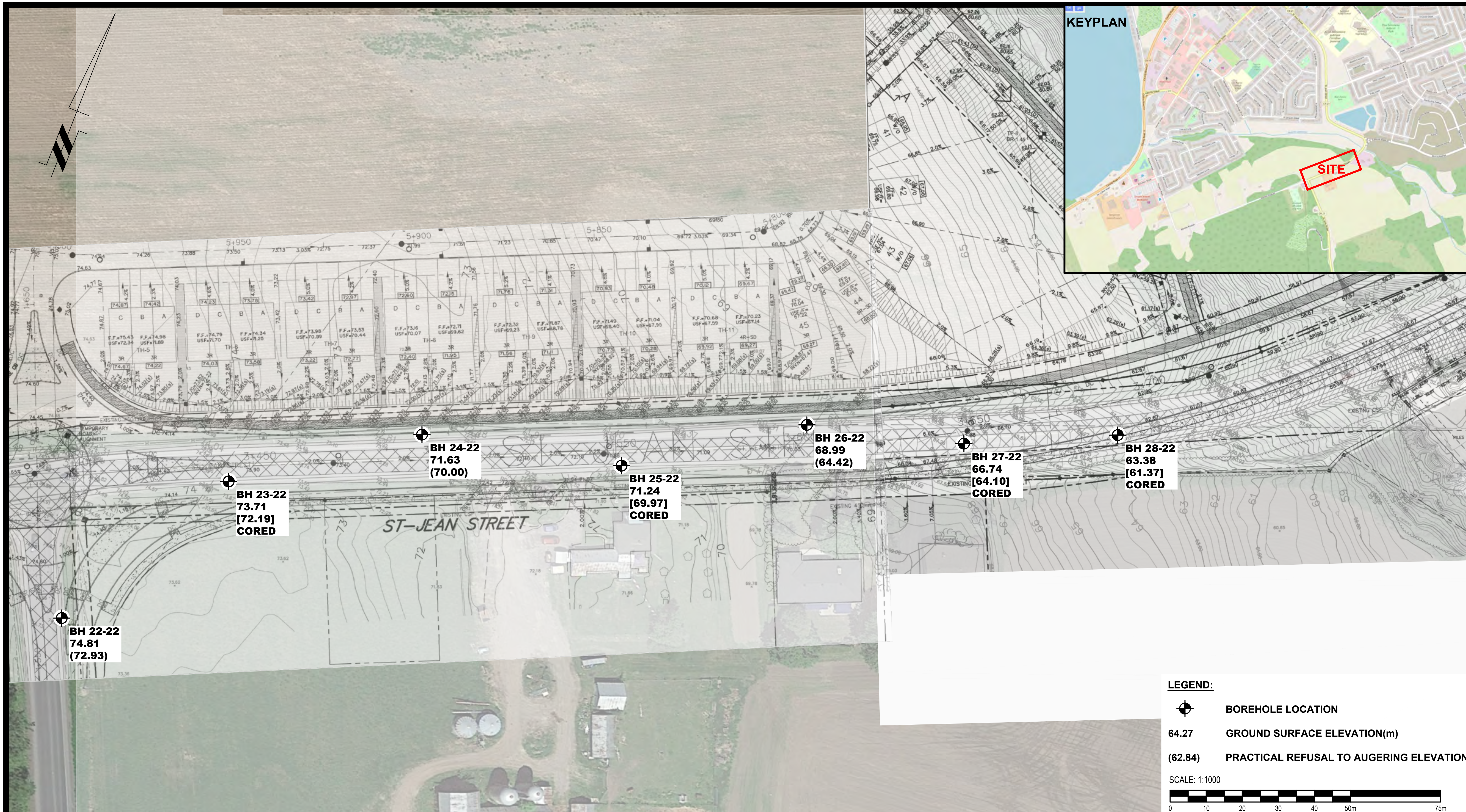


**patersongroup**
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| 0 | | | |

SPACE BUILDER

GEOTECHNICAL INVESTIGATION - ROAD RECONSTRUCTION
RUE ST JEAN

ROCKLAND, ONTARIO

Title:

# TEST HOLE LOCATION PLAN - PAGE 4

| | |
|---|---|
| Scale: 1:1000 | Date: 12/2022 |
| Drawn by: RCG | Report No.: PG6427 |
| Checked by: JV | Dwg. No.: PG6427-1 |
| Approved by: JV | Revision No.: 0 |

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PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| 1 | REVISED TO NEW GRADING PLAN | 13/01/2023 | JV |

SPACE BUILDER

GEOTECHNICAL INVESTIGATION - ROAD RECONSTRUCTION
RUE ST JEAN

ROCKLAND, ONTARIO

Title:

# TEST HOLE LOCATION PLAN - PAGE 5

| | |
|---|---|
| Scale: 1:1000 | Date: 12/2022 |
| Drawn by: RCG | Report No.: PG6427 |
| Checked by: JV | Dwg. No.: PG6427-1 |
| Approved by: JV | Revision No.: 1 |

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**patersongroup**
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
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| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| 0 | | | |

SPACE BUILDER
GEOTECHNICAL INVESTIGATION - ROAD RECONSTRUCTION
RUE ST JEAN
ROCKLAND, ONTARIO

Title:
# TEST HOLE LOCATION PLAN - PAGE 6

| | |
|---|---|
| Scale: 1:1000 | Date: 12/2022 |
| Drawn by: RCG | Report No.: PG6427 |
| Checked by: JV | Dwg. No.: PG6427-1 |
| Approved by: JV | Revision No.: 0 |

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PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| 0 | | | |

SPACE BUILDER

GEOTECHNICAL INVESTIGATION - ROAD RECONSTRUCTION
RUE ST JEAN

ROCKLAND, ONTARIO

Title:

# TEST HOLE LOCATION PLAN - PAGE 7

| | |
|---|---|
| Scale: 1:1000 | Date: 12/2022 |
| Drawn by: RCG | Report No.: PG6427 |
| Checked by: JV | Dwg. No.: PG6427-1 |
| Approved by: JV | Revision No.: 0 |

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| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| 0 | | | |

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SPACE BUILDER

GEOTECHNICAL INVESTIGATION - ROAD RECONSTRUCTION
RUE ST JEAN

ROCKLAND, ONTARIO

Title:

# TEST HOLE LOCATION PLAN - PAGE 8

Scale: 1:1000

Date: 12/2022

Drawn by: RCG

Report No.: PG6427

Checked by: JV

Dwg. No.: PG6427-1

Approved by: JV

Revision No.: 0

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**PATERSON GROUP**

9 AURIGA DRIVE
OTTAWA, ON
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TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|
| 0 | | | |

SPACE BUILDER

GEOTECHNICAL INVESTIGATION - ROAD RECONSTRUCTION
RUE ST JEAN

ROCKLAND, ONTARIO

Title:

# TEST HOLE LOCATION PLAN - PAGE 9

| | |
|---|---|
| Scale: 1:1000 | Date: 12/2022 |
| Drawn by: RCG | Report No.: PG6427 |
| Checked by: JV | Dwg. No.: PG6427-1 |
| Approved by: JV | Revision No.: 0 |

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PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

| NO. | REVISIONS | DATE | INITIAL |
|---|---|---|---|

SPACE BUILDER
GEOTECHNICAL INVESTIGATION - ROAD RECONSTRUCTION
RUE ST JEAN
ROCKLAND, ONTARIO

Title:
PERMISSIBLE GRADE RAISE PLAN

| | |
|---|---|
| Scale: 1:1000 | Date: 01/2023 |
| Drawn by: RCG | Report No.: PG6427 |
| Checked by: JV | Dwg. No.: PG6427-2 |
| Approved by: JV | Revision No.: |

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# APPENDIX "I"

## Traffic Analysis: Forecast
## Ultimate Build-Out Conditions

| Lane Group | SEL | SER | NEL | NET | SWT | SWR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 47 | 295 | 232 | 273 | 816 | 133 |
| Future Volume (vph) | 47 | 295 | 232 | 273 | 816 | 133 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (m) | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.5 |
| Storage Length (m) | 70.0 | 0.0 | 0.0 | | | 0.0 |
| Storage Lanes | 1 | 1 | 1 | | | 0 |
| Taper Length (m) | 7.5 | | 7.5 | | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 0.95 | 0.95 |
| Frt | | 0.850 | | | 0.979 | |
| Flt Protected | 0.950 | | 0.950 | | | |
| Satd. Flow (prot) | 1772 | 1551 | 1772 | 1865 | 3469 | 0 |
| Flt Permitted | 0.950 | | 0.239 | | | |
| Satd. Flow (perm) | 1772 | 1551 | 446 | 1865 | 3469 | 0 |
| Right Turn on Red | | Yes | | | | Yes |
| Satd. Flow (RTOR) | | 185 | | | 48 | |
| Link Speed (k/h) | 50 | | | 50 | 50 | |
| Link Distance (m) | 1276.4 | | | 1017.9 | 1073.7 | |
| Travel Time (s) | 91.9 | | | 73.3 | 77.3 | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles (%) | 3% | 3% | 3% | 3% | 3% | 3% |
| Adj. Flow (vph) | 51 | 321 | 252 | 297 | 887 | 145 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 51 | 321 | 252 | 297 | 1032 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No |
| Lane Alignment | Left | R NA | Left | Left | Left | Right |
| Median Width(m) | 3.7 | | | 3.7 | 3.7 | |
| Link Offset(m) | 0.0 | | | 0.0 | 0.0 | |
| Crosswalk Width(m) | 3.5 | | | 3.5 | 3.5 | |
| Two way Left Turn Lane | | | | | | |
| Headway Factor | 0.99 | 1.01 | 0.99 | 0.99 | 0.99 | 1.01 |
| Turning Speed (k/h) | 25 | 15 | 25 | | | 15 |
| Turn Type | Prot | Perm | Perm | NA | NA | |
| Protected Phases | 6 | | | 4 | 8 | |
| Permitted Phases | | 6 | 4 | | | |
| Minimum Split (s) | 22.5 | 22.5 | 22.5 | 22.5 | 22.5 | |
| Total Split (s) | 23.0 | 23.0 | 57.0 | 57.0 | 57.0 | |
| Total Split (%) | 28.8% | 28.8% | 71.3% | 71.3% | 71.3% | |
| Maximum Green (s) | 18.5 | 18.5 | 52.5 | 52.5 | 52.5 | |
| Yellow Time (s) | 3.5 | 3.5 | 3.5 | 3.5 | 3.5 | |
| All-Red Time (s) | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Lost Time (s) | 4.5 | 4.5 | 4.5 | 4.5 | 4.5 | |
| Lead/Lag | | | | | | |
| Lead-Lag Optimize? | | | | | | |
| Walk Time (s) | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Flash Dont Walk (s) | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | |
| Pedestrian Calls (#/hr) | 0 | 0 | 0 | 0 | 0 | |
| Act Effct Green (s) | 18.5 | 18.5 | 52.5 | 52.5 | 52.5 | |

| Lane Group | SEL | SER | NEL | NET | SWT | SWR |
|---|---|---|---|---|---|---|
| Actuated g/C Ratio | 0.23 | 0.23 | 0.66 | 0.66 | 0.66 | |
| v/c Ratio | 0.12 | 0.64 | 0.86 | 0.24 | 0.45 | |
| Control Delay | 25.4 | 18.4 | 42.8 | 6.2 | 7.1 | |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | 25.4 | 18.4 | 42.8 | 6.2 | 7.1 | |
| LOS | C | B | D | A | A | |
| Approach Delay | 19.4 | | | 23.0 | 7.1 | |
| Approach LOS | B | | | C | A | |
| Queue Length 50th (m) | 6.5 | 18.4 | 27.8 | 16.9 | 34.8 | |
| Queue Length 95th (m) | 15.5 | 46.3 | #80.3 | 27.4 | 46.6 | |
| Internal Link Dist (m) | 1252.4 | | | 993.9 | 1049.7 | |
| Turn Bay Length (m) | 70.0 | | | | | |
| Base Capacity (vph) | 409 | 500 | 292 | 1223 | 2293 | |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | 0.12 | 0.64 | 0.86 | 0.24 | 0.45 | |

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2: and 6:SEL, Start of Green

Natural Cycle: 80

Control Type: Pretimed

Maximum v/c Ratio: 0.86

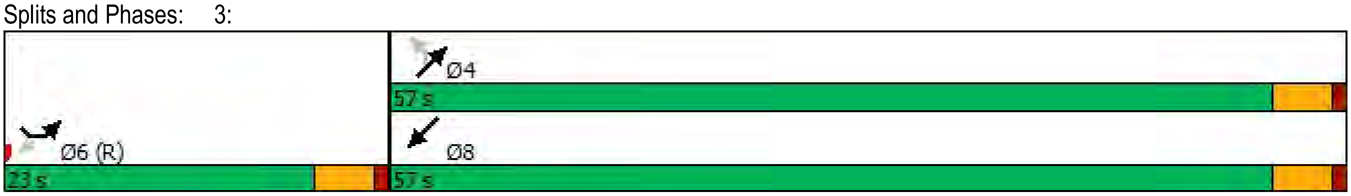
Intersection Signal Delay: 13.9 Intersection LOS: B

Intersection Capacity Utilization 55.1% ICU Level of Service B

Analysis Period (min) 15

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

Splits and Phases: 3:



| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 44 | 253 | 215 | 332 | 766 | 13 | 461 | 13 | 209 | 43 | 41 | 145 |
| Future Volume (vph) | 44 | 253 | 215 | 332 | 766 | 13 | 461 | 13 | 209 | 43 | 41 | 145 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (m) | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 |
| Storage Length (m) | 100.0 | | 75.0 | 105.0 | | 0.0 | 80.0 | | 75.0 | 50.0 | | 0.0 |
| Storage Lanes | 1 | | 1 | 1 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (m) | 7.5 | | | 7.5 | | | 7.5 | | | 7.5 | | |
| Lane Util. Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 0.95 | 0.95 | 0.95 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | | | 0.850 | | 0.998 | | | | 0.850 | | 0.883 | |
| Flt Protected | 0.950 | | | 0.950 | | | 0.950 | 0.955 | | 0.950 | | |
| Satd. Flow (prot) | 1733 | 3544 | 1551 | 1733 | 3537 | 0 | 1646 | 1692 | 1551 | 1733 | 1647 | 0 |
| Flt Permitted | 0.950 | | | 0.950 | | | 0.599 | 0.570 | | 0.498 | | |
| Satd. Flow (perm) | 1733 | 3544 | 1551 | 1733 | 3537 | 0 | 1038 | 1010 | 1551 | 908 | 1647 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | | 234 | | 2 | | | | 227 | | 158 | |
| Link Speed (k/h) | | 50 | | | 50 | | | 50 | | | 50 | |
| Link Distance (m) | | 187.6 | | | 176.2 | | | 150.0 | | | 150.0 | |
| Travel Time (s) | | 13.5 | | | 12.7 | | | 10.8 | | | 10.8 | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles (%) | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% |
| Adj. Flow (vph) | 48 | 275 | 234 | 361 | 833 | 14 | 501 | 14 | 227 | 47 | 45 | 158 |
| Shared Lane Traffic (%) | | | | | | | 49% | | | | | |
| Lane Group Flow (vph) | 48 | 275 | 234 | 361 | 847 | 0 | 256 | 259 | 227 | 47 | 203 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(m) | | 5.0 | | | 5.0 | | | 3.5 | | | 3.5 | |
| Link Offset(m) | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Crosswalk Width(m) | | 3.5 | | | 3.5 | | | 3.5 | | | 3.5 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.01 | 0.99 | 1.01 | 1.01 | 0.99 | 1.01 | 1.01 | 0.99 | 1.01 | 1.01 | 0.99 | 1.01 |
| Turning Speed (k/h) | 25 | | 15 | 25 | | 15 | 25 | | 15 | 25 | | 15 |
| Turn Type | Prot | NA | Perm | Prot | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | 7 | 4 | | 3 | 8 | | | 2 | | | 6 | |
| Permitted Phases | | | 4 | | | | 2 | | 2 | 6 | | |
| Minimum Split (s) | 10.6 | 23.6 | 23.6 | 10.6 | 23.6 | | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | |
| Total Split (s) | 12.1 | 23.6 | 23.6 | 25.0 | 36.5 | | 31.4 | 31.4 | 31.4 | 31.4 | 31.4 | |
| Total Split (%) | 15.1% | 29.5% | 29.5% | 31.3% | 45.6% | | 39.3% | 39.3% | 39.3% | 39.3% | 39.3% | |
| Maximum Green (s) | 6.5 | 18.0 | 18.0 | 19.4 | 30.9 | | 25.8 | 25.8 | 25.8 | 25.8 | 25.8 | |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Lost Time (s) | 5.6 | 5.6 | 5.6 | 5.6 | 5.6 | | 5.6 | 5.6 | 5.6 | 5.6 | 5.6 | |
| Lead/Lag | Lead | Lag | Lag | Lead | Lag | | | | | | | |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | Yes | | | | | | | |
| Walk Time (s) | | 7.0 | 7.0 | | 7.0 | | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Flash Dont Walk (s) | | 11.0 | 11.0 | | 11.0 | | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | |
| Pedestrian Calls (#/hr) | | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Act Effct Green (s) | 6.5 | 18.0 | 18.0 | 19.4 | 30.9 | | 25.8 | 25.8 | 25.8 | 25.8 | 25.8 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Actuated g/C Ratio | 0.08 | 0.22 | 0.22 | 0.24 | 0.39 | | 0.32 | 0.32 | 0.32 | 0.32 | 0.32 | |
| v/c Ratio | 0.34 | 0.35 | 0.44 | 0.86 | 0.62 | | 0.77 | 0.80 | 0.35 | 0.16 | 0.32 | |
| Control Delay | 41.9 | 27.5 | 6.8 | 50.9 | 22.2 | | 42.0 | 45.2 | 4.7 | 21.2 | 7.4 | |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | 41.9 | 27.5 | 6.8 | 50.9 | 22.2 | | 42.0 | 45.2 | 4.7 | 21.2 | 7.4 | |
| LOS | D | C | A | D | C | | D | D | A | C | A | |
| Approach Delay | | 20.1 | | | 30.8 | | | 31.7 | | | 10.0 | |
| Approach LOS | | C | | | C | | | C | | | B | |
| Queue Length 50th (m) | 7.4 | 19.5 | 0.0 | 55.3 | 56.0 | | 38.4 | 39.2 | 0.0 | 5.3 | 5.0 | |
| Queue Length 95th (m) | 18.0 | 30.5 | 17.5 | #102.7 | 75.3 | | #79.2 | #81.8 | 14.8 | 13.6 | 19.8 | |
| Internal Link Dist (m) | | 163.6 | | | 152.2 | | | 126.0 | | | 126.0 | |
| Turn Bay Length (m) | 100.0 | | 75.0 | 105.0 | | | 80.0 | | 75.0 | 50.0 | | |
| Base Capacity (vph) | 140 | 797 | 530 | 420 | 1367 | | 334 | 325 | 653 | 292 | 638 | |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | 0.34 | 0.35 | 0.44 | 0.86 | 0.62 | | 0.77 | 0.80 | 0.35 | 0.16 | 0.32 | |

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Pretimed

Maximum v/c Ratio: 0.86

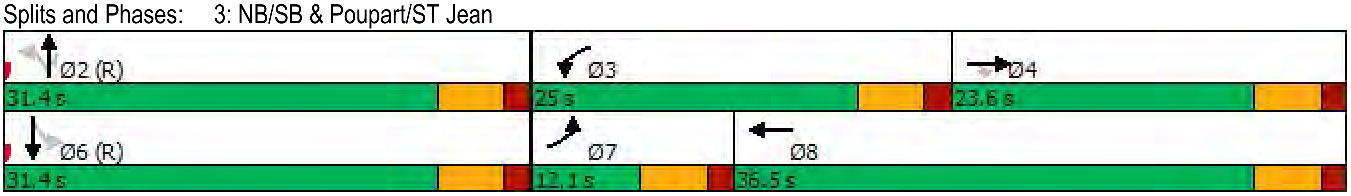
Intersection Signal Delay: 27.0 Intersection LOS: C

Intersection Capacity Utilization 68.6% ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 3: NB/SB & Poupart/ST Jean



# Intersection #3 - AM

03-24-2023

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 52 | 442 | 59 | 186 | 1351 | 8 | 186 | 0 | 43 | 28 | 0 | 171 |
| Future Volume (vph) | 52 | 442 | 59 | 186 | 1351 | 8 | 186 | 0 | 43 | 28 | 0 | 171 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (m) | 50.0 | | 0.0 | 50.0 | | 0.0 | 20.0 | | 0.0 | 20.0 | | 0.0 |
| Storage Lanes | 1 | | 0 | 1 | | 0 | 1 | | 0 | 1 | | 0 |
| Taper Length (m) | 7.5 | | | 7.5 | | | 7.5 | | | 7.5 | | |
| Lane Util. Factor | 1.00 | 0.95 | 0.95 | 1.00 | 0.95 | 0.95 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | | 0.982 | | | 0.999 | | | 0.850 | | | 0.850 | |
| Flt Protected | 0.950 | | | 0.950 | | | 0.950 | | | 0.950 | | |
| Satd. Flow (prot) | 1772 | 3480 | 0 | 1772 | 3540 | 0 | 1772 | 1585 | 0 | 1772 | 1585 | 0 |
| Flt Permitted | 0.136 | | | 0.446 | | | 0.640 | | | 0.726 | | |
| Satd. Flow (perm) | 254 | 3480 | 0 | 832 | 3540 | 0 | 1194 | 1585 | 0 | 1354 | 1585 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | 34 | | | 1 | | | 306 | | | 47 | |
| Link Speed (k/h) | | 50 | | | 50 | | | 50 | | | 50 | |
| Link Distance (m) | | 351.7 | | | 423.8 | | | 184.2 | | | 205.1 | |
| Travel Time (s) | | 25.3 | | | 30.5 | | | 13.3 | | | 14.8 | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles (%) | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% |
| Adj. Flow (vph) | 57 | 480 | 64 | 202 | 1468 | 9 | 202 | 0 | 47 | 30 | 0 | 186 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 57 | 544 | 0 | 202 | 1477 | 0 | 202 | 47 | 0 | 30 | 186 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(m) | | 6.0 | | | 6.0 | | | 3.7 | | | 3.7 | |
| Link Offset(m) | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Crosswalk Width(m) | | 4.0 | | | 4.0 | | | 4.0 | | | 4.0 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Turning Speed (k/h) | 25 | | 15 | 25 | | 15 | 25 | | 15 | 25 | | 15 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Minimum Split (s) | 23.6 | 23.6 | | 23.6 | 23.6 | | 23.6 | 23.6 | | 23.6 | 23.6 | |
| Total Split (s) | 35.0 | 35.0 | | 35.0 | 35.0 | | 25.0 | 25.0 | | 25.0 | 25.0 | |
| Total Split (%) | 58.3% | 58.3% | | 58.3% | 58.3% | | 41.7% | 41.7% | | 41.7% | 41.7% | |
| Maximum Green (s) | 29.4 | 29.4 | | 29.4 | 29.4 | | 19.4 | 19.4 | | 19.4 | 19.4 | |
| Yellow Time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| All-Red Time (s) | 1.6 | 1.6 | | 1.6 | 1.6 | | 1.6 | 1.6 | | 1.6 | 1.6 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Lost Time (s) | 5.6 | 5.6 | | 5.6 | 5.6 | | 5.6 | 5.6 | | 5.6 | 5.6 | |
| Lead/Lag | | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Walk Time (s) | 7.0 | 7.0 | | 7.0 | 7.0 | | 7.0 | 7.0 | | 7.0 | 7.0 | |
| Flash Dont Walk (s) | 11.0 | 11.0 | | 11.0 | 11.0 | | 11.0 | 11.0 | | 11.0 | 11.0 | |
| Pedestrian Calls (#/hr) | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Act Effct Green (s) | 29.4 | 29.4 | | 29.4 | 29.4 | | 19.4 | 19.4 | | 19.4 | 19.4 | |
| Actuated g/C Ratio | 0.49 | 0.49 | | 0.49 | 0.49 | | 0.32 | 0.32 | | 0.32 | 0.32 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v/c Ratio | 0.46 | 0.32 | | 0.50 | 0.85 | | 0.52 | 0.07 | | 0.07 | 0.34 | |
| Control Delay | 25.7 | 9.2 | | 15.6 | 19.8 | | 22.5 | 0.2 | | 14.7 | 13.5 | |
| Queue Delay | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Delay | 25.7 | 9.2 | | 15.6 | 19.8 | | 22.5 | 0.2 | | 14.7 | 13.5 | |
| LOS | C | A | | B | B | | C | A | | B | B | |
| Approach Delay | | 10.8 | | | 19.3 | | | 18.3 | | | 13.7 | |
| Approach LOS | | B | | | B | | | B | | | B | |
| Queue Length 50th (m) | 4.0 | 17.2 | | 14.6 | 72.9 | | 18.7 | 0.0 | | 2.4 | 11.7 | |
| Queue Length 95th (m) | #18.9 | 26.3 | | 32.2 | #106.8 | | 37.3 | 0.0 | | 7.4 | 26.0 | |
| Internal Link Dist (m) | | 327.7 | | | 399.8 | | | 160.2 | | | 181.1 | |
| Turn Bay Length (m) | 50.0 | | | 50.0 | | | 20.0 | | | 20.0 | | |
| Base Capacity (vph) | 124 | 1722 | | 407 | 1735 | | 386 | 719 | | 437 | 544 | |
| Starvation Cap Reductn | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Reduced v/c Ratio | 0.46 | 0.32 | | 0.50 | 0.85 | | 0.52 | 0.07 | | 0.07 | 0.34 | |

Intersection Summary

Area Type: Other

Cycle Length: 60

Actuated Cycle Length: 60

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 60

Control Type: Pretimed

Maximum v/c Ratio: 0.85

Intersection Signal Delay: 16.9 Intersection LOS: B

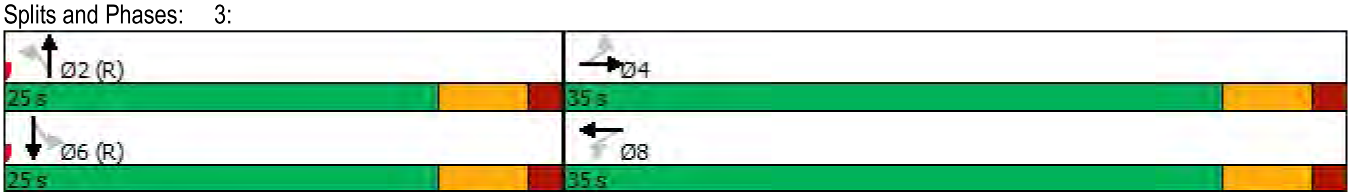
Intersection Capacity Utilization 81.3% ICU Level of Service D

Analysis Period (min) 15

\# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3:



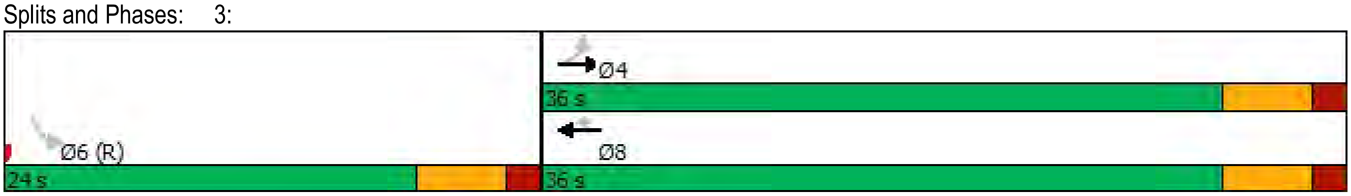
| Lane Group | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 10 | 449 | 1414 | 292 | 105 | 63 |
| Future Volume (vph) | 10 | 449 | 1414 | 292 | 105 | 63 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (m) | 50.0 | | | 0.0 | 0.0 | 0.0 |
| Storage Lanes | 1 | | | 1 | 1 | 0 |
| Taper Length (m) | 7.5 | | | | 7.5 | |
| Lane Util. Factor | 1.00 | 0.95 | 0.95 | 1.00 | 1.00 | 1.00 |
| Frt | | | | 0.850 | 0.950 | |
| Flt Protected | 0.950 | | | | 0.970 | |
| Satd. Flow (prot) | 1772 | 3544 | 3544 | 1585 | 1719 | 0 |
| Flt Permitted | 0.132 | | | | 0.970 | |
| Satd. Flow (perm) | 246 | 3544 | 3544 | 1585 | 1719 | 0 |
| Right Turn on Red | | | | Yes | | Yes |
| Satd. Flow (RTOR) | | | | 317 | 17 | |
| Link Speed (k/h) | | 50 | 50 | | 50 | |
| Link Distance (m) | | 351.7 | 423.8 | | 205.1 | |
| Travel Time (s) | | 25.3 | 30.5 | | 14.8 | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles (%) | 3% | 3% | 3% | 3% | 3% | 3% |
| Adj. Flow (vph) | 11 | 488 | 1537 | 317 | 114 | 68 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 11 | 488 | 1537 | 317 | 182 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Left | Right | Left | Right |
| Median Width(m) | | 6.0 | 6.0 | | 3.7 | |
| Link Offset(m) | | 0.0 | 0.0 | | 0.0 | |
| Crosswalk Width(m) | | 4.0 | 4.0 | | 4.0 | |
| Two way Left Turn Lane | | | | | | |
| Headway Factor | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Turning Speed (k/h) | 25 | | | 15 | 25 | 15 |
| Turn Type | Perm | NA | NA | Perm | Perm | |
| Protected Phases | | 4 | 8 | | | |
| Permitted Phases | 4 | | | 8 | 6 | |
| Minimum Split (s) | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | |
| Total Split (s) | 36.0 | 36.0 | 36.0 | 36.0 | 24.0 | |
| Total Split (%) | 60.0% | 60.0% | 60.0% | 60.0% | 40.0% | |
| Maximum Green (s) | 30.4 | 30.4 | 30.4 | 30.4 | 18.4 | |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Lost Time (s) | 5.6 | 5.6 | 5.6 | 5.6 | 5.6 | |
| Lead/Lag | | | | | | |
| Lead-Lag Optimize? | | | | | | |
| Walk Time (s) | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Flash Dont Walk (s) | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | |
| Pedestrian Calls (#/hr) | 0 | 0 | 0 | 0 | 0 | |
| Act Effct Green (s) | 30.4 | 30.4 | 30.4 | 30.4 | 18.4 | |
| Actuated g/C Ratio | 0.51 | 0.51 | 0.51 | 0.51 | 0.31 | |

| Lane Group | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| v/c Ratio | 0.09 | 0.27 | 0.86 | 0.33 | 0.34 | |
| Control Delay | 9.9 | 9.0 | 19.4 | 2.2 | 16.7 | |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | 9.9 | 9.0 | 19.4 | 2.2 | 16.7 | |
| LOS | A | A | B | A | B | |
| Approach Delay | | 9.0 | 16.5 | | 16.7 | |
| Approach LOS | | A | B | | B | |
| Queue Length 50th (m) | 0.6 | 15.6 | 74.8 | 0.0 | 14.4 | |
| Queue Length 95th (m) | 3.1 | 23.7 | #109.4 | 10.2 | 29.1 | |
| Internal Link Dist (m) | | 327.7 | 399.8 | | 181.1 | |
| Turn Bay Length (m) | 50.0 | | | | | |
| Base Capacity (vph) | 124 | 1795 | 1795 | 959 | 538 | |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | 0.09 | 0.27 | 0.86 | 0.33 | 0.34 | |

Intersection Summary

Area Type: Other
Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green
Natural Cycle: 60
Control Type: Pretimed
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 15.0 Intersection LOS: B
Intersection Capacity Utilization 58.1% ICU Level of Service B
Analysis Period (min) 15
# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3:



| Lane Group | SEL | SER | NEL | NET | SWT | SWR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 145 | 301 | 380 | 869 | 539 | 73 |
| Future Volume (vph) | 145 | 301 | 380 | 869 | 539 | 73 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (m) | 3.7 | 3.5 | 3.7 | 3.7 | 3.7 | 3.5 |
| Storage Length (m) | 70.0 | 0.0 | 0.0 | | | 0.0 |
| Storage Lanes | 1 | 1 | 1 | | | 0 |
| Taper Length (m) | 7.5 | | 7.5 | | | |
| Lane Util. Factor | 1.00 | 1.00 | 1.00 | 1.00 | 0.95 | 0.95 |
| Frt | | 0.850 | | | 0.982 | |
| Flt Protected | 0.950 | | 0.950 | | | |
| Satd. Flow (prot) | 1772 | 1551 | 1772 | 1865 | 3480 | 0 |
| Flt Permitted | 0.950 | | 0.223 | | | |
| Satd. Flow (perm) | 1772 | 1551 | 416 | 1865 | 3480 | 0 |
| Right Turn on Red | | Yes | | | | Yes |
| Satd. Flow (RTOR) | | 327 | | | 21 | |
| Link Speed (k/h) | 50 | | | 50 | 50 | |
| Link Distance (m) | 1276.4 | | | 1017.9 | 1073.7 | |
| Travel Time (s) | 91.9 | | | 73.3 | 77.3 | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles (%) | 3% | 3% | 3% | 3% | 3% | 3% |
| Adj. Flow (vph) | 158 | 327 | 413 | 945 | 586 | 79 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 158 | 327 | 413 | 945 | 665 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No |
| Lane Alignment | Left | Right | Left | Left | Left | Right |
| Median Width(m) | 3.7 | | | 3.7 | 3.7 | |
| Link Offset(m) | 0.0 | | | 0.0 | 0.0 | |
| Crosswalk Width(m) | 3.5 | | | 3.5 | 3.5 | |
| Two way Left Turn Lane | | | | | | |
| Headway Factor | 0.99 | 1.01 | 0.99 | 0.99 | 0.99 | 1.01 |
| Turning Speed (k/h) | 25 | 15 | 25 | | | 15 |
| Turn Type | Prot | Perm | pm+pt | NA | NA | |
| Protected Phases | 6 | | 7 | 4 | 8 | |
| Permitted Phases | | 6 | 4 | | | |
| Minimum Split (s) | 23.6 | 23.6 | 9.5 | 23.6 | 23.6 | |
| Total Split (s) | 24.0 | 24.0 | 20.2 | 46.0 | 25.8 | |
| Total Split (%) | 34.3% | 34.3% | 28.9% | 65.7% | 36.9% | |
| Maximum Green (s) | 18.4 | 18.4 | 15.7 | 40.4 | 20.2 | |
| Yellow Time (s) | 4.0 | 4.0 | 3.5 | 4.0 | 4.0 | |
| All-Red Time (s) | 1.6 | 1.6 | 1.0 | 1.6 | 1.6 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Lost Time (s) | 5.6 | 5.6 | 4.5 | 5.6 | 5.6 | |
| Lead/Lag | | | Lead | | Lag | |
| Lead-Lag Optimize? | | | Yes | | Yes | |
| Walk Time (s) | 7.0 | 7.0 | | 7.0 | 7.0 | |
| Flash Dont Walk (s) | 11.0 | 11.0 | | 11.0 | 11.0 | |
| Pedestrian Calls (#/hr) | 0 | 0 | | 0 | 0 | |
| Act Effct Green (s) | 18.4 | 18.4 | 41.5 | 40.4 | 20.2 | |

| Lane Group | SEL | SER | NEL | NET | SWT | SWR |
|---|---|---|---|---|---|---|
| Actuated g/C Ratio | 0.26 | 0.26 | 0.59 | 0.58 | 0.29 | |
| v/c Ratio | 0.34 | 0.50 | 0.75 | 0.88 | 0.65 | |
| Control Delay | 23.4 | 5.9 | 20.1 | 24.6 | 24.7 | |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | 23.4 | 5.9 | 20.1 | 24.6 | 24.7 | |
| LOS | C | A | C | C | C | |
| Approach Delay | 11.6 | | | 23.2 | 24.7 | |
| Approach LOS | B | | | C | C | |
| Queue Length 50th (m) | 17.6 | 0.0 | 26.9 | 100.7 | 40.5 | |
| Queue Length 95th (m) | 33.0 | 18.0 | #68.3 | #187.5 | 58.0 | |
| Internal Link Dist (m) | 1252.4 | | | 993.9 | 1049.7 | |
| Turn Bay Length (m) | 70.0 | | | | | |
| Base Capacity (vph) | 465 | 648 | 550 | 1076 | 1019 | |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | 0.34 | 0.50 | 0.75 | 0.88 | 0.65 | |

Intersection Summary

Area Type: Other

Cycle Length: 70

Actuated Cycle Length: 70

Offset: 0 (0%), Referenced to phase 2: and 6:SEL, Start of Green

Natural Cycle: 70

Control Type: Pretimed

Maximum v/c Ratio: 0.88

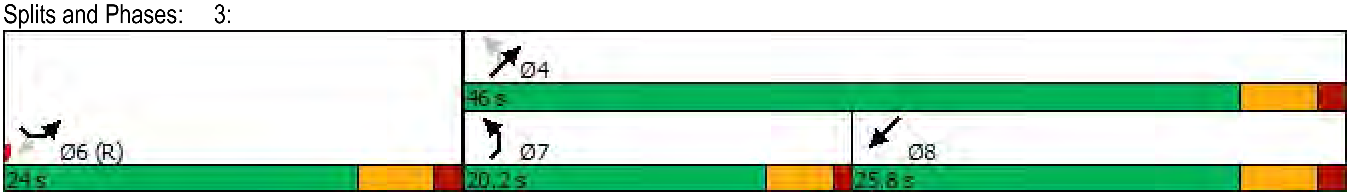
Intersection Signal Delay: 21.4 Intersection LOS: C

Intersection Capacity Utilization 63.1% ICU Level of Service B

Analysis Period (min) 15

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

Splits and Phases: 3:



# Intersection #2 - PM

03-24-2023

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 151 | 824 | 545 | 292 | 503 | 46 | 397 | 42 | 398 | 27 | 26 | 92 |
| Future Volume (vph) | 151 | 824 | 545 | 292 | 503 | 46 | 397 | 42 | 398 | 27 | 26 | 92 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Lane Width (m) | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 | 3.5 | 3.7 | 3.5 |
| Storage Length (m) | 100.0 | | 75.0 | 120.0 | | 0.0 | 80.0 | | 75.0 | 50.0 | | 0.0 |
| Storage Lanes | 1 | | 1 | 1 | | 0 | 1 | | 1 | 1 | | 0 |
| Taper Length (m) | 7.5 | | | 7.5 | | | 7.5 | | | 7.5 | | |
| Lane Util. Factor | 1.00 | 0.95 | 1.00 | 1.00 | 0.95 | 0.95 | 0.95 | 0.95 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | | | 0.850 | | 0.987 | | | | 0.850 | | 0.883 | |
| Flt Protected | 0.950 | | | 0.950 | | | 0.950 | 0.961 | | 0.950 | | |
| Satd. Flow (prot) | 1733 | 3544 | 1551 | 1733 | 3498 | 0 | 1646 | 1703 | 1551 | 1733 | 1647 | 0 |
| Flt Permitted | 0.950 | | | 0.950 | | | 0.675 | 0.682 | | 0.491 | | |
| Satd. Flow (perm) | 1733 | 3544 | 1551 | 1733 | 3498 | 0 | 1170 | 1208 | 1551 | 896 | 1647 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | | 592 | | 13 | | | | 433 | | 100 | |
| Link Speed (k/h) | | 50 | | | 50 | | | 50 | | | 50 | |
| Link Distance (m) | | 187.6 | | | 176.2 | | | 150.0 | | | 150.0 | |
| Travel Time (s) | | 13.5 | | | 12.7 | | | 10.8 | | | 10.8 | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles (%) | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% |
| Adj. Flow (vph) | 164 | 896 | 592 | 317 | 547 | 50 | 432 | 46 | 433 | 29 | 28 | 100 |
| Shared Lane Traffic (%) | | | | | | | 45% | | | | | |
| Lane Group Flow (vph) | 164 | 896 | 592 | 317 | 597 | 0 | 238 | 240 | 433 | 29 | 128 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | R NA | Left | Left | Right |
| Median Width(m) | | 5.0 | | | 5.0 | | | 3.5 | | | 3.5 | |
| Link Offset(m) | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Crosswalk Width(m) | | 3.5 | | | 3.5 | | | 3.5 | | | 3.5 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 1.01 | 0.99 | 1.01 | 1.01 | 0.99 | 1.01 | 1.01 | 0.99 | 1.01 | 1.01 | 0.99 | 1.01 |
| Turning Speed (k/h) | 25 | | 15 | 25 | | 15 | 25 | | 15 | 25 | | 15 |
| Turn Type | Prot | NA | Perm | Prot | NA | | Perm | NA | Perm | Perm | NA | |
| Protected Phases | 7 | 4 | | 3 | 8 | | | 2 | | | 6 | |
| Permitted Phases | | | 4 | | | | 2 | | 2 | 6 | | |
| Minimum Split (s) | 10.6 | 23.6 | 23.6 | 10.6 | 23.6 | | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | |
| Total Split (s) | 20.8 | 29.0 | 29.0 | 24.0 | 32.2 | | 27.0 | 27.0 | 27.0 | 27.0 | 27.0 | |
| Total Split (%) | 26.0% | 36.3% | 36.3% | 30.0% | 40.3% | | 33.8% | 33.8% | 33.8% | 33.8% | 33.8% | |
| Maximum Green (s) | 15.2 | 23.4 | 23.4 | 18.4 | 26.6 | | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Lost Time (s) | 5.6 | 5.6 | 5.6 | 5.6 | 5.6 | | 5.6 | 5.6 | 5.6 | 5.6 | 5.6 | |
| Lead/Lag | Lead | Lag | Lag | Lead | Lag | | | | | | | |
| Lead-Lag Optimize? | Yes | Yes | Yes | Yes | Yes | | | | | | | |
| Walk Time (s) | | 7.0 | 7.0 | | 7.0 | | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Flash Dont Walk (s) | | 11.0 | 11.0 | | 11.0 | | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | |
| Pedestrian Calls (#/hr) | | 0 | 0 | | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Act Effct Green (s) | 15.2 | 23.4 | 23.4 | 18.4 | 26.6 | | 21.4 | 21.4 | 21.4 | 21.4 | 21.4 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Actuated g/C Ratio | 0.19 | 0.29 | 0.29 | 0.23 | 0.33 | | 0.27 | 0.27 | 0.27 | 0.27 | 0.27 | |
| v/c Ratio | 0.50 | 0.86 | 0.68 | 0.80 | 0.51 | | 0.76 | 0.74 | 0.59 | 0.12 | 0.25 | |
| Control Delay | 35.0 | 37.3 | 6.7 | 45.9 | 22.8 | | 45.2 | 43.0 | 6.4 | 23.9 | 9.1 | |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | 35.0 | 37.3 | 6.7 | 45.9 | 22.8 | | 45.2 | 43.0 | 6.4 | 23.9 | 9.1 | |
| LOS | C | D | A | D | C | | D | D | A | C | A | |
| Approach Delay | | 26.1 | | | 30.8 | | | 26.2 | | | 11.8 | |
| Approach LOS | | C | | | C | | | C | | | B | |
| Queue Length 50th (m) | 23.7 | 71.0 | 0.0 | 48.0 | 38.9 | | 36.7 | 36.8 | 0.0 | 3.5 | 3.3 | |
| Queue Length 95th (m) | 42.8 | #104.0 | 25.2 | #88.8 | 54.6 | | #74.9 | #74.2 | 21.8 | 10.1 | 16.2 | |
| Internal Link Dist (m) | | 163.6 | | | 152.2 | | | 126.0 | | | 126.0 | |
| Turn Bay Length (m) | 100.0 | | 75.0 | 120.0 | | | 80.0 | | 75.0 | 50.0 | | |
| Base Capacity (vph) | 329 | 1036 | 872 | 398 | 1171 | | 312 | 323 | 732 | 239 | 513 | |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | 0.50 | 0.86 | 0.68 | 0.80 | 0.51 | | 0.76 | 0.74 | 0.59 | 0.12 | 0.25 | |

Intersection Summary

Area Type: Other

Cycle Length: 80

Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green

Natural Cycle: 80

Control Type: Pretimed

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 26.7 Intersection LOS: C

Intersection Capacity Utilization 71.7% ICU Level of Service C

Analysis Period (min) 15

# 95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Splits and Phases: 3: NB/SB & Poupart

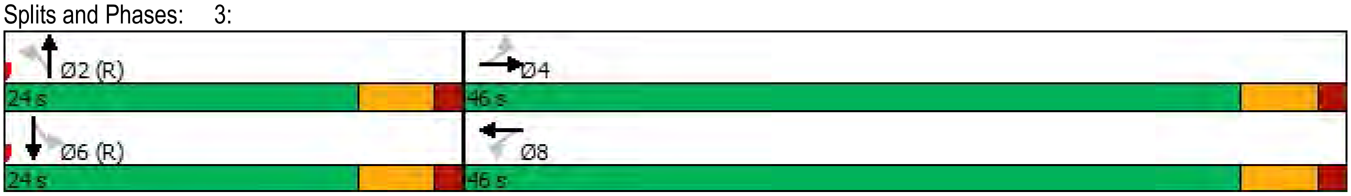
| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Traffic Volume (vph) | 178 | 1474 | 196 | 46 | 919 | 28 | 122 | 0 | 27 | 18 | 0 | 110 |
| Future Volume (vph) | 178 | 1474 | 196 | 46 | 919 | 28 | 122 | 0 | 27 | 18 | 0 | 110 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (m) | 60.0 | | 0.0 | 50.0 | | 0.0 | 20.0 | | 0.0 | 20.0 | | 0.0 |
| Storage Lanes | 1 | | 0 | 1 | | 0 | 1 | | 0 | 1 | | 0 |
| Taper Length (m) | 7.5 | | | 7.5 | | | 7.5 | | | 7.5 | | |
| Lane Util. Factor | 1.00 | 0.95 | 0.95 | 1.00 | 0.95 | 0.95 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Frt | | 0.982 | | | 0.996 | | | 0.850 | | | 0.850 | |
| Flt Protected | 0.950 | | | 0.950 | | | 0.950 | | | 0.950 | | |
| Satd. Flow (prot) | 1772 | 3480 | 0 | 1772 | 3530 | 0 | 1772 | 1585 | 0 | 1772 | 1585 | 0 |
| Flt Permitted | 0.229 | | | 0.099 | | | 0.680 | | | 0.738 | | |
| Satd. Flow (perm) | 427 | 3480 | 0 | 185 | 3530 | 0 | 1268 | 1585 | 0 | 1376 | 1585 | 0 |
| Right Turn on Red | | | Yes | | | Yes | | | Yes | | | Yes |
| Satd. Flow (RTOR) | | 35 | | | 7 | | | 41 | | | 110 | |
| Link Speed (k/h) | | 50 | | | 50 | | | 50 | | | 50 | |
| Link Distance (m) | | 351.7 | | | 423.8 | | | 184.2 | | | 205.1 | |
| Travel Time (s) | | 25.3 | | | 30.5 | | | 13.3 | | | 14.8 | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles (%) | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% | 3% |
| Adj. Flow (vph) | 193 | 1602 | 213 | 50 | 999 | 30 | 133 | 0 | 29 | 20 | 0 | 120 |
| Shared Lane Traffic (%) | | | | | | | | | | | | |
| Lane Group Flow (vph) | 193 | 1815 | 0 | 50 | 1029 | 0 | 133 | 29 | 0 | 20 | 120 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Right | Left | Left | Right | Left | Left | Right | Left | Left | Right |
| Median Width(m) | | 6.0 | | | 6.0 | | | 3.7 | | | 3.7 | |
| Link Offset(m) | | 0.0 | | | 0.0 | | | 0.0 | | | 0.0 | |
| Crosswalk Width(m) | | 4.0 | | | 4.0 | | | 4.0 | | | 4.0 | |
| Two way Left Turn Lane | | | | | | | | | | | | |
| Headway Factor | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Turning Speed (k/h) | 25 | | 15 | 25 | | 15 | 25 | | 15 | 25 | | 15 |
| Turn Type | Perm | NA | | Perm | NA | | Perm | NA | | Perm | NA | |
| Protected Phases | | 4 | | | 8 | | | 2 | | | 6 | |
| Permitted Phases | 4 | | | 8 | | | 2 | | | 6 | | |
| Minimum Split (s) | 23.6 | 23.6 | | 23.6 | 23.6 | | 23.6 | 23.6 | | 23.6 | 23.6 | |
| Total Split (s) | 46.0 | 46.0 | | 46.0 | 46.0 | | 24.0 | 24.0 | | 24.0 | 24.0 | |
| Total Split (%) | 65.7% | 65.7% | | 65.7% | 65.7% | | 34.3% | 34.3% | | 34.3% | 34.3% | |
| Maximum Green (s) | 40.4 | 40.4 | | 40.4 | 40.4 | | 18.4 | 18.4 | | 18.4 | 18.4 | |
| Yellow Time (s) | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| All-Red Time (s) | 1.6 | 1.6 | | 1.6 | 1.6 | | 1.6 | 1.6 | | 1.6 | 1.6 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Lost Time (s) | 5.6 | 5.6 | | 5.6 | 5.6 | | 5.6 | 5.6 | | 5.6 | 5.6 | |
| Lead/Lag | | | | | | | | | | | | |
| Lead-Lag Optimize? | | | | | | | | | | | | |
| Walk Time (s) | 7.0 | 7.0 | | 7.0 | 7.0 | | 7.0 | 7.0 | | 7.0 | 7.0 | |
| Flash Dont Walk (s) | 11.0 | 11.0 | | 11.0 | 11.0 | | 11.0 | 11.0 | | 11.0 | 11.0 | |
| Pedestrian Calls (#/hr) | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Act Effct Green (s) | 40.4 | 40.4 | | 40.4 | 40.4 | | 18.4 | 18.4 | | 18.4 | 18.4 | |
| Actuated g/C Ratio | 0.58 | 0.58 | | 0.58 | 0.58 | | 0.26 | 0.26 | | 0.26 | 0.26 | |

| Lane Group | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| v/c Ratio | 0.78 | 0.90 | | 0.47 | 0.50 | | 0.40 | 0.07 | | 0.06 | 0.24 | |
| Control Delay | 38.1 | 20.5 | | 27.5 | 9.8 | | 25.6 | 5.7 | | 19.9 | 6.9 | |
| Queue Delay | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | | 0.0 | 0.0 | |
| Total Delay | 38.1 | 20.5 | | 27.5 | 9.8 | | 25.6 | 5.7 | | 19.9 | 6.9 | |
| LOS | D | C | | C | A | | C | A | | B | A | |
| Approach Delay | | 22.2 | | | 10.7 | | | 22.0 | | | 8.8 | |
| Approach LOS | | C | | | B | | | C | | | A | |
| Queue Length 50th (m) | 18.5 | 102.4 | | 3.6 | 39.7 | | 15.1 | 0.0 | | 2.1 | 1.0 | |
| Queue Length 95th (m) | #58.1 | #165.1 | | #19.6 | 54.1 | | 30.3 | 4.5 | | 7.0 | 12.5 | |
| Internal Link Dist (m) | | 327.7 | | | 399.8 | | | 160.2 | | | 181.1 | |
| Turn Bay Length (m) | 60.0 | | | 50.0 | | | 20.0 | | | 20.0 | | |
| Base Capacity (vph) | 246 | 2023 | | 106 | 2040 | | 333 | 446 | | 361 | 497 | |
| Starvation Cap Reductn | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | | 0 | 0 | | 0 | 0 | | 0 | 0 | |
| Reduced v/c Ratio | 0.78 | 0.90 | | 0.47 | 0.50 | | 0.40 | 0.07 | | 0.06 | 0.24 | |

Intersection Summary

Area Type: Other
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Pretimed
Maximum v/c Ratio: 0.90
Intersection Signal Delay: 18.0 | Intersection LOS: B
Intersection Capacity Utilization 78.6% | ICU Level of Service D
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3:



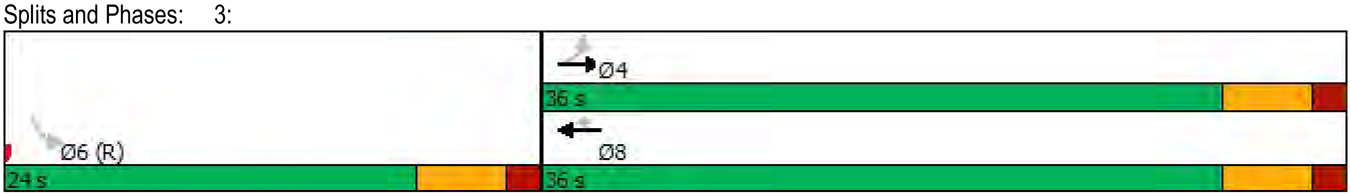
| Lane Group | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | |
| Traffic Volume (vph) | 55 | 1491 | 924 | 215 | 331 | 24 |
| Future Volume (vph) | 55 | 1491 | 924 | 215 | 331 | 24 |
| Ideal Flow (vphpl) | 1900 | 1900 | 1900 | 1900 | 1900 | 1900 |
| Storage Length (m) | 50.0 | | | 0.0 | 0.0 | 0.0 |
| Storage Lanes | 1 | | | 1 | 1 | 0 |
| Taper Length (m) | 7.5 | | | | 7.5 | |
| Lane Util. Factor | 1.00 | 0.95 | 0.95 | 1.00 | 1.00 | 1.00 |
| Frt | | | | 0.850 | 0.991 | |
| Flt Protected | 0.950 | | | | 0.955 | |
| Satd. Flow (prot) | 1772 | 3544 | 3544 | 1585 | 1765 | 0 |
| Flt Permitted | 0.223 | | | | 0.955 | |
| Satd. Flow (perm) | 416 | 3544 | 3544 | 1585 | 1765 | 0 |
| Right Turn on Red | | | | Yes | | Yes |
| Satd. Flow (RTOR) | | | | 234 | 6 | |
| Link Speed (k/h) | | 50 | 50 | | 50 | |
| Link Distance (m) | | 351.7 | 423.8 | | 205.1 | |
| Travel Time (s) | | 25.3 | 30.5 | | 14.8 | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles (%) | 3% | 3% | 3% | 3% | 3% | 3% |
| Adj. Flow (vph) | 60 | 1621 | 1004 | 234 | 360 | 26 |
| Shared Lane Traffic (%) | | | | | | |
| Lane Group Flow (vph) | 60 | 1621 | 1004 | 234 | 386 | 0 |
| Enter Blocked Intersection | No | No | No | No | No | No |
| Lane Alignment | Left | Left | Left | Right | Left | Right |
| Median Width(m) | | 6.0 | 6.0 | | 3.7 | |
| Link Offset(m) | | 0.0 | 0.0 | | 0.0 | |
| Crosswalk Width(m) | | 4.0 | 4.0 | | 4.0 | |
| Two way Left Turn Lane | | | | | | |
| Headway Factor | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 | 0.99 |
| Turning Speed (k/h) | 25 | | | 15 | 25 | 15 |
| Turn Type | Perm | NA | NA | Perm | Perm | |
| Protected Phases | | 4 | 8 | | | |
| Permitted Phases | 4 | | | 8 | 6 | |
| Minimum Split (s) | 23.6 | 23.6 | 23.6 | 23.6 | 23.6 | |
| Total Split (s) | 36.0 | 36.0 | 36.0 | 36.0 | 24.0 | |
| Total Split (%) | 60.0% | 60.0% | 60.0% | 60.0% | 40.0% | |
| Maximum Green (s) | 30.4 | 30.4 | 30.4 | 30.4 | 18.4 | |
| Yellow Time (s) | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| All-Red Time (s) | 1.6 | 1.6 | 1.6 | 1.6 | 1.6 | |
| Lost Time Adjust (s) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Lost Time (s) | 5.6 | 5.6 | 5.6 | 5.6 | 5.6 | |
| Lead/Lag | | | | | | |
| Lead-Lag Optimize? | | | | | | |
| Walk Time (s) | 7.0 | 7.0 | 7.0 | 7.0 | 7.0 | |
| Flash Dont Walk (s) | 11.0 | 11.0 | 11.0 | 11.0 | 11.0 | |
| Pedestrian Calls (#/hr) | 0 | 0 | 0 | 0 | 0 | |
| Act Effct Green (s) | 30.4 | 30.4 | 30.4 | 30.4 | 18.4 | |
| Actuated g/C Ratio | 0.51 | 0.51 | 0.51 | 0.51 | 0.31 | |

| Lane Group | EBL | EBT | WBT | WBR | SBL | SBR |
|---|---|---|---|---|---|---|
| v/c Ratio | 0.29 | 0.90 | 0.56 | 0.25 | 0.71 | |
| Control Delay | 13.1 | 22.7 | 11.7 | 2.1 | 27.0 | |
| Queue Delay | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| Total Delay | 13.1 | 22.7 | 11.7 | 2.1 | 27.0 | |
| LOS | B | C | B | A | C | |
| Approach Delay | | 22.3 | 9.9 | | 27.0 | |
| Approach LOS | | C | A | | C | |
| Queue Length 50th (m) | 3.7 | 82.5 | 38.7 | 0.0 | 38.4 | |
| Queue Length 95th (m) | 11.5 | #134.1 | 54.4 | 8.8 | #74.3 | |
| Internal Link Dist (m) | | 327.7 | 399.8 | | 181.1 | |
| Turn Bay Length (m) | 50.0 | | | | | |
| Base Capacity (vph) | 210 | 1795 | 1795 | 918 | 545 | |
| Starvation Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Spillback Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Storage Cap Reductn | 0 | 0 | 0 | 0 | 0 | |
| Reduced v/c Ratio | 0.29 | 0.90 | 0.56 | 0.25 | 0.71 | |

| Intersection Summary | |
|---|---|
| Area Type: Other | |
| Cycle Length: 60 | |
| Actuated Cycle Length: 60 | |
| Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green | |
| Natural Cycle: 60 | |
| Control Type: Pretimed | |
| Maximum v/c Ratio: 0.90 | |
| Intersection Signal Delay: 18.2 | Intersection LOS: B |
| Intersection Capacity Utilization 70.3% | ICU Level of Service C |
| Analysis Period (min) 15 | |

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

Splits and Phases: 3:



# LANE SUMMARY

## Site: Intersection 1 - St Jean - St 1 AM

New Site
Roundabout

**Lane Use and Performance**

| | Demand Flows Total veh/h | Demand Flows HV % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue Veh | 95% Back of Queue Dist m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East: Street No 1 | | | | | | | | | | | | | |
| Lane 1 | 446 | 3.0 | 1250 | 0.357 | 100 | 9.4 | LOS A | 2.0 | 14.7 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 553 | 3.0 | 1550 | 0.357 | 100 | 7.4 | LOS A | 2.1 | 15.3 | Full | 500 | 0.0 | 0.0 |
| Approach | 999 | 3.0 | | 0.357 | | 8.3 | LOS A | 2.1 | 15.3 | | | | |
| NorthWest: St Jean St | | | | | | | | | | | | | |
| Lane 1[d] | 360 | 3.0 | 976 | 0.369 | 100 | 5.6 | LOS A | 1.5 | 10.7 | Full | 500 | 0.0 | 0.0 |
| Approach | 360 | 3.0 | | 0.369 | | 5.6 | LOS A | 1.5 | 10.7 | | | | |
| SouthWest: St Jean St | | | | | | | | | | | | | |
| Lane 1 | 244 | 3.0 | 1444 | 0.169 | 100 | 9.6 | LOS A | 0.9 | 6.6 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 287 | 3.0 | 1730 | 0.166 | 98[5] | 2.0 | LOS A | 0.9 | 6.7 | Full | 500 | 0.0 | 0.0 |
| Approach | 532 | 3.0 | | 0.169 | | 5.5 | LOS A | 0.9 | 6.7 | | | | |
| Intersection | 1891 | 3.0 | | 0.369 | | 7.0 | LOS A | 2.1 | 15.3 | | | | |

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

5 Lane under-utilisation found by the program
d Dominant lane on roundabout approach


Organisation: CASTLEGLENN CONSULTANTS | Processed: Monday, March 13, 2023 1:12:12 PM
Project: C:\Castleglenn\7307 - Rockland EA\Intersection 1-4 Roundabout Analysis.sip6

# LANE SUMMARY

**Site: Intersection 2 - Poupart - St Jean - AM**

New Site
Roundabout

| Lane Use and Performance | Demand Flows Total veh/h | Demand Flows HV % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue Veh | 95% Back of Queue Dist m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: St. Jean St | | | | | | | | | | | | | |
| Lane 1[d] | 499 | 3.0 | 1309 | 0.381 | 100 | 10.2 | LOS B | 1.8 | 13.0 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 220 | 3.0 | 1009 | 0.218 | 100 | 4.4 | LOS A | 0.8 | 6.1 | Full | 500 | 0.0 | 0.0 |
| Approach | 719 | 3.0 | | 0.381 | | 8.4 | LOS A | 1.8 | 13.0 | | | | |
| East: St. Jean St | | | | | | | | | | | | | |
| Lane 1 | 512 | 3.0 | 1003 | 0.511 | 100 | 10.7 | LOS B | 3.7 | 26.6 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 657 | 3.0 | 1288 | 0.511 | 100 | 5.1 | LOS A | 3.9 | 27.7 | Full | 500 | 0.0 | 0.0 |
| Approach | 1169 | 3.0 | | 0.511 | | 7.6 | LOS A | 3.9 | 27.7 | | | | |
| North: New Road 2 | | | | | | | | | | | | | |
| Lane 1[d] | 241 | 3.0 | 592 | 0.407 | 100 | 10.0 | LOS A | 2.2 | 15.8 | Full | 500 | 0.0 | 0.0 |
| Approach | 241 | 3.0 | | 0.407 | | 10.0 | LOS A | 2.2 | 15.8 | | | | |
| West: Poupart Road | | | | | | | | | | | | | |
| Lane 1 | 238 | 3.0 | 1065 | 0.224 | 100 | 5.7 | LOS A | 1.2 | 8.7 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 301 | 3.0 | 1343 | 0.224 | 100 | 4.4 | LOS A | 1.3 | 9.5 | Full | 500 | 0.0 | 0.0 |
| Approach | 539 | 3.0 | | 0.224 | | 5.0 | LOS A | 1.3 | 9.5 | | | | |
| Intersection | 2668 | 3.0 | | 0.511 | | 7.5 | LOS A | 3.9 | 27.7 | | | | |

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

# LANE SUMMARY

## Site: Intersection 3 - Poupart - Stewart Village - AM

New Site
Roundabout

**Lane Use and Performance**

| | Demand Flows Total veh/h | HV % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue Veh | Dist m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: New Road 3 / Stewart Village S | | | | | | | | | | | | | |
| Lane 1[d] | 246 | 3.0 | 1100 | 0.224 | 100 | 9.3 | LOS A | 0.7 | 5.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 246 | 3.0 | | 0.224 | | 9.3 | LOS A | 0.7 | 5.0 | | | | |
| East: Poupart Road | | | | | | | | | | | | | |
| Lane 1 | 649 | 3.0 | 1231 | 0.527 | 100 | 4.2 | LOS A | 3.6 | 25.5 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 796 | 3.0 | 1511 | 0.527 | 100 | 3.8 | LOS A | 3.7 | 26.6 | Full | 500 | 0.0 | 0.0 |
| Approach | 1444 | 3.0 | | 0.527 | | 4.0 | LOS A | 3.7 | 26.6 | | | | |
| North: Stewart Village 1st | | | | | | | | | | | | | |
| Lane 1[d] | 215 | 3.0 | 670 | 0.320 | 100 | 7.9 | LOS A | 1.5 | 10.5 | Full | 500 | 0.0 | 0.0 |
| Approach | 215 | 3.0 | | 0.320 | | 7.9 | LOS A | 1.5 | 10.5 | | | | |
| West: Poupart Road | | | | | | | | | | | | | |
| Lane 1 | 266 | 3.0 | 1440 | 0.185 | 100 | 4.2 | LOS A | 0.9 | 6.5 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 316 | 3.0 | 1712 | 0.185 | 100 | 2.9 | LOS A | 0.9 | 6.7 | Full | 500 | 0.0 | 0.0 |
| Approach | 582 | 3.0 | | 0.185 | | 3.5 | LOS A | 0.9 | 6.7 | | | | |
| Intersection | 2487 | 3.0 | | 0.527 | | 4.7 | LOS A | 3.7 | 26.6 | | | | |

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach


Organisation: CASTLEGLENN CONSULTANTS | Processed: Monday, March 13, 2023 3:00:50 PM
Project: C:\Castleglenn\7307 - Rockland EA\Intersection 1-4 Roundabout Analysis.sip6

# LANE SUMMARY

## Site: Intersection 4 - Poupart - AM

New Site
Roundabout

**Lane Use and Performance**

| | Demand Flows Total veh/h | Demand Flows HV % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue Veh | 95% Back of Queue Dist m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East: Poupart Road | | | | | | | | | | | | | |
| Lane 1 | 815 | 3.0 | 1514 | 0.538 | 100 | 2.8 | LOS A | 4.3 | 30.8 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 981 | 3.0 | 1822 | 0.538 | 100 | 2.9 | LOS A | 4.2 | 30.4 | Full | 500 | 0.0 | 0.0 |
| Approach | 1796 | 3.0 | | 0.538 | | 2.8 | LOS A | 4.3 | 30.8 | | | | |
| North: Stewart Village 1st | | | | | | | | | | | | | |
| Lane 1[d] | 177 | 3.0 | 831 | 0.213 | 100 | 10.4 | LOS B | 0.8 | 5.8 | Full | 500 | 0.0 | 0.0 |
| Approach | 177 | 3.0 | | 0.213 | | 10.4 | LOS B | 0.8 | 5.8 | | | | |
| West: Poupart Road | | | | | | | | | | | | | |
| Lane 1 | 220 | 3.0 | 1343 | 0.164 | 100 | 3.1 | LOS A | 0.9 | 6.3 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 263 | 3.0 | 1604 | 0.164 | 100 | 2.7 | LOS A | 0.9 | 6.6 | Full | 500 | 0.0 | 0.0 |
| Approach | 483 | 3.0 | | 0.164 | | 2.9 | LOS A | 0.9 | 6.6 | | | | |
| Intersection | 2456 | 3.0 | | 0.538 | | 3.4 | LOS A | 4.3 | 30.8 | | | | |

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akcelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

# LANE SUMMARY

## Site: Intersection 1 - St Jean - St 1 PM

New Site
Roundabout

**Lane Use and Performance**

| | Demand Flows Total veh/h | Demand Flows HV % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue Veh | 95% Back of Queue Dist m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East: Street No 1 | | | | | | | | | | | | | |
| Lane 1 | 283 | 3.0 | 1095 | 0.258 | 100 | 10.0 | LOS A | 1.5 | 10.7 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 361 | 3.0 | 1399 | 0.258 | 100 | 8.2 | LOS A | 1.6 | 11.5 | Full | 500 | 0.0 | 0.0 |
| Approach | 644 | 3.0 | | 0.258 | | 9.0 | LOS A | 1.6 | 11.5 | | | | |
| NorthWest: St Jean St | | | | | | | | | | | | | |
| Lane 1[d] | 469 | 3.0 | 1082 | 0.434 | 100 | 6.0 | LOS A | 1.8 | 13.1 | Full | 500 | 0.0 | 0.0 |
| Approach | 469 | 3.0 | | 0.434 | | 6.0 | LOS A | 1.8 | 13.1 | | | | |
| SouthWest: St Jean St | | | | | | | | | | | | | |
| Lane 1 | 592 | 3.0 | 1322 | 0.448 | 100 | 7.8 | LOS A | 3.1 | 22.2 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 723 | 3.0 | 1614 | 0.448 | 100 | 2.4 | LOS A | 3.2 | 23.0 | Full | 500 | 0.0 | 0.0 |
| Approach | 1315 | 3.0 | | 0.448 | | 4.8 | LOS A | 3.2 | 23.0 | | | | |
| Intersection | 2428 | 3.0 | | 0.448 | | 6.2 | LOS A | 3.2 | 23.0 | | | | |

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

# LANE SUMMARY

## Site: Intersection 2 - Poupart - St Jean - PM

New Site
Roundabout

**Lane Use and Performance**

| | Demand Flows Total veh/h | Demand Flows HV % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue Veh | 95% Back of Queue Dist m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: St. Jean St | | | | | | | | | | | | | |
| Lane 1 [d] | 462 | 3.0 | 942 | 0.491 | 100 | 12.0 | LOS B | 3.2 | 22.9 | Full | 500 | 0.0 | 0.0 |
| Lane 2 | 419 | 3.0 | 739 | 0.567 | 100 | 8.1 | LOS A | 3.7 | 26.2 | Full | 500 | 0.0 | 0.0 |
| Approach | 881 | 3.0 | | 0.567 | | 10.1 | LOS B | 3.7 | 26.2 | | | | |
| East: St. Jean St | | | | | | | | | | | | | |
| Lane 1 | 385 | 3.0 | 907 | 0.424 | 100 | 11.2 | LOS B | 2.8 | 20.3 | Full | 500 | 0.0 | 0.0 |
| Lane 2 [d] | 500 | 3.0 | 1180 | 0.424 | 100 | 5.3 | LOS A | 3.2 | 22.8 | Full | 500 | 0.0 | 0.0 |
| Approach | 885 | 3.0 | | 0.424 | | 7.8 | LOS A | 3.2 | 22.8 | | | | |
| North: New Road 2 | | | | | | | | | | | | | |
| Lane 1 [d] | 153 | 3.0 | 721 | 0.212 | 100 | 7.2 | LOS A | 0.9 | 6.8 | Full | 500 | 0.0 | 0.0 |
| Approach | 153 | 3.0 | | 0.212 | | 7.2 | LOS A | 0.9 | 6.8 | | | | |
| West: Poupart Road | | | | | | | | | | | | | |
| Lane 1 | 713 | 3.0 | 1122 | 0.635 | 100 | 7.0 | LOS A | 5.7 | 40.6 | Full | 500 | 0.0 | 0.0 |
| Lane 2 [d] | 887 | 3.0 | 1396 | 0.635 | 100 | 5.1 | LOS A | 5.8 | 41.3 | Full | 500 | 0.0 | 0.0 |
| Approach | 1600 | 3.0 | | 0.635 | | 5.9 | LOS A | 5.8 | 41.3 | | | | |
| Intersection | 3519 | 3.0 | | 0.635 | | 7.5 | LOS A | 5.8 | 41.3 | | | | |

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

# LANE SUMMARY

## Site: Intersection 3 - Poupart - Stewart Village - PM

New Site
Roundabout

| Lane Use and Performance | Demand Flows Total veh/h | Demand Flows HV % | Cap veh/h | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue Veh | 95% Back of Queue Dist m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| South: New Road 3 / Stewart Village S | | | | | | | | | | | | | |
| Lane 1[d] | 162 | 3.0 | 696 | 0.233 | 100 | 12.2 | LOS B | 1.0 | 7.1 | Full | 500 | 0.0 | 0.0 |
| Approach | 162 | 3.0 | | 0.233 | | 12.2 | LOS B | 1.0 | 7.1 | | | | |
| East: Poupart Road | | | | | | | | | | | | | |
| Lane 1 | 467 | 3.0 | 1174 | 0.398 | 100 | 4.9 | LOS A | 2.3 | 16.8 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 578 | 3.0 | 1454 | 0.398 | 100 | 3.9 | LOS A | 2.5 | 17.8 | Full | 500 | 0.0 | 0.0 |
| Approach | 1045 | 3.0 | | 0.398 | | 4.3 | LOS A | 2.5 | 17.8 | | | | |
| North: Stewart Village 1st | | | | | | | | | | | | | |
| Lane 1[d] | 140 | 3.0 | 833 | 0.168 | 100 | 6.1 | LOS A | 0.6 | 4.6 | Full | 500 | 0.0 | 0.0 |
| Approach | 140 | 3.0 | | 0.168 | | 6.1 | LOS A | 0.6 | 4.6 | | | | |
| West: Poupart Road | | | | | | | | | | | | | |
| Lane 1 | 884 | 3.0 | 1427 | 0.619 | 100 | 4.6 | LOS A | 4.9 | 35.5 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 1062 | 3.0 | 1714 | 0.619 | 100 | 3.1 | LOS A | 4.9 | 35.4 | Full | 500 | 0.0 | 0.0 |
| Approach | 1945 | 3.0 | | 0.619 | | 3.8 | LOS A | 4.9 | 35.5 | | | | |
| Intersection | 3293 | 3.0 | | 0.619 | | 4.5 | LOS A | 4.9 | 35.5 | | | | |

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

# LANE SUMMARY

## Site: Intersection 4 - Poupart - PM

New Site
Roundabout

**Lane Use and Performance**

| | Demand Flows Total veh/h | HV % | Cap. veh/h | Deg. Satn v/c | Lane Util. % | Average Delay sec | Level of Service | 95% Back of Queue Veh | Dist m | Lane Config | Lane Length m | Cap. Adj. % | Prob. Block. % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| East: Poupart Road | | | | | | | | | | | | | |
| Lane 1 | 546 | 3.0 | 1420 | 0.384 | 100 | 3.0 | LOS A | 2.8 | 19.9 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 653 | 3.0 | 1700 | 0.384 | 100 | 3.1 | LOS A | 2.9 | 20.6 | Full | 500 | 0.0 | 0.0 |
| Approach | 1199 | 3.0 | | 0.384 | | 3.0 | LOS A | 2.9 | 20.6 | | | | |
| North: Stewart Village 1st | | | | | | | | | | | | | |
| Lane 1[d] | 374 | 3.0 | 948 | 0.394 | 100 | 11.5 | LOS B | 1.7 | 11.9 | Full | 500 | 0.0 | 0.0 |
| Approach | 374 | 3.0 | | 0.394 | | 11.5 | LOS B | 1.7 | 11.9 | | | | |
| West: Poupart Road | | | | | | | | | | | | | |
| Lane 1 | 724 | 3.0 | 1106 | 0.654 | 100 | 6.3 | LOS A | 6.4 | 46.2 | Full | 500 | 0.0 | 0.0 |
| Lane 2[d] | 904 | 3.0 | 1381 | 0.654 | 100 | 4.7 | LOS A | 6.5 | 46.5 | Full | 500 | 0.0 | 0.0 |
| Approach | 1627 | 3.0 | | 0.654 | | 5.4 | LOS A | 6.5 | 46.5 | | | | |
| Intersection | 3200 | 3.0 | | 0.654 | | 5.2 | LOS A | 6.5 | 46.5 | | | | |

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Signalised Intersections.
Lane LOS values are based on average delay and v/c ratio (degree of saturation) per lane.
LOS F will result if v/c > irrespective of lane delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all lanes (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: SIDRA Standard.
SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

d Dominant lane on roundabout approach

# APPENDIX "J"

## Conceptual Level Costing

## Summary of Intersections Cost Estimates ($M)

### Assumptions:

| Item | Assumptions |
|---|---|
| Earthwork construction cost | City of Ottawa Nov 29, 2022 |
| Utility protection/relocation cost | 5% of construction cost |
| Small culvert crossing: | 5% of construction cost for intersection #1 and 3% for others |
| Temporary Traffic Control Plan | 5% of construction cost |
| Mobilization and Engineering | 15% of construction cost |
| Contingency | 20% of construction cost |

### Intersection assumed dimensions for cost estimates

| Intersection | East (m) | West (m) | North (m) | South (m) |
|---|---|---|---|---|
| #1 | 160 | 332 | 98 | n/a |
| #2 | 190 | 152 | 90 | 152 |
| #3 | 130 | 115 | 100 | 100 |
| #4 | 115 | 105 | 130 | n/a |
| Segment Between #2 and #3 | 578 | | | |

The roadway estimate between intersection #1 and #2 is included in intersection #1
The roadway estimate between intersection #3 and #4 is included in intersection #3 and #4 (split in the middle)

### Exclusions:

1. Property acquisition cost
2. High-voltage power lines
3. Supply to accommodate streetlights and traffic signals;
4. Landscaping requirements instead of grass;
5. Major culvert crossing at intersection #1
6. Erosion and sedimentation control measures
7. Staging Cost
8. Proposed new utilities

### Summary of Cost for each intersection and option

| Summary:Rockland - Preliminary Construction Cost Estimate | Intersection #1 Traffic Signal Option ($M) | Intersection #1 Roundabout Option ($M) | Intersection #2 Traffic Signal Option ($M) | Intersection #2 Roundabout Option ($M) | Intersection #3 Traffic Signal Option ($M) | Intersection #3 Roundabout Option ($M) | Intersection #4 Traffic Signal Option ($M) | Intersection #4 Roundabout Option ($M) |
|---|---|---|---|---|---|---|---|---|
| Roadway Sub-Total | $3.82 | $5.08 | $2.35 | $2.65 | $1.70 | $2.00 | $1.62 | $2.19 |
| Drainage System Sub-Total | $0.70 | $0.72 | $0.63 | $0.63 | $0.51 | $0.51 | $0.41 | $0.41 |
| Traffic Signal Sub-Total | $0.27 | $0.00 | $0.53 | $0.00 | $0.53 | $0.00 | $0.29 | $0.00 |
| Pavement Marking, Signage and Barrier Sub-Total | $0.04 | $0.08 | $0.03 | $0.06 | $0.03 | $0.05 | $0.02 | $0.05 |
| Street Light Sub-Total | $0.23 | $0.27 | $0.18 | $0.22 | $0.05 | $0.07 | $0.07 | $0.09 |
| Service Roads and Utility Corridor Sub-Total | $1.04 | $1.03 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 | $0.00 |
| **Total Construction Cost** | **$6.10** | **$7.17** | **$3.72** | **$3.55** | **$2.82** | **$2.63** | **$2.41** | **$2.73** |
| Estimate of Mobilization and Engineering | $0.91 (15%) | $1.08 (15%) | $0.56 (15%) | $0.53 (15%) | $0.42 (15%) | $0.40 (15%) | $0.36 (15%) | $0.41 (15%) |
| Utility Protection/Relocations | $0.30 (5%) | $0.36 (5%) | $0.19 (5%) | $0.18 (5%) | $0.14 (5%) | $0.13 (5%) | $0.12 (5%) | $0.14 (5%) |
| Culvert Crossings | $0.30 (5%) | $0.36 (5%) | $0.11 (3%) | $0.11 (3%) | $0.08 (3%) | $0.08 (3%) | $0.07 (3%) | $0.08 (3%) |
| Temporary Traffic Control Plan and Services during Construction | $0.30 (5%) | $0.36 (5%) | $0.19 (5%) | $0.18 (5%) | $0.14 (5%) | $0.13 (5%) | $0.12 (5%) | $0.14 (5%) |
| Contingency | $1.59 (20%) | $1.86 (20%) | $0.95 (20%) | $0.91 (20%) | $0.72 (20%) | $0.67 (20%) | $0.62 (20%) | $0.70 (20%) |
| **Total Cost Estimate** | **$9.51** | **$11.19** | **$5.71** | **$5.46** | **$4.33** | **$4.05** | **$3.71** | **$4.20** |

### Summary of Cost

| Intersection | Signalized ($M) | Roundabout ($M) |
|---|---|---|
| #1 | $9.51 | $11.19 |
| #2 | $5.71 | $5.46 |
| #3 | $4.33 | $4.05 |
| #4 | $3.71 | $4.20 |
| Sub Total | **$23.26** | **$24.90** |
| Roadway Between Int. #2 and #3 | $7.24 | |
| Total | **$30.51** | **$32.14** |

**Rockland - Preliminary Construction Cost Estimate - Intersection #1 Traffic Signal Option**

| No. | ITEM | UNIT | ESTIMATED UNIT PRICE | QUANTITY | TOTAL AMOUNT |
|---|---|---|---|---|---|
| 1 | **Roadway** | | | | |
| 1.1 | Cutting of Pavement | m | $13.45 | 185 | $2,488 |
| 1.2 | Asphalt Removal | m2 | $46.30 | 3552 | $164,458 |
| 1.3 | Hydro Pol Removal | ea | $208.33 | 11 | $2,292 |
| 1.4 | Earth Excavation Including all Removals (min Cut 600mm) | m3 | $45.10 | 6237.32 | $281,303 |
| 1.5 | Borrow Excavation Loaded to Trucks (Fill 200mm) | m3 | $39.72 | 3107.72 | $123,439 |
| | Borrow Excavation Loaded to Trucks (Fill 2800mm) | m3 | $39.72 | 21550.48 | $855,985 |
| 1.6 | Granular Base Course A (150mm) | t | $47.68 | 3730.584 | $177,874 |
| 1.7 | Granular Sub-base Course B (600mm) | t | $37.81 | 10467.82 | $395,788 |
| 1.8 | Erosion and Sediment Control | LS | $6,700.00 | 1 | $6,700 |
| 1.9 | Roundabout Central Island | m2 | $36.82 | 0 | $0 |
| 1.10 | Concrete Curb | m | $154.19 | 73 | $11,256 |
| 1.11 | Curb and Gutter | m | $222.22 | 1156 | $256,886 |
| 1.12 | Mountable Curb with Gutter | m | $226.74 | 0 | $0 |
| 1.13 | Hot Mix Asphalt - Superpave 12.5mm Level B (40mm Surface Course) | t | $420.41 | 809.784 | $340,441 |
| 1.14 | Hot Mix Asphalt - Superpave 19.0mm Level B (2x50mm Base Course) | t | $406.04 | 1799.52 | $730,677 |
| 1.15 | Median Concrete Surfacing | m2 | $167.23 | 182 | $30,436 |
| 1.16 | Truck Apron Concrete Pavement 250mm | m2 | $171.56 | 0 | $0 |
| 1.17 | Top soil, Imported (100mm thick) | m3 | $102.28 | 475.4 | $48,624 |
| 1.18 | Hydroseeding | m2 | $2.00 | 4754 | $9,508 |
| 1.19 | Multi Use Path (Asphalt) | m2 | $72.03 | 1560.6 | $112,410 |
| 1.20 | Sidewalk (Concrete) | m2 | $223.08 | 1218 | $271,711 |
| | **Roadway Sub-Total** | | | | **$3,822,277** |
| 2 | **Drainage System** | | | | |
| 2.1 | Catch basin | ea | $5,550.51 | 20 | $111,010 |
| 2.2 | Catch basin Leads | m | $569.57 | 140 | $79,740 |
| 2.3 | Sub-drain | m | $68.20 | 686 | $46,785 |
| 2.4 | Storm Sewer Pipe (300 mm) | m | $419.48 | 270 | $113,260 |
| 2.5 | Storm Sewer Pipe (600 mm) | m | $913.37 | 343 | $313,286 |
| 2.6 | Manhole | ea | $6,000.00 | 6 | $36,000 |
| | **Drainage System Sub-Total** | | | | **$700,081** |
| 3 | **Traffic Signals** | | | | |
| 3.1 | Short Over Head Traffic Signal | ea | $50,000.00 | 2 | $100,000 |
| 3.2 | Long Over Head Traffic Signal | ea | $55,000.00 | 3 | $165,000 |
| 3.3 | Double Short Heads Traffic Signals | ea | $60,000.00 | 0 | $0 |
| | **Traffic Signal Sub-Total** | | | | **$265,000** |
| 4 | **Pavement Marking, Signage, and Barrier** | | | | |
| 4.1 | Install Sign (Stop and Yield) | ea | $400.00 | 1 | $400 |
| 4.2 | Street Name Sign | ea | $150.00 | 4 | $600 |
| 4.3 | Intersection Information Signage | ea | $2,000.00 | 3 | $6,000 |
| 4.4 | Other Signages (speed limit, Object markers,..) | LS | $2,000.00 | 1 | $2,000 |
| 4.5 | TWSI | m2 | $1,288.94 | 14.457 | $18,634 |
| 4.6 | Pavement Marking | LS | $5,000.00 | 1 | $5,000 |
| 4.7 | Strong Post W-Beam Guardrail - Supply and Install | m | $100.00 | 120 | $12,000 |
| | **Pavement Marking, Signage and Barrier Sub-Total** | | | | **$44,634** |
| 5 | **Street Light** | | | | |
| 5.1 | Single street light | ea | $10,000.00 | 23 | **$230,000** |
| | **Street Light Sub-Totsl** | | | | **$230,000** |
| 6 | **Service Roads and Utility Corridor** | | | | |
| 6.1 | Removal Retaining Wall | m3 | $3,124.18 | 9 | $27,337 |
| 6.2 | Retaining Wall | m3 | $1,438.95 | 14 | $20,145 |
| 6.3 | Uitlity Corridor - Cut (150mm) | m3 | $45.10 | 665 | $29,969 |
| 6.4 | Uitlity Corridor - Fill (2000mm) | m3 | $39.72 | 10189 | $404,707 |
| 6.5 | Private Service Road (East Side of St Jean St.) | m | $2,000.00 | 172 | $344,000 |
| 6.6 | Service Road (West Side of St. Jean St.) | m | $1,000.00 | 210 | $210,000 |
| | **Service Roads and Utility Corridor Sub-Total** | | | | **$1,036,158** |
| | **Total Construction Cost** | | | | **$6,098,149** |
| | Estimate of Mobilization and Engineering | | | 15% | $914,722 |
| | Utility Protection/Relocations | | | 5% | $304,907 |
| | Culvert Crossings | | | 5% | $304,907 |
| | Temporary Traffic Control Plan and Services during Construction | | | 5% | $304,907 |
| | **Sub-Total** | | | | **$7,927,594** |
| | Contingency | | | 20% | $1,585,519 |
| | **Total Cost Estimate** | | | | **$9,513,113** |

**Rockland - Preliminary Construction Cost Estimate - Intersection #1 Roundabout Option**

| No. | ITEM | UNIT | ESTIMATED UNIT PRICE | QUANTITY | TOTAL AMOUNT |
|---|---|---|---|---|---|
| 1 | **Roadway** | | | | |
| 1.1 | Cutting of Pavement | m | $13.45 | 120 | $1,614 |
| 1.2 | Asphalt Removal | m2 | $46.30 | 3899 | $180,524 |
| 1.3 | Hydro Pol Removal | ea. | $208.33 | 11 | $2,292 |
| 1.4 | Earth Excavation Including all Removals (min Cut 600mm) | m3 | $45.10 | 7322.46 | $330,243 |
| 1.5 | Borrow Excavation Loaded to Trucks (Fill 200mm) | m3 | $39.72 | 3716.46 | $147,618 |
| 1.6 | Borrow Excavation to Reprofile St Jean (Average Fill 3000mm) | m3 | $39.72 | 36381 | $1,445,053 |
| 1.7 | Granular Base Course A (150mm) | t | $47.68 | 4425.333 | $211,000 |
| 1.8 | Granular Sub-base Course B (600mm) | t | $37.81 | 12771.44 | $482,888 |
| 1.9 | Erosion and Sediment Control | LS | $6,700.00 | 1 | $6,700 |
| 1.10 | Roundabout Central Island | m2 | $36.82 | 1018 | $37,487 |
| 1.11 | Concrete Curb | m | $154.19 | 543 | $83,725 |
| 1.12 | Curb and Gutter | m | $222.22 | 1146 | $254,664 |
| 1.13 | Mountable Curb with Gutter | m | $226.74 | 138 | $31,290 |
| 1.14 | Hot Mix Asphalt - Superpave 12.5mm Level B (40mm Surface Course) | t | $420.41 | 841.248 | $353,669 |
| 1.15 | Hot Mix Asphalt - Superpave 19.0mm Level B (2x50mm Base Course) | t | $406.04 | 1957.76 | $794,929 |
| 1.16 | Median Concrete Surfacing | m2 | $167.23 | 1132 | $189,304 |
| 1.17 | Truck Apron Concrete Pavement 250mm | m2 | $171.56 | 503 | $86,295 |
| 1.18 | Top soil, Imported (100mm thick) | m3 | $102.28 | 570.5 | $58,351 |
| 1.19 | Hydroseeding | m2 | $2.00 | 5705 | $11,410 |
| 1.20 | Multi Use Path (Asphalt) | m2 | $72.03 | 1598.4 | $115,133 |
| 1.21 | Sidewalk (Concrete) | m2 | $223.08 | 1131.9 | $252,504 |
| | **Roadway Sub-Total** | | | | **$5,076,692** |
| 2 | **Drainage System** | | | | |
| 2.1 | Catch basin | ea. | $5,550.51 | 22 | $122,111 |
| 2.2 | Catch basin Leads | m | $569.57 | 154 | $87,714 |
| 2.3 | Sub-drain | m | $68.20 | 686 | $46,785 |
| 2.4 | Storm Sewer Pipe (300 mm) | m | $419.48 | 263 | $110,323 |
| 2.5 | Storm Sewer Pipe (600 mm) | m | $913.37 | 343 | $313,286 |
| 2.6 | Manhole | ea. | $6,000.00 | 6 | $36,000 |
| | **Drainage System Sub-Total** | | | | **$716,219** |
| 3 | **Traffic Signals** | | | | |
| 3.1 | Short Over Head Traffic Signal | ea. | $50,000.00 | 0 | $0 |
| 3.2 | Long Over Head Traffic Signal | ea. | $55,000.00 | 0 | $0 |
| 3.3 | Double Short Heads Traffic Signals | ea. | $60,000.00 | 0 | $0 |
| | **Traffic Signal Sub-Total** | | | | **$0** |
| 4 | **Pavement Marking, Signage, and Barrier** | | | | |
| 4.1 | Install Sign (Stop and Yield) | ea. | $400.00 | 5 | $2,000 |
| 4.2 | Street Name Sign | ea. | $150.00 | 3 | $450 |
| 4.3 | Intersection Information Signage | ea. | $2,000.00 | 6 | $12,000 |
| 4.4 | Other Signages (speed limit, Pedestrians, Object markers,..) | LS | $2,500.00 | 1 | $2,500 |
| 4.5 | TWSI | m2 | $1,288.94 | 34.6 | $44,597 |
| 4.6 | Pavement Marking | LS | $7,000.00 | 1 | $7,000 |
| 4.7 | Strong Post W-Beam Guardrail - Supply and Install | m | $100.00 | 120 | $12,000 |
| | **Pavement Marking, Signage and Barrier Sub-Total** | | | | **$80,547** |
| 5 | **Street Light** | | | | |
| 5.1 | Single street light | ea. | $10,000.00 | 27 | **$270,000** |
| | **Street Light Sub-Totsl** | | | | **$270,000** |
| 6 | **Service Roads and Utility Corridor** | | | | |
| 6.1 | Removal Retaining Wall | m3 | $3,124.18 | 9 | $27,337 |
| 6.2 | Retaining Wall | m3 | $1,438.95 | 14 | $20,145 |
| 6.3 | Uitlity Corridor - Cut (150mm) | m3 | $45.10 | 603 | $27,202 |
| 6.4 | Uitlity Corridor - Fill (2500mm) | m3 | $39.72 | 10053 | $399,285 |
| 6.5 | Private Service Road (East Side of St Jean St.) | m | $2,000.00 | 172 | $344,000 |
| 6.6 | Service Road (West Side of St. Jean St.) | m | $1,000.00 | 210 | $210,000 |
| | **Service Roads and Utility Corridor Sub-Total** | | | | **$1,027,969** |
| | **Total Construction Cost** | | | | **$7,171,428** |
| | Estimate of Mobilization and Engineering | | | 15% | $1,075,714 |
| | Utility Protection/Relocations | | | 5% | $358,571 |
| | Culvert Crossings | | | 5% | $358,571 |
| | Temporary Traffic Control Plan and Services during Construction | | | 5% | $358,571 |
| | **Sub-Total** | | | | **$9,322,857** |
| | Contingency | | | 20% | $1,864,571 |
| | **Total Cost Estimate** | | | | **$11,187,428** |

**Rockland - Preliminary Construction Cost Estimate - Intersection #2 Traffic Signal Option**

| No. | ITEM | UNIT | ESTIMATED UNIT PRICE | QUANTITY | TOTAL AMOUNT |
|---|---|---|---|---|---|
| 1 | **Roadway** | | | | |
| 1.1 | Cutting of Pavement | m | $13.45 | 1156 | $15,548 |
| 1.2 | Asphalt Removal | m2 | $46.30 | 319 | $14,770 |
| 1.3 | Hydro Pol Removal | ea | $208.33 | 15 | $3,125 |
| 1.4 | Earth Excavation Including all Removals (min Cut 600mm) | m3 | $45.10 | 4280.2 | $193,037 |
| 1.5 | Borrow Excavation Loaded to Trucks (Fill 200mm) | m3 | $39.72 | 1859.8 | $73,871 |
| 1.6 | Granular Base Course A (150mm) | t | $47.68 | 2785.134 | $132,795 |
| 1.7 | Granular Sub-base Course B (600mm) | t | $37.81 | 8418.52 | $318,304 |
| 1.8 | Erosion and Sediment Control | LS | $6,700.00 | 1 | $6,700 |
| 1.9 | Roundabout Central Island | m2 | $36.82 | 0 | $0 |
| 1.10 | Concrete Curb | m | $154.19 | 470 | $72,469 |
| 1.11 | Curb and Gutter | m | $222.22 | 1066 | $236,887 |
| 1.12 | Mountable Curb with Gutter | m | $226.74 | 0 | $0 |
| 1.13 | Hot Mix Asphalt - Superpave 12.5mm Level B (40mm Surface Course) | t | $420.41 | 921.748 | $387,512 |
| 1.14 | Hot Mix Asphalt - Superpave 19.0mm Level B (2x50mm Base Course) | t | $406.04 | 1391.73 | $565,098 |
| 1.15 | Median Concrete Surfacing | m2 | $167.23 | 560 | $93,649 |
| 1.16 | Truck Apron Concrete Pavement 250mm | m2 | $171.56 | 0 | $0 |
| 1.17 | Top soil, Imported (100mm thick) | m3 | $102.28 | 114 | $11,660 |
| 1.18 | Hydroseeding | m2 | $2.00 | 1140 | $2,280 |
| 1.19 | Multi Use Path (Asphalt) | m2 | $72.03 | 842.4 | $60,678 |
| 1.20 | Sidewalk (Concrete) | m2 | $223.08 | 705.6 | $157,405 |
| | **Roadway Sub-Total** | | | | **$2,345,789** |
| 2 | **Drainage System** | | | | |
| 2.1 | Catch basin | ea | $5,550.51 | 20 | $111,010 |
| 2.2 | Catch basin Leads | m | $569.57 | 140 | $79,740 |
| 2.3 | Sub-drain | m | $68.20 | 672 | $45,830 |
| 2.4 | Storm Sewer Pipe (300 mm) | m | $419.48 | 151 | $63,341 |
| 2.5 | Storm Sewer Pipe (600 mm) | m | $913.37 | 336 | $306,892 |
| 2.6 | Manhole | ea | $6,000.00 | 4 | $24,000 |
| | **Drainage System Sub-Total** | | | | **$630,814** |
| 3 | **Traffic Signals** | | | | |
| 3.1 | Short Over Head Traffic Signal | ea | $50,000.00 | 6 | $300,000 |
| 3.2 | Long Over Head Traffic Signal | ea | $55,000.00 | 2 | $110,000 |
| 3.3 | Double Short Heads Traffic Signals | ea | $60,000.00 | 2 | $120,000 |
| | **Traffic Signal Sub-Total** | | | | **$530,000** |
| 4 | **Pavement Marking, Signage, and Barrier** | | | | |
| 4.1 | Install Sign (Stop and Yield) | ea | $400.00 | 1 | $400 |
| 4.2 | Street Name Sign | ea | $150.00 | 4 | $600 |
| 4.3 | Intersection Information Signage | ea | $2,000.00 | 3 | $6,000 |
| 4.4 | Other Signages (speed limit, Object markers,..) | LS | $2,000.00 | 1 | $2,000 |
| 4.5 | TWSI | m2 | $1,288.94 | 13.054 | $16,826 |
| 4.6 | Pavement Marking | LS | $5,000.00 | 1 | $5,000 |
| 4.7 | Strong Post W-Beam Guardrail - Supply and Install | m | $100.00 | 0 | $0 |
| | **Pavement Marking, Signage and Barrier Sub-Total** | | | | **$30,826** |
| 5 | **Street Light** | | | | |
| 5.1 | Single street light | ea | $10,000.00 | 18 | **$180,000** |
| | **Street Light Sub-Total** | | | | **$180,000** |
| 6 | **Service Roads and Utility Corridor** | | | | |
| 6.1 | | m3 | $0.00 | 0 | $0 |
| | **Service Roads and Utility Corridor Sub-Total** | | | | **$0** |
| | **Total Construction Cost** | | | | **$3,717,429** |
| | Estimate of Mobilization and Engineering | | | 15% | $557,614 |
| | Utility Protection/Relocations | | | 5% | $185,871 |
| | Culvert Crossings | | | 3% | $111,523 |
| | Temporary Traffic Control Plan and Services during Construction | | | 5% | $185,871 |
| | **Sub-Total** | | | | **$4,758,309** |
| | Contingency | | | 20% | $951,662 |
| | **Total Cost Estimate** | | | | **$5,709,970** |

**Rockland - Preliminary Construction Cost Estimate - Intersection #2 Roundabout Option**

| No. | ITEM | UNIT | ESTIMATED UNIT PRICE | QUANTITY | TOTAL AMOUNT |
|---|---|---|---|---|---|
| 1 | **Roadway** | | | | |
| 1.1 | Cutting of Pavement | m | $13.45 | 908 | $12,213 |
| 1.2 | Asphalt Removal | m2 | $46.30 | 1173 | $54,310 |
| 1.3 | Hydro Pol Removal | ea. | $208.33 | 15 | $3,125 |
| 1.4 | Earth Excavation Including all Removals (min Cut 600mm) | m3 | $45.10 | 4650.94 | $209,757 |
| 1.5 | Borrow Excavation Loaded to Trucks (Fill 200mm) | m3 | $39.72 | 2203.74 | $87,533 |
| 1.6 | Granular Base Course A (150mm) | t | $47.68 | 3060.321 | $145,916 |
| 1.7 | Granular Sub-base Course B (600mm) | t | $37.81 | 8955.87 | $338,621 |
| 1.8 | Erosion and Sediment Control | LS | $6,700.00 | 1 | $6,700 |
| 1.9 | Roundabout Central Island | m2 | $36.82 | 804 | $29,606 |
| 1.10 | Concrete Curb | m | $154.19 | 687 | $105,929 |
| 1.11 | Curb and Gutter | m | $222.22 | 1021 | $226,887 |
| 1.12 | Mountable Curb with Gutter | m | $226.74 | 126 | $28,569 |
| 1.13 | Hot Mix Asphalt - Superpave 12.5mm Level B (40mm Surface Course) | t | $420.41 | 803.436 | $337,773 |
| 1.14 | Hot Mix Asphalt - Superpave 19.0mm Level B (2x50mm Base Course) | t | $406.04 | 1303.18 | $529,143 |
| 1.15 | Median Concrete Surfacing | m2 | $167.23 | 1143 | $191,144 |
| 1.16 | Truck Apron Concrete Pavement 250mm | m2 | $171.56 | 452 | $77,545 |
| 1.17 | Top soil, Imported (100mm thick) | m3 | $102.28 | 205.55 | $21,024 |
| 1.18 | Hydroseeding | m2 | $2.00 | 2055.5 | $4,111 |
| 1.19 | Multi Use Path (Asphalt) | m2 | $72.03 | 931.5 | $67,096 |
| 1.20 | Sidewalk (Concrete) | m2 | $223.08 | 770.7 | $171,928 |
| | **Roadway Sub-Total** | | | | **$2,648,929** |
| 2 | **Drainage System** | | | | |
| 2.1 | Catch basin | ea. | $5,550.51 | 20 | $111,010 |
| 2.2 | Catch basin Leads | m | $569.57 | 140 | $79,740 |
| 2.3 | Sub-drain | m | $68.20 | 672 | $45,830 |
| 2.4 | Storm Sewer Pipe (300 mm) | m | $419.48 | 151 | $63,341 |
| 2.5 | Storm Sewer Pipe (600 mm) | m | $913.37 | 336 | $306,892 |
| 2.6 | Manhole | ea. | $6,000.00 | 4 | $24,000 |
| | **Drainage System Sub-Total** | | | | **$630,814** |
| 3 | **Traffic Signals** | | | | |
| 3.1 | Short Over Head Traffic Signal | ea. | $50,000.00 | 0 | $0 |
| 3.2 | Long Over Head Traffic Signal | ea. | $55,000.00 | 0 | $0 |
| 3.3 | Double Short Heads Traffic Signals | ea. | $60,000.00 | 0 | $0 |
| | **Traffic Signal Sub-Total** | | | | **$0** |
| 4 | **Pavement Marking, Signage, and Barrier** | | | | |
| 4.1 | Install Sign (Stop and Yield) | ea. | $400.00 | 5 | $2,000 |
| 4.2 | Street Name Sign | ea. | $150.00 | 3 | $450 |
| 4.3 | Intersection Information Signage | ea. | $2,000.00 | 6 | $12,000 |
| 4.4 | Other Signages (speed limit, Pedestrians, Object markers,..) | LS | $2,500.00 | 1 | $2,500 |
| 4.5 | TWSI | m2 | $1,288.94 | 24.156 | $31,136 |
| 4.6 | Pavement Marking | LS | $7,000.00 | 1 | $7,000 |
| 4.7 | Strong Post W-Beam Guardrail - Supply and Install | m | $100.00 | 0 | $0 |
| | **Pavement Marking, Signage and Barrier Sub-Total** | | | | **$55,086** |
| 5 | **Street Light** | | | | |
| 5.1 | Single street light | ea. | $10,000.00 | 22 | **$220,000** |
| | **Street Light Sub-Total** | | | | **$220,000** |
| 6 | **Service Roads and Utility Corridor** | | | | |
| 6.1 | | m3 | $0.00 | 0 | $0 |
| | **Service Roads and Utility Corridor Sub-Total** | | | | **$0** |
| | **Total Construction Cost** | | | | **$3,554,829** |
| | Estimate of Mobilization and Engineering | | | 15% | $533,224 |
| | Utility Protection/Relocations | | | 5% | $177,741 |
| | Culvert Crossings | | | 3% | $106,645 |
| | Temporary Traffic Control Plan and Services during Construction | | | 5% | $177,741 |
| | **Sub-Total** | | | | **$4,550,181** |
| | Contingency | | | 20% | $910,036 |
| | **Total Cost Estimate** | | | | **$5,460,217** |

**Rockland - Preliminary Construction Cost Estimate - Intersection #3 Traffic Signal Option**

| No. | ITEM | UNIT | ESTIMATED UNIT PRICE | QUANTITY | TOTAL AMOUNT |
|---|---|---|---|---|---|
| 1 | **Roadway** | | | | |
| 1.1 | Cutting of Pavement | m | $13.45 | 400 | $5,380 |
| 1.2 | Asphalt Removal | m2 | $46.30 | 796 | $36,855 |
| 1.3 | Hydro Pol Removal | ea | $208.33 | 0 | $0 |
| 1.4 | Earth Excavation Including all Removals (min Cut 600mm) | m3 | $45.10 | 3955.98 | $178,415 |
| 1.5 | Borrow Excavation Loaded to Trucks (Fill 200mm) | m3 | $39.72 | 1647.18 | $65,426 |
| 1.6 | Granular Base Course A (150mm) | t | $47.68 | 2518.131 | $120,064 |
| 1.7 | Granular Sub-base Course B (600mm) | t | $37.81 | 7969.39 | |
| 1.8 | Erosion and Sediment Control | LS | $6,700.00 | 1 | $6,700 |
| 1.9 | Roundabout Central Island | m2 | $36.82 | 0 | $0 |
| 1.10 | Concrete Curb | m | $154.19 | 411 | $63,372 |
| 1.11 | Curb and Gutter | m | $222.22 | 791 | $175,776 |
| 1.12 | Mountable Curb with Gutter | m | $226.74 | 0 | $0 |
| 1.13 | Hot Mix Asphalt - Superpave 12.5mm Level B (40mm Surface Course) | t | $420.41 | 615.296 | $258,677 |
| 1.14 | Hot Mix Asphalt - Superpave 19.0mm Level B (2x50mm Base Course) | t | $406.04 | 1327.56 | $539,042 |
| 1.15 | Median Concrete Surfacing | m2 | $167.23 | 455 | $76,090 |
| 1.16 | Truck Apron Concrete Pavement 250mm | m2 | $171.56 | 0 | $0 |
| 1.17 | Top soil, Imported (100mm thick) | m3 | $102.28 | 82.75 | $8,464 |
| 1.18 | Hydroseeding | m2 | $2.00 | 827.5 | $1,655 |
| 1.19 | Multi Use Path (Asphalt) | m2 | $72.03 | 666.9 | $48,037 |
| 1.20 | Sidewalk (Concrete) | m2 | $223.08 | 514.5 | $114,775 |
| | **Roadway Sub-Total** | | | | **$1,698,727** |
| 2 | **Drainage System** | | | | |
| 2.1 | Catch basin | ea | $5,550.51 | 16 | $88,808 |
| 2.2 | Catch basin Leads | m | $569.57 | 112 | $63,792 |
| 2.3 | Sub-drain | m | $68.20 | 490 | $33,418 |
| 2.4 | Storm Sewer Pipe (300 mm) | m | $419.48 | 200 | $83,896 |
| 2.5 | Storm Sewer Pipe (600 mm) | m | $913.37 | 245 | $223,776 |
| 2.6 | Manhole | ea | $6,000.00 | 3 | $18,000 |
| | **Drainage System Sub-Total** | | | | **$511,690** |
| 3 | **Traffic Signals** | | | | |
| 3.1 | Short Over Head Traffic Signal | ea | $50,000.00 | 6 | $300,000 |
| 3.2 | Long Over Head Traffic Signal | ea | $55,000.00 | 2 | $110,000 |
| 3.3 | Double Short Heads Traffic Signals | ea | $60,000.00 | 2 | $120,000 |
| | **Traffic Signal Sub-Total** | | | | **$530,000** |
| 4 | **Pavement Marking, Signage, and Barrier** | | | | |
| 4.1 | Install Sign (Stop and Yield) | ea | $400.00 | 0 | $0 |
| 4.2 | Street Name Sign | ea | $150.00 | 4 | $600 |
| 4.3 | Intersection Information Signage | ea | $2,000.00 | 3 | $6,000 |
| 4.4 | Other Signages (speed limit, Object markers,..) | LS | $2,000.00 | 1 | $2,000 |
| 4.5 | TWSI | m2 | $1,288.94 | 11.102 | $14,310 |
| 4.6 | Pavement Marking | LS | $5,000.00 | 1 | $5,000 |
| 4.7 | Strong Post W-Beam Guardrail - Supply and Install | m | $100.00 | 0 | $0 |
| | **Pavement Marking, Signage and Barrier Sub-Total** | | | | **$27,910** |
| 5 | **Street Light** | | | | |
| 5.1 | Single street light | ea. | $10,000.00 | 5 | $50,000 |
| | **Street Light Sub-Total** | | | | **$50,000** |
| 6 | **Service Roads and Utility Corridor** | | | | |
| 6.1 | | m3 | $0.00 | 0 | $0 |
| | **Service Roads and Utility Corridor Sub-Total** | | | | **$0** |
| | **Total Construction Cost** | | | | **$2,818,326** |
| | Estimate of Mobilization and Engineering | | | 15% | $422,749 |
| | Utility Protection/Relocations | | | 5% | $140,916 |
| | Culvert Crossings | | | 3% | $84,550 |
| | Temporary Traffic Control Plan and Services during Construction | | | 5% | $140,916 |
| | **Sub-Total** | | | | **$3,607,458** |
| | Contingency | | | 20% | $721,492 |
| | **Total Cost Estimate** | | | | **$4,328,949** |

**Rockland - Preliminary Construction Cost Estimate - Intersection #3 Roundabout Option**

| No. | ITEM | UNIT | ESTIMATED UNIT PRICE | QUANTITY | TOTAL AMOUNT |
|---|---|---|---|---|---|
| 1 | **Roadway** | | | | |
| 1.1 | Cutting of Pavement | m | $13.45 | 525 | $7,061 |
| 1.2 | Asphalt Removal | m2 | $46.30 | 918 | $42,503 |
| 1.3 | Hydro Pol Removal | ea | $208.33 | 0 | $0 |
| 1.4 | Earth Excavation Including all Removals (min Cut 600mm) | m3 | $45.10 | 4286.18 | $193,307 |
| 1.5 | Borrow Excavation Loaded to Trucks (Fill 200mm) | m3 | $39.72 | 1984.18 | $78,812 |
| 1.6 | Granular Base Course A (150mm) | t | $47.68 | 2797.971 | $133,407 |
| 1.7 | Granular Sub-base Course B (600mm) | t | $37.81 | 8613 | |
| 1.8 | Erosion and Sediment Control | LS | $6,700.00 | 1 | $6,700 |
| 1.9 | Roundabout Central Island | m2 | $36.82 | 804 | $29,606 |
| 1.10 | Concrete Curb | m | $154.19 | 684 | $105,466 |
| 1.11 | Curb and Gutter | m | $222.22 | 742 | $164,887 |
| 1.12 | Mountable Curb with Gutter | m | $226.74 | 126 | $28,569 |
| 1.13 | Hot Mix Asphalt - Superpave 12.5mm Level B (40mm Surface Course) | t | $420.41 | 560.372 | $235,586 |
| 1.14 | Hot Mix Asphalt - Superpave 19.0mm Level B (2x50mm Base Course) | t | $406.04 | 1219.69 | $495,243 |
| 1.15 | Median Concrete Surfacing | m2 | $167.23 | 1320 | $220,744 |
| 1.16 | Truck Apron Concrete Pavement 250mm | m2 | $171.56 | 452 | $77,545 |
| 1.17 | Top soil, Imported (100mm thick) | m3 | $102.28 | 166.45 | $17,025 |
| 1.18 | Hydroseeding | m2 | $2.00 | 1664.5 | $3,329 |
| 1.19 | Multi Use Path (Asphalt) | m2 | $72.03 | 666.9 | $48,037 |
| 1.20 | Sidewalk (Concrete) | m2 | $223.08 | 514.5 | $114,775 |
| | **Roadway Sub-Total** | | | | **$2,002,602** |
| 2 | **Drainage System** | | | | |
| 2.1 | Catch basin | ea | $5,550.51 | 16 | $88,808 |
| 2.2 | Catch basin Leads | m | $569.57 | 112 | $63,792 |
| 2.3 | Sub-drain | m | $68.20 | 490 | $33,418 |
| 2.4 | Storm Sewer Pipe (300 mm) | m | $419.48 | 200 | $83,896 |
| 2.5 | Storm Sewer Pipe (600 mm) | m | $913.37 | 245 | $223,776 |
| 2.6 | Manhole | ea | $6,000.00 | 3 | $18,000 |
| | **Drainage System Sub-Total** | | | | **$511,690** |
| 3 | **Traffic Signals** | | | | |
| 3.1 | Short Over Head Traffic Signal | ea | $50,000.00 | 0 | $0 |
| 3.2 | Long Over Head Traffic Signal | ea | $55,000.00 | 0 | $0 |
| 3.3 | Double Short Heads Traffic Signals | ea | $60,000.00 | 0 | $0 |
| | **Traffic Signal Sub-Total** | | | | **$0** |
| 4 | **Pavement Marking, Signage, and Barrier** | | | | |
| 4.1 | Install Sign (Stop and Yield) | ea | $400.00 | 4 | $1,600 |
| 4.2 | Street Name Sign | ea | $150.00 | 4 | $600 |
| 4.3 | Intersection Information Signage | ea | $2,000.00 | 5 | $10,000 |
| 4.4 | Other Signages (speed limit, Object markers,..) | LS | $2,500.00 | 1 | $2,500 |
| 4.5 | TWSI | m2 | $1,288.94 | 22.204 | $28,620 |
| 4.6 | Pavement Marking | LS | $7,000.00 | 1 | $7,000 |
| 4.7 | Strong Post W-Beam Guardrail - Supply and Install | m | $100.00 | 0 | $0 |
| | **Pavement Marking, Signage and Barrier Sub-Total** | | | | **$50,320** |
| 5 | **Street Light** | | | | |
| 5.1 | Single street light | ea. | $10,000.00 | 7 | $70,000 |
| | **Street Light Sub-Total** | | | | **$70,000** |
| 6 | **Service Roads and Utility Corridor** | | | | |
| 6.1 | | m3 | $0.00 | 0 | $0 |
| | **Service Roads and Utility Corridor Sub-Total** | | | | **$0** |
| | **Total Construction Cost** | | | | **$2,634,611** |
| | Estimate of Mobilization and Engineering | | | 15% | $395,192 |
| | Utility Protection/Relocations | | | 5% | $131,731 |
| | Culvert Crossings | | | 3% | $79,038 |
| | Temporary Traffic Control Plan and Services during Construction | | | 5% | $131,731 |
| | **Sub-Total** | | | | **$3,372,302** |
| | Contingency | | | 20% | $674,460 |
| | **Total Cost Estimate** | | | | **$4,046,763** |

**Rockland - Preliminary Construction Cost Estimate - Intersection #4 Traffic Signal Option**

| No. | ITEM | UNIT | ESTIMATED UNIT PRICE | QUANTITY | TOTAL AMOUNT |
|---|---|---|---|---|---|
| 1 | **Roadway** | | | | |
| 1.1 | Cutting of Pavement | m | $13.45 | 280 | $3,766 |
| 1.2 | Asphalt Removal | m2 | $46.30 | 660 | $30,558 |
| 1.3 | Hydro Pol Removal | ea | $208.33 | 6 | $1,250 |
| 1.4 | Earth Excavation Including all Removals (min Cut 600mm) | m3 | $45.10 | 3618.56 | $163,197 |
| 1.5 | Borrow Excavation Loaded to Trucks (Fill 200mm) | m3 | $39.72 | 1600.56 | $63,574 |
| 1.6 | Granular Base Course A (150mm) | t | $47.68 | 2474.373 | $117,978 |
| 1.7 | Granular Sub-base Course B (600mm) | t | $37.81 | 7195.32 | |
| 1.8 | Erosion and Sediment Control | LS | $6,700.00 | 1 | $6,700 |
| 1.9 | Roundabout Central Island | m2 | $36.82 | 0 | $0 |
| 1.10 | Concrete Curb | m | $154.19 | 374 | $57,667 |
| 1.11 | Curb and Gutter | m | $222.22 | 629 | $139,776 |
| 1.12 | Mountable Curb with Gutter | m | $226.74 | 0 | $0 |
| 1.13 | Hot Mix Asphalt - Superpave 12.5mm Level B (40mm Surface Course) | t | $420.41 | 552.92 | $232,453 |
| 1.14 | Hot Mix Asphalt - Superpave 19.0mm Level B (2x50mm Base Course) | t | $406.04 | 1160.35 | $471,149 |
| 1.15 | Median Concrete Surfacing | m2 | $167.23 | 696 | $116,392 |
| 1.16 | Truck Apron Concrete Pavement 250mm | m2 | $171.56 | 0 | $0 |
| 1.17 | Top soil, Imported (100mm thick) | m3 | $102.28 | 77.65 | $7,942 |
| 1.18 | Hydroseeding | m2 | $2.00 | 776.5 | $1,553 |
| 1.19 | Multi Use Path (Asphalt) | m2 | $72.03 | 815.4 | $58,733 |
| 1.20 | Sidewalk (Concrete) | m2 | $223.08 | 669.9 | $149,441 |
| | **Roadway Sub-Total** | | | | **$1,622,130** |
| 2 | **Drainage System** | | | | |
| 2.1 | Catch basin | ea | $5,550.51 | 12 | $66,606 |
| 2.2 | Catch basin Leads | m | $569.57 | 84 | $47,844 |
| 2.3 | Sub-drain | m | $68.20 | 440 | $30,008 |
| 2.4 | Storm Sewer Pipe (300 mm) | m | $419.48 | 120 | $50,338 |
| 2.5 | Storm Sewer Pipe (600 mm) | m | $913.37 | 220 | $200,941 |
| 2.6 | Manhole | ea | $6,000.00 | 3 | $18,000 |
| | **Drainage System Sub-Total** | | | | **$413,737** |
| 3 | **Traffic Signals** | | | | |
| 3.1 | Short Over Head Traffic Signal | ea | $50,000.00 | 3 | $150,000 |
| 3.2 | Long Over Head Traffic Signal | ea | $55,000.00 | 3 | $165,000 |
| 3.3 | Double Short Heads Traffic Signals | ea | $60,000.00 | 2 | $120,000 |
| | **Traffic Signal Sub-Total** | | | | **$285,000** |
| 4 | **Pavement Marking, Signage, and Barrier** | | | | |
| 4.1 | Install Sign (Stop and Yield) | ea | $400.00 | 2 | $800 |
| 4.2 | Street Name Sign | ea | $150.00 | 3 | $450 |
| 4.3 | Intersection Information Signage | ea | $2,000.00 | 2 | $4,000 |
| 4.4 | Other Signages (speed limit, Object markers,..) | LS | $2,000.00 | 1 | $2,000 |
| 4.5 | TWSI | m2 | $1,288.94 | 9.15 | $11,794 |
| 4.6 | Pavement Marking | LS | $5,000.00 | 1 | $5,000 |
| 4.7 | Strong Post W-Beam Guardrail - Supply and Install | m | $100.00 | 0 | $0 |
| | **Pavement Marking, Signage and Barrier Sub-Total** | | | | **$24,044** |
| 5 | **Street Light** | | | | |
| 5.1 | Single street light | ea. | $10,000.00 | 7 | $70,000 |
| | **Street Light Sub-Total** | | | | **$70,000** |
| 6 | **Service Roads and Utility Corridor** | | | | |
| 6.1 | | m3 | $0.00 | 0 | $0 |
| | **Service Roads and Utility Corridor Sub-Total** | | | | **$0** |
| | **Total Construction Cost** | | | | **$2,414,911** |
| | Estimate of Mobilization and Engineering | | | 15% | $362,237 |
| | Utility Protection/Relocations | | | 5% | $120,746 |
| | Culvert Crossings | | | 3% | $72,447 |
| | Temporary Traffic Control Plan and Services during Construction | | | 5% | $120,746 |
| | **Sub-Total** | | | | **$3,091,086** |
| | Contingency | | | 20% | $618,217 |
| | **Total Cost Estimate** | | | | **$3,709,303** |

**Rockland - Preliminary Construction Cost Estimate - Intersection #4 Roundabout Option**

| No. | ITEM | UNIT | ESTIMATED UNIT PRICE | QUANTITY | TOTAL AMOUNT |
|---|---|---|---|---|---|
| 1 | **Roadway** | | | | |
| 1.1 | Cutting of Pavement | m | $13.45 | 426 | $5,730 |
| 1.2 | Asphalt Removal | m2 | $46.30 | 617 | $28,567 |
| 1.3 | Hydro Pol Removal | ea | $208.33 | 6 | $1,250 |
| 1.4 | Earth Excavation Including all Removals (min Cut 600mm) | m3 | $45.10 | 4150.72 | $187,197 |
| 1.5 | Borrow Excavation Loaded to Trucks (Fill 200mm) | m3 | $39.72 | 1931.12 | $76,704 |
| 1.6 | Granular Base Course A (150mm) | t | $47.68 | 2712.468 | $129,330 |
| 1.7 | Granular Sub-base Course B (600mm) | t | $37.81 | 8184 | $309,437 |
| 1.8 | Erosion and Sediment Control | LS | $6,700.00 | 1 | $6,700 |
| 1.9 | Roundabout Central Island | m2 | $36.82 | 804 | $29,606 |
| 1.10 | Concrete Curb | m | $154.19 | 555 | $85,575 |
| 1.11 | Curb and Gutter | m | $222.22 | 608 | $135,110 |
| 1.12 | Mountable Curb with Gutter | m | $226.74 | 126 | $28,569 |
| 1.13 | Hot Mix Asphalt - Superpave 12.5mm Level B (40mm Surface Course) | t | $420.41 | 562.856 | $236,630 |
| 1.14 | Hot Mix Asphalt - Superpave 19.0mm Level B (2x50mm Base Course) | t | $406.04 | 1172.31 | $476,005 |
| 1.15 | Median Concrete Surfacing | m2 | $167.23 | 1116 | $186,629 |
| 1.16 | Truck Apron Concrete Pavement 250mm | m2 | $171.56 | 452 | $77,545 |
| 1.17 | Top soil, Imported (100mm thick) | m3 | $102.28 | 170.6 | $17,449 |
| 1.18 | Hydroseeding | m2 | $2.00 | 1706 | $3,412 |
| 1.19 | Multi Use Path (Asphalt) | m2 | $72.03 | 810 | $58,344 |
| 1.20 | Sidewalk (Concrete) | m2 | $223.08 | 474.6 | $105,874 |
| | **Roadway Sub-Total** | | | | **$2,185,665** |
| 2 | **Drainage System** | | | | |
| 2.1 | Catch basin | ea | $5,550.51 | 12 | $66,606 |
| 2.2 | Catch basin Leads | m | $569.57 | 84 | $47,844 |
| 2.3 | Sub-drain | m | $68.20 | 440 | $30,008 |
| 2.4 | Storm Sewer Pipe (300 mm) | m | $419.48 | 120 | $50,338 |
| 2.5 | Storm Sewer Pipe (600 mm) | m | $913.37 | 220 | $200,941 |
| 2.6 | Manhole | ea | $6,000.00 | 3 | $18,000 |
| | **Drainage System Sub-Total** | | | | **$413,737** |
| 3 | **Traffic Signals** | | | | |
| 3.1 | Short Over Head Traffic Signal | ea | $50,000.00 | 0 | $0 |
| 3.2 | Long Over Head Traffic Signal | ea | $55,000.00 | 0 | $0 |
| 3.3 | Double Short Heads Traffic Signals | ea | $60,000.00 | 0 | $0 |
| | **Traffic Signal Sub-Total** | | | | **$0** |
| 4 | **Pavement Marking, Signage, and Barrier** | | | | |
| 4.1 | Install Sign (Stop and Yield) | ea | $400.00 | 5 | $2,000 |
| 4.2 | Street Name Sign | ea | $150.00 | 3 | $450 |
| 4.3 | Intersection Information Signage | ea | $2,000.00 | 5 | $10,000 |
| 4.4 | Other Signages (speed limit, Object markers,..) | LS | $2,500.00 | 1 | $2,500 |
| 4.5 | TWSI | m2 | $1,288.94 | 18.3 | $23,588 |
| 4.6 | Pavement Marking | LS | $7,000.00 | 1 | $7,000 |
| 4.7 | Strong Post W-Beam Guardrail - Supply and Install | m | $100.00 | 0 | $0 |
| | **Pavement Marking, Signage and Barrier Sub-Total** | | | | **$45,538** |
| 5 | **Street Light** | | | | |
| 5.1 | Single street light | ea. | $10,000.00 | 9 | $90,000 |
| | **Street Light Sub-Total** | | | | **$90,000** |
| 6 | **Service Roads and Utility Corridor** | | | | |
| 6.1 | | m3 | $0.00 | 0 | $0 |
| | **Service Roads and Utility Corridor Sub-Total** | | | | **$0** |
| | **Total Construction Cost** | | | | **$2,734,939** |
| | Estimate of Mobilization and Engineering | | | 15% | $410,241 |
| | Utility Protection/Relocations | | | 5% | $136,747 |
| | Culvert Crossings | | | 3% | $82,048 |
| | Temporary Traffic Control Plan and Services during Construction | | | 5% | $136,747 |
| | **Sub-Total** | | | | **$3,500,722** |
| | Contingency | | | 20% | $700,144 |
| | **Total Cost Estimate** | | | | **$4,200,867** |

**Rockland - Preliminary Construction Cost Estimate - Road Between Intersection #2 and #3**

| No. | ITEM | UNIT | ESTIMATED UNIT PRICE | QUANTITY | TOTAL AMOUNT |
|---|---|---|---|---|---|
| 1 | **Roadway** | | | | |
| 1.1 | Cutting of Pavement | m | $13.45 | 85 | $1,143 |
| 1.2 | Asphalt Removal | m2 | $46.30 | 4009 | $185,617 |
| 1.3 | Hydro Pol Removal | ea | $208.33 | 6 | $1,250 |
| 1.4 | Earth Excavation Including all Removals (min Cut 600mm) | m3 | $45.10 | 8187.76 | $369,268 |
| 1.5 | Borrow Excavation Loaded to Trucks (Fill 200mm) | m3 | $39.72 | 3226.76 | $128,167 |
| 1.6 | Granular Base Course A (150mm) | t | $47.68 | 4219.446 | $201,183 |
| 1.7 | Granular Sub-base Course B (600mm) | t | $37.81 | 12069.31 | $456,341 |
| 1.8 | Erosion and Sediment Control | LS | $6,700.00 | 2 | $13,400 |
| 1.9 | Roundabout Central Island | m2 | $36.82 | 0 | $0 |
| 1.10 | Concrete Curb | m | $154.19 | 1170 | $180,402 |
| 1.11 | Curb and Gutter | m | $222.22 | 1152 | $255,997 |
| 1.12 | Mountable Curb with Gutter | m | $226.74 | 0 | $0 |
| 1.13 | Hot Mix Asphalt - Superpave 12.5mm Level B (40mm Surface Course) | t | $420.41 | 1006.02 | $422,941 |
| 1.14 | Hot Mix Asphalt - Superpave 19.0mm Level B (2x50mm Base Course) | t | $406.04 | 1987.2 | $806,883 |
| 1.15 | Median Concrete Surfacing | m2 | $167.23 | 863 | $144,319 |
| 1.16 | Truck Apron Concrete Pavement 250mm | m2 | $171.56 | 0 | $0 |
| 1.17 | Top soil, Imported (100mm thick) | m3 | $102.28 | 386.6 | $39,541 |
| 1.18 | Hydroseeding | m2 | $2.00 | 3866 | $7,732 |
| 1.19 | Multi Use Path (Asphalt) | m2 | $72.03 | 1555.2 | $112,021 |
| 1.20 | Sidewalk (Concrete) | m2 | $223.08 | 1209.6 | $269,838 |
| | | | | **Roadway Sub-Total** | **$3,596,043** |
| 2 | **Drainage System** | | | | |
| 2.1 | Catch basin | ea | $5,550.51 | 24 | $133,212 |
| 2.2 | Catch basin Leads | m | $569.57 | 168 | $95,688 |
| 2.3 | Sub-drain | m | $68.20 | 1152 | $78,566 |
| 2.4 | Storm Sewer Pipe (300 mm) | m | $419.48 | 0 | $0 |
| 2.5 | Storm Sewer Pipe (600 mm) | m | $913.37 | 576 | $526,101 |
| 2.6 | Manhole | ea | $6,000.00 | 6 | $36,000 |
| | | | | **Drainage System Sub-Total** | **$869,568** |
| 3 | **Traffic Signals** | | | | |
| 3.1 | Short Over Head Traffic Signal | ea | $50,000.00 | | $0 |
| 3.2 | Long Over Head Traffic Signal | ea | $55,000.00 | | $0 |
| 3.3 | Double Short Heads Traffic Signals | ea | $60,000.00 | | $0 |
| | | | | **Traffic Signal Sub-Total** | **$0** |
| 4 | **Pavement Marking, Signage, and Barrier** | | | | |
| 4.1 | Install Sign (Stop and Yield) | ea | $400.00 | | $0 |
| 4.2 | Street Name Sign | ea | $150.00 | | $0 |
| 4.3 | Intersection Information Signage | ea | $2,000.00 | | $0 |
| 4.4 | Other Signages (speed limit, Object markers,..) | LS | $2,000.00 | 2 | $4,000 |
| 4.5 | TWSI | m2 | $1,288.94 | | $0 |
| 4.6 | Pavement Marking | LS | $4,000.00 | 1 | $4,000 |
| 4.7 | Strong Post W-Beam Guardrail - Supply and Install | m | $100.00 | | $0 |
| | | | | **Pavement Marking, Signage and Barrier Sub-Total** | **$8,000** |
| 5 | **Street Light** | | | | |
| 5.1 | Single street light | ea | $10,000.00 | 24 | **$240,000** |
| | | | | **Total Construction Cost** | **$4,713,611** |
| | | | Estimate of Mobilization and Engineering | 15% | $707,042 |
| | | | Utility Protection/Relocations | 5% | $235,681 |
| | | | Culvert Crossings | 3% | $141,408 |
| | | | Temporary Traffic Control Plan and Services during Construction | 5% | $235,681 |
| | | | | **Sub-Total** | **$6,033,422** |
| | | | Contingency | 20% | $1,206,684 |
| | | | | **Total Cost Estimate** | **$7,240,106** |

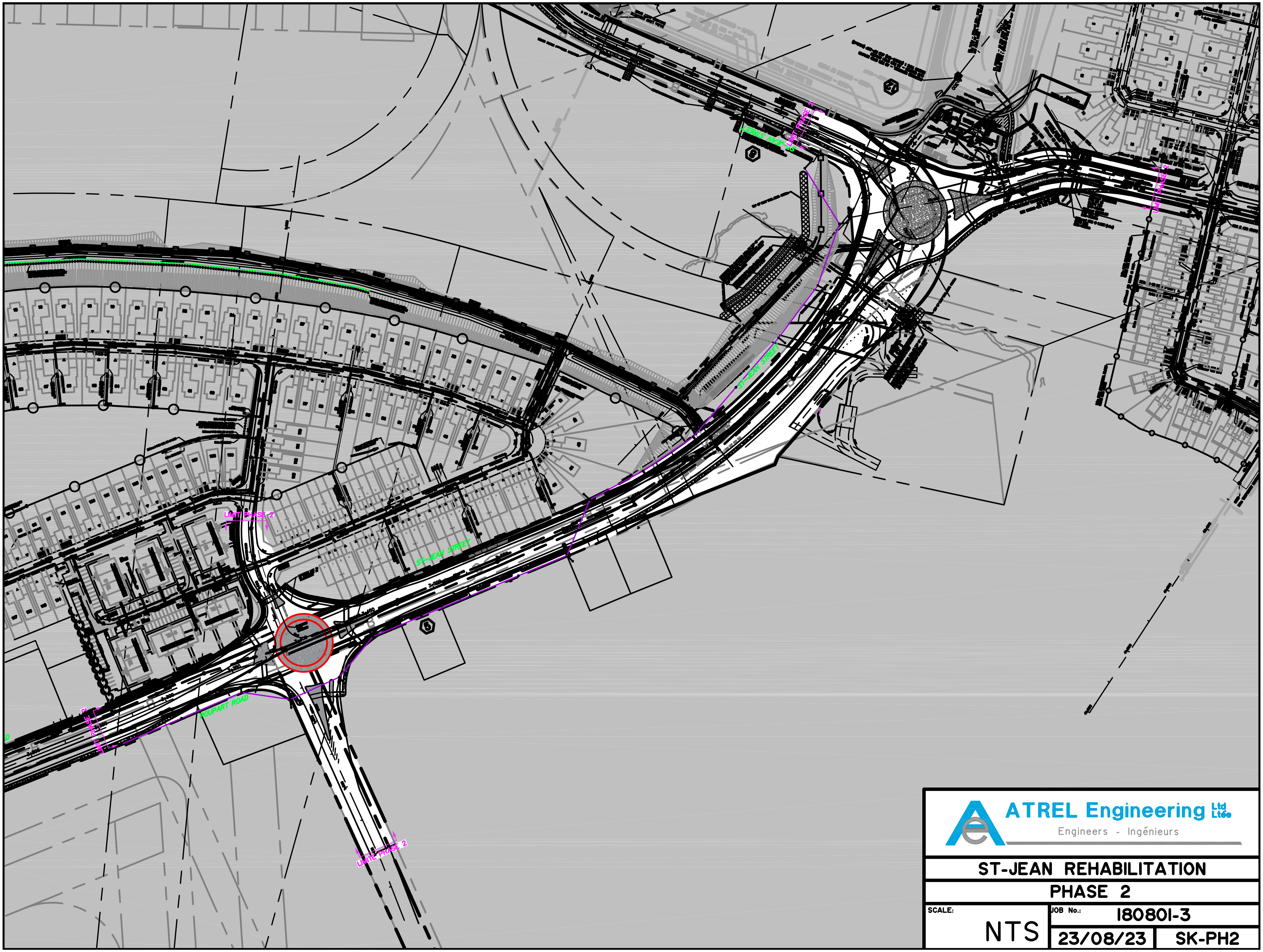
## PRELIMINARY COST ESTIMATE - ST-JEAN STREET - PHASE 2

PROJECT NUMBER: 180802-3 | PREPARED BY: Atrel Engineering Ltd
PROJECT NAME: St-Jean Rehabilitation - Phase 2 | DATE: Revised July 2023
CLIENT: Spacebuilders Ottawa Ltd / City of Clarence-Rockland | BY: CED

| PART | | TOTAL AMOUNT |
|---|---|---|
| PART "A" - SITE PREPARATION | | $ 830,922.50 |
| PART "B" - REMOVALS | | $ 220,416.00 |
| PART "C" - WATERMAIN | | $ 685,449.99 |
| PART "D" - SANITARY SEWER | | $ 178,890.00 |
| PART "E" - STORM SEWER | | $ 2,287,202.49 |
| PART "F" - MASS EARTH MOVEMENT | | $ 5,401,130.00 |
| PART "G" - BASE COURSE | | $ 2,226,178.00 |
| PART "H" - SERVICES | | $ 19,750.00 |
| PART "I" - CURBS, SIDEWALKS & LANDSCAPING | | $ 1,963,939.50 |
| PART "J" - WEAR COURSE | | $ 464,977.00 |
| PART "K" - MISCELLANEOUS | | $ 379,017.50 |
| PART "L" - UTILITIES | | $ 2,650,136.00 |
| PART "M" - CENTENNIAL CONSTRUCTION ROCKLAND LTÉE | | $ 279,581.00 |
| PART "N" - LAND ACQUISITION | | $ - |
| | SUBTOTAL (Phase 2) | $ 17,587,589.98 |
| PART "O" - CONTINGENCY ALLOWANCE (20%) | | $ 3,517,518.00 |
| PART "P" - ENGINEERING FEES (15%) | | $ 2,638,138.50 |
| | TOTAL (Phase 2-2023) | $ 23,743,246.47 |
| | TOTAL (Phase 2-2024-7% ADDED) | $ 25,405,273.73 |
| | TOTAL (Phase 2-2025-7% ADDED) | $ 27,183,642.89 |
| | TOTAL (Phase 2-2026-7% ADDED) | $ 29,086,497.89 |

NOTES:

1) CONTAMINED SOUND MATERIAL IS EXCLUDED; IT WILL REMAIN ON SITE
2) PROPERTY ACQUISITION IS EXCLUDED
3) UTILITY RELOCATION COST IS A VERY ROUGH ESTIMATE
4) ENGINEERING COST OF 15% IS INCLUDED
5) A CONTINGENCY ALLOWANCE OF 20% IS INCLUDED
6) TRAFFIC SIGNAL OPTION IS NOT PART OF THIS ESTIMATE
7) 7% IS ADDED PER YEAR TO ACCOUNT FOR INFLATION




ATREL Engineering Ltd Ltée

Engineers - Ingénieurs

ST-JEAN REHABILITATION

PHASE 2

| | |
|---|---|
| SCALE: NTS | JOB No.: 180801-3 |
| | 23/08/23 \| SK-PH2 |

**Table 4**

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "A"**<br>**SITE PREPARATION** | | | | | |
| **1** | **Mobilization (includes bonds, insurance and demobilization)** | S.P. | 1 | L.S. | $ 300,000.00 | $ 300,000.00 |
| **2** | **Pre-construction survey** | S.P. | 1 | L.S. | $ 45,000.00 | $ 45,000.00 |
| **3** | **Supply and install silt fence barrier** | 805 & S.P. | 1042.5 | m | $ 15.00 | $ 15,637.50 |
| **4** | **Straw bales (by location)** | 805 & S.P. | 6 | each | $ 500.00 | $ 3,000.00 |
| **5** | **Traffic control and signs** | S.P. | | | | |
| | i) Traffic control plan | | 1 | L.S. | $ 3,000.00 | $ 3,000.00 |
| | ii) Permanent large closing notice signs (TC-64) | | 4 | each | $ 1,000.00 | $ 4,000.00 |
| | iii) Permanant traffic control signs | | 1 | L.S. | $ 60,000.00 | $ 60,000.00 |
| | iv) PVMS (portable variable message sign) for 1 week | | 3 | each | $ 3,000.00 | $ 9,000.00 |
| **6** | **Temporary fencing (MODU-LOC or equivalent)** | S.P. | 1 | L.S. | $ 15,000.00 | $ 15,000.00 |
| **7** | **Topsoil stripping** | 206 & S.P. | | | | |
| | i) Topsoil stripping | | 28300.0 | $m^2$ | $ 2.00 | $ 56,600.00 |
| | ii) Topsoil loading and hauling off site | | 4245.0 | $m^3$ | $ 18.00 | $ 76,410.00 |
| **8** | **Grubbing** | 201 & S.P. | 1 | L.S. | $ 20,000.00 | $ 20,000.00 |
| **9** | **Temporary snow fence c/w t-bar at 1.8m spacing** | S.P. | 120.0 | m | $ 45.00 | $ 5,400.00 |
| **10** | **Tree clearing** | | | | | |
| | i) Tree cutting services | | 1 | L.S. | $ 5,000.00 | $ 5,000.00 |
| | ii) Work by contractor: road signs, cut permit and cleanup | | 1 | L.S. | $ 2,500.00 | $ 2,500.00 |
| | iii) Wood chipper with operator | | 1 | L.S. | $ 3,000.00 | $ 3,000.00 |
| | iv) Brush cutter with operator | | 1 | L.S. | $ 1,500.00 | $ 1,500.00 |
| | v) Skid steer with operator | | 1 | L.S. | $ 3,000.00 | $ 3,000.00 |
| | vi) Backhoe with operator | | 1 | L.S. | $ 3,000.00 | $ 3,000.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| **11** | **Hydrovac** | | 300.0 | hrs | $ 325.00 | $ 97,500.00 |
| **12** | **Portable generator and pumps for construction** | S.P. | | | | |
| | i ) 2" pump | | 9 | week | $ 1,475.00 | $ 13,275.00 |
| | ii) 4" pump | | 9 | week | $ 2,400.00 | $ 21,600.00 |
| | iii) 6" pump | | 9 | week | $ 4,400.00 | $ 39,600.00 |
| | iv) Dewatering time and equipment | | 9 | week | $ 3,100.00 | $ 27,900.00 |

SUB-TOTAL PART "A" $ 830,922.50

TENDERER'S INITIALS ______________

**Table 4**

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "B"**<br>**REMOVALS (to be disposed off-site, unless specified)** | | | | | |
| **1** | **Remove existing culverts** | 510 & S.P. | 203.0 | m | $ 30.00 | $ 6,090.00 |
| **2** | **Remove existing road structure** | | | | | |
| | i) Asphalt (to be hauled off-site) | 510 & S.P. | 9685.0 | $m^2$ | $ 7.00 | $ 67,795.00 |
| | ii) Granulars (use on site as fill material) | | 4832.0 | $m^3$ | $ 8.00 | $ 38,656.00 |
| **3** | **Remove existing signs** | 510 & S.P. | 37 | each | $ 75.00 | $ 2,775.00 |
| **4** | **Remove and reinstall existing mailbox** | 510 & S.P. | 2 | each | $ 300.00 | $ 600.00 |
| **5** | **Remove temporary DICB 500 c/w 200mm dia. lead and plug CB** | 510 & S.P. | 1 | L.S. | $ 500.00 | $ 500.00 |
| **6** | **Remove existing hydro pole and guy wire** | 510 & S.P. | 26 | each | $ 4,000.00 | $ 104,000.00 |

SUB-TOTAL PART "B" $ 220,416.00

TENDERER'S INITIALS ______________

| ITEM NO. | | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|---|
| | **PART "C" WATERMAIN** | | | | | | |
| 1 | **Connect to existing watermain** | | | | | | |
| | i) | 400mm dia. watermain at St-Jean Street and Bronze Avenue (±3+895) | 441 & S.P. | 1 | L.S. | $ 3,000.00 | $ 3,000.00 |
| | ii) | 300mm dia. watermain at St-Jean Street and pathway (±3+715) | | 1 | L.S. | $ 2,500.00 | $ 2,500.00 |
| | iii) | 300mm dia. watermain at St-Jean Street and Stewart Village Street No. 1 (±1+648) | | 1 | L.S. | $ 2,500.00 | $ 2,500.00 |
| 2 | **Supply and install watermain** | | | | | | |
| | i) | 300mm dia. PVC DR18 CLASS 150 | 441 & S.P. | 176.0 | m | $ 600.00 | $ 105,599.99 |
| | ii) | 400mm dia. PVC DR18 CLASS 150 | | 519.0 | m | $ 900.00 | $ 467,100.00 |
| 3 | **Supply and install valve and valve box** | | | | | | |
| | i) | 300mm dia. | 441 & S.P. | 2 | each | $ 6,500.00 | $ 13,000.00 |
| | ii) | 400mm dia. | | 3 | each | $ 10,000.00 | $ 30,000.00 |
| 4 | **Supply and install fire hydrant c/w valve and valve box** | | 441 & S.P. | 5 | each | $ 9,500.00 | $ 47,500.00 |
| 5 | **Flush, pressure test and chlorinate watermain** | | 441 & S.P. | 1 | L.S. | $ 8,000.00 | $ 8,000.00 |
| 6 | **Supply and install watermain insulation** | | | | | | |
| | i) | 50mm-thick, 1.2m-wide SM HI-40 | 1605 & S.P. | 50.0 | m | $ 25.00 | $ 1,250.00 |
| | ii) | 100mm-thick, 1.2m-wide SM HI-40 | | 50.0 | m | $ 30.00 | $ 1,500.00 |
| | iii) | 150mm-thick, 1.2m-wide SM HI-40 | | 50.0 | m | $ 35.00 | $ 1,750.00 |
| | **PROVISIONAL ITEMS** | | | | | | |
| 7 | **Subexcavation for trench** | | S.P. | 25.0 | $m^3$ | $ 70.00 | $ 1,750.00 |

SUB-TOTAL PART "C" $ 685,449.99

TENDERER'S INITIALS ____________

**Table 4**

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "D"**<br>**SANITARY SEWER** | | | | | |
| 1 | **Connection to existing** | | | | | |
| | i) Connect 250mm dia. sanitary sewer to SAN MH 165 on St-Jean Street (±3+905)(as per City Standard Drawing S12.2) | S.P. | 1 | each | $ 3,500.00 | $ 3,500.00 |
| 2 | **Supply and install structures** | 401, 402, 407, 410, 492 & S.P. | | | | |
| | i) 1200mm dia. maintenance hole | | 2 | each | $ 8,500.00 | $ 17,000.00 |
| | ii) 1200mm dia. maintenance hole c/w safety landing | | 3 | each | $ 9,000.00 | $ 27,000.00 |
| 3 | **Sanitary sewer** | 401, 402, 407, 410, 492 & S.P. | | | | |
| | i) 200mm dia. PVC SDR 35 | | 260.0 | m | $ 350.00 | $ 91,000.00 |
| | ii) 250mm dia. PVC SDR 35 | | 52.0 | m | $ 400.00 | $ 20,800.00 |
| 4 | **Supply and install sanitary sewer insulation** | 1605 & S.P. | | | | |
| | i) 50mm-thick, 1.2m-wide SM HI-40 | | 25.0 | m | $ 25.00 | $ 625.00 |
| | ii) 100mm-thick, 1.2m-wide SM HI-40 | | 25.0 | m | $ 30.00 | $ 750.00 |
| | iii) 150mm-thick, 1.2m-wide SM HI-40 | | 25.0 | m | $ 35.00 | $ 875.00 |
| 5 | **T.V. inspection and report** | 409 & S.P. | | | | |
| | i) Initial | | 312.0 | m | $ 10.00 | $ 3,120.00 |
| | ii) Final (1 year after substantial completion) | | 312.0 | m | $ 10.00 | $ 3,120.00 |
| 6 | **Supply and install temporary inlet control device (ICD)** | | 1 | each | $ 600.00 | $ 600.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| 7 | **Subexcavation for trench** | S.P. | 150.0 | m³ | $ 70.00 | $ 10,500.00 |

SUB-TOTAL PART "D" $ 178,890.00

TENDERER'S INITIALS ______________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "E"**<br>**STORM SEWER** | | | | | |
| 1 | **Connection to existing** | | | | | |
| | i) Connect DICB 101 lead to storm sewer | | 1 | each | $ 3,000.00 | $ 3,000.00 |
| 2 | **Supply and install structures** | 401, 402, 407, 410, 492 & S.P. | | | | |
| | i) 1200mm dia. maintenance hole | | 11 | each | $ 8,000.00 | $ 88,000.00 |
| | ii) 1500mm dia. maintenance hole | | 2 | each | $ 12,000.00 | $ 24,000.00 |
| | iii) 2400mm dia. maintenance hole | | 1 | each | $ 22,000.00 | $ 22,000.00 |
| | iv) 2400mm x 2400mm box culvert | | 159 | m | $ 7,800.00 | $ 1,240,200.00 |
| | v) Blueskin for box culvert to place over roof and down 0.3m of culvert walls | | 1 | L.S. | $ 40,000.00 | $ 40,000.00 |
| | vi) Supply and place armour stone (0.5m high) in box culvert (see 150403-P18) | | 81.5 | m | $ 500.00 | $ 40,750.00 |
| | vii) Fill box culverts with 0.2m of native fill (see 150403-P18) | | 8.0 | m³ | $ 250.00 | $ 2,000.00 |
| | viii) Fill box culverts with 0.5m of blasted rock (see 150403-P18) | | 170.0 | m³ | $ 90.00 | $ 15,300.00 |
| | ix) Remove existing 1500mm dia. CSP culvert on St-Jean Street | | 14.5 | m | $ 150.00 | $ 2,175.00 |
| | x) Headwall as per OPSD 804.040 c/w type 1 galvanized railing, a steel grate as per OPSD 804.050 and rip-rap (±9.0m²) | | 1 | each | $ 35,000.00 | $ 35,000.00 |
| | xi) Road curb inlet catchbasin c/w two 3.0m subdrains & 200mm dia. PVC SDR 35 lead | | 34 | each | $ 5,000.00 | $ 170,000.00 |
| 3 | **Storm sewer** | 401, 402, 407, 410, 492 & S.P. | | | | |
| | i) 300mm dia. PVC SDR 35 | | 206.5 | m | $ 375.00 | $ 77,437.50 |
| | ii) 450mm dia. PVC SDR 35 | | 160.0 | m | $ 400.00 | $ 64,000.00 |
| | iii) 600mm dia. CONC 100D | | 466.0 | m | $ 500.00 | $ 233,000.00 |
| | iv) 750mm dia. CONC 100D | | 101.5 | m | $ 750.00 | $ 76,125.00 |
| | v) 1200mm dia. CONC 100D | | 75.5 | m | $ 1,450.00 | $ 109,475.00 |
| 4 | **Supply and install inlet control device, plug type (ICD)** | S.P. | | | | |
| | i) 70mm x 70mm Diamond opening ICD (RR-15.5) | | 34 | each | $ 500.00 | $ 17,000.00 |
| 5 | **Supply and install temporary inlet control device (ICD)** | | 1 | each | $ 600.00 | $ 600.00 |
| 6 | **Supply and install storm insulation** | 1605 & S.P. | | | | |
| | i) 50mm-thick, 1.2m-wide SM HI-40 | | 50.0 | m | $ 25.00 | $ 1,250.00 |
| | ii) 100mm-thick, 1.2m-wide SM HI-40 | | 50.0 | m | $ 30.00 | $ 1,500.00 |
| | iii) 150mm-thick, 1.2m-wide SM HI-40 | | 50.0 | m | $ 35.00 | $ 1,749.99 |
| 7 | **T.V. inspection and report** | 409 & S.P. | | | | |
| | i) Initial | | 1009.5 | m | $ 10.00 | $ 10,095.00 |
| | ii) Final (1 year after substantial completion) | | 1009.5 | m | $ 10.00 | $ 10,095.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| 8 | **Subexcavation for trench** | S.P. | 35.0 | m³ | $ 70.00 | $ 2,450.00 |

SUB-TOTAL PART "E" $ 2,287,202.49

TENDERER'S INITIALS __________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "F"**<br>**MASS EARTH MOVEMENT** | | | | | |
| **1** | **Fill temporary ditch along pond** | S.P. | 400.0 | $m^3$ | $ 42.00 | $ 16,800.00 |
| **2** | **Rock removal (rock to be kept and used on site)** | S.P. | 1300.0 | $m^3$ | $ 55.00 | $ 71,500.00 |
| **3** | **Fill**<br>i) Excavate, haul, place and compact sound fill originating from site to fill in ditch, removed rock, removed road structure, etc. | S.P. | 17000.0 | $m^3$ | $ 18.00 | $ 306,000.00 |
| **4** | **Remove organic material underneath road structure (ex. topsoil, trace of wood, peat, etc.)** | S.P. | 24500.0 | $m^3$ | $ 30.00 | $ 735,000.00 |
| **5** | **Remove fill over top peat layer (within wetland)** | S.P. | 11500.0 | $m^3$ | $ 42.00 | $ 483,000.00 |
| **6** | **Remove clay layer underneath peat until till layer is reached (within wetland)** | S.P. | 3000.0 | $m^3$ | $ 42.00 | $ 126,000.00 |
| **7** | **Import required material on-site** | S.P. | 69000.0 | $m^3$ | $ 52.00 | $ 3,588,000.00 |
| **8** | **Haul and place 5.0m wide clay wall down to till elevation, including the blasted rock working pad as per Paterson "PG6427-Memo.02"** | 206 & S.P. | 410 | $m^3$ | $ 118.00 | $ 48,380.00 |
| **9** | **Haul and place 1.0m clay seal on top of blasted rock and lower portion of embankment c/w geotextile** | 206 & S.P. | 550 | $m^3$ | $ 32.00 | $ 17,600.00 |
| **10** | **Supply and install "washed clear stone bags" in ditch: Two (2) rows staggered with tarp to elevation 44.00m (upstream of culvert)** | S.P. | 15.0 | m | $ 590.00 | $ 8,850.00 |

SUB-TOTAL PART "F" $ 5,401,130.00

TENDERER'S INITIALS ______________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "G"**<br>**BASE COURSE** | | | | | |
| **1** | **Subgrade preparation for roadway** | S.P. | 23965.0 | $m^2$ | $ 4.50 | $ 107,842.50 |
| **2** | **Supply, place and compact granulars** | | | | | |
| | i) 600mm-thick of granular 'B' | 314 & S.P. | 23965.0 | m² | $ 35.00 | $ 838,775.00 |
| | ii) 150mm-thick of granular 'A' | | 17816.0 | m² | $ 10.50 | $ 187,068.00 |
| **3** | **Supply, place and compact asphalt** | | | | | |
| | i) 1st lift - 50mm-thick HL8 for base course (with a minimum PG 58-34 or SP 19.0) | 310 & S.P. | 17816.0 | m² | $ 24.00 | $ 427,584.00 |
| | ii) 2nd lift - 50mm-thick HL8 for base course (with a minimum PG 58-34 or SP 19.0) | | 17816.0 | m² | $ 24.00 | $ 427,584.00 |
| **4** | **Iron work adjustment (initial)** | | | | | |
| | i) Maintenance hole | 408 & S.P. | 23 | each | $ 850.00 | $ 19,550.00 |
| | ii) Catchbasin | | 40 | each | $ 850.00 | $ 34,000.00 |
| | iii) Valve box | | 10 | each | $ 650.00 | $ 6,500.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| **5** | **Supply and install high performance geogrid (TBX2500 or equivalent)** | S.P. | 11983.0 | m² | $ 4.00 | $ 47,932.00 |
| **6** | **Supply and install filter fabric - Terrafix non-woven 270R or equivalent** | S.P. | 11983.0 | m² | $ 2.50 | $ 29,957.50 |
| **7** | **Subexcavation for roadways** | 314 | 899.0 | $m^3$ | $ 75.00 | $ 67,425.00 |
| **8** | **Subexcavation for soft spots** | 314 | 225.0 | $m^3$ | $ 75.00 | $ 16,875.00 |
| **9** | **Temporary asphalt ramping** | | | | | |
| | i) Curbs (around the apron, sidewalk and MUP depression) | 314 | 375.0 | m | $ 35.00 | $ 13,125.00 |
| | ii) To match existing streets | | 56.0 | m | $ 35.00 | $ 1,960.00 |

SUB-TOTAL PART "G" $ 2,226,178.00

TENDERER'S INITIALS ______________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "H"**<br>**SERVICES** | | | | | |
| **1** | **Connect existing dwelling services to new lines on St-Jean Street including disconnection of the pipe and connection with proper fittings**<br>-19mm dia. PEX water service<br>-125mm dia. PVC SDR 35 sanitary service<br>-100mm dia. PVC SDR 35 storm service | 401, 410, 441 & S.P. | 2 | each | $ 9,000.00 | $ 18,000.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| **2** | **Subexcavation for trench** | S.P. | 25.0 | m³ | $ 70.00 | $ 1,750.00 |

SUB-TOTAL PART "H" $ 19,750.00

TENDERER'S INITIALS ____________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "I"**<br>**CURBS, SIDEWALKS & LANDSCAPING** | | | | | |
| 1 | **Supply and install concrete barrier curb (OPSD 600.110)** | 600 & S.P. | 2416.0 | m | $ 95.00 | $ 229,520.00 |
| 2 | **Supply and install concrete barrier curb with key for sidewalk (OPSD 600.110)** | 600 & S.P. | 982.5 | m | $ 95.00 | $ 93,337.50 |
| 3 | **Supply and install concrete semi-mountable curb with narrow gutter for roundabout truck apron with key for concrete (MTOD-600.091)** | 600 & S.P. | 264.0 | m | $ 155.00 | $ 40,920.00 |
| 4 | **Supply and install concrete barrier curb with narrow gutter for roundabout truck apron (MTOD-600.080)** | 600 & S.P. | 213.5 | m | $ 155.00 | $ 33,092.50 |
| 5 | **Supply and install wooden 3 rail post & rail fence** | S.P. | 142.0 | m | $ 100.00 | $ 14,200.00 |
| 6 | **Supply and install concrete sidewalk (2.0m-wide) 125mm-thick concrete on 200mm compacted granular 'A'** | 310 & S.P. | 1557.5 | $m^2$ | $ 130.00 | $ 202,475.00 |
| 7 | **Supply and install concrete sidewalk (1.8m-wide) 125mm-thick concrete on 200mm compacted granular 'A'** | 310 & S.P. | 199.5 | $m^2$ | $ 130.00 | $ 25,935.00 |
| 8 | **Supply and install asphalt pathway M.U.P. (2.5m-wide) 50mm-thick HL3 asphalt on 200mm compacted granular 'A'** | 310 & S.P. | 2387.5 | $m^2$ | $ 60.00 | $ 143,250.00 |
| 9 | **Supply and install asphalt pathway M.U.P. (1.8m-wide) 50mm-thick HL3 asphalt on 200mm compacted granular 'A'** | 310 & S.P. | 126.5 | $m^2$ | $ 55.00 | $ 6,957.50 |
| 10 | **Access route (5m wide)** | | | | | |
| | i) 150mm granular 'A' | S.P. | 740.0 | $m^2$ | $ 11.10 | $ 8,214.00 |
| | ii) 300mm blasted rock | | 740.0 | $m^2$ | $ 13.30 | $ 9,842.00 |
| 11 | **Gabion stone (100-200mm) - 0.4m thick with geotextile, terrafix non-woven 370rs or equivalent as per opss 511 & 1860, at each end of the box culvert** | 511, 1860 & S.P. | 80.0 | $m^2$ | $ 69.00 | $ 5,520.00 |
| 12 | **Supply and instal tactile walking surface indicators (TWSI)** | 351 & S.P. | 55.0 | $m^2$ | $ 1,200.00 | $ 66,000.00 |
| 13 | **Supply and install concrete for roundabout** | | | | | |
| | i) Coloured concrete (Intersta-Baja Red, RG-2827R) cap as per City of Ottawa Standard SC10.1 | S.P. | 955.0 | $m^2$ | $ 300.00 | $ 286,500.00 |
| | ii) Raised concrete splitter island (typ). OPSD 504.010 | | 1632.0 | $m^2$ | $ 130.00 | $ 212,160.00 |
| | iii) Landscaping of the roundabout and boulevards | | 2 | each | $ 75,000.00 | $ 150,000.00 |
| 14 | **Entrances** | | | | | |
| | i) At the entrance of P.S. No. 9 | | | | | |
| | a) 300mm-thick of granular 'B' | 310, 314 & S.P. | 135.5 | $m^2$ | $ 30.00 | $ 4,065.00 |
| | b) 150mm-thick of granular 'A' | | 71.5 | $m^2$ | $ 12.00 | $ 858.00 |
| | c) 40mm-thick HL8 (with a minimum PG 58-34 or SP 19.0) | | 71.5 | $m^2$ | $ 50.00 | $ 3,575.00 |
| | d) 40mm-thick HL3 (with a minimum PG 58-34 or SP 12.5) | | 71.5 | $m^2$ | $ 52.00 | $ 3,718.00 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15 | **ECC-2B Double net coconut biodegradable rolled erosion control product where slopes are greater than 3H:1V** | 804.05.02 & S.P. | 4950.0 | $m^2$ | $ 55.00 | $ 272,250.00 |
| 16 | **Supply and place 100mm-thick topsoil and hydroseeding** | 803 & S.P. | 15,800.0 | $m^2$ | $ 7.00 | $ 110,600.00 |
| 17 | **Armour stone retaining wall at the south end of the st-jean street culvert** | 902 & S.P. | 26 | $m^2$ | $ 1,100.00 | $ 28,600.00 |
| 18 | **Railing on armour stone wall as per OPSD 980.101** | S.P. | 9.5 | m | $ 1,300.00 | $ 12,350.00 |

SUB-TOTAL PART "I" $ 1,963,939.50

TENDERER'S INITIALS ______________

**Table 4**

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "J"**<br>**WEAR COURSE** | | | | | |
| 1 | **Supply, place & compact asphalt** | | | | | |
| | i) 40mm-thick HL-3 for wear course (with a minimum PG 58-34 or SP 12.5) | 310 & S.P. | 17816.0 | $m^2$ | $ 22.00 | $ 391,952.00 |
| 2 | **Iron work adjustment (final)** | 408 & S.P. | | | | |
| | i) Maintenance hole | | 23 | each | $ 900.00 | $ 20,700.00 |
| | ii) Catchbasin | | 40 | each | $ 900.00 | $ 36,000.00 |
| | iii) Valve box | | 10 | each | $ 650.00 | $ 6,500.00 |
| 3 | **Provide grinding key at all asphalt matching areas** | | 56.0 | m | $ 60.00 | $ 3,360.00 |
| 4 | **Asphalt ramps removal** | | 431.0 | m | $ 15.00 | $ 6,465.00 |

SUB-TOTAL PART "J" $ 464,977.00

TENDERER'S INITIALS ______________

Table 4

| ITEM NO. | ITEM | | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|---|
| | **PART "K" MISCELLANEOUS** | | | | | | |
| 1 | **Road painting** | | | | | | |
| | i) | Line painting (single yellow centerline) | 710 & S.P. | 1262.0 | m | $ 3.50 | $ 4,417.00 |
| | ii) | Stop bar (white) | | 2 | each | $ 140.00 | $ 280.00 |
| | iii) | Roundabout markings | | 1 | L.S. | $ 7,000.00 | $ 7,000.00 |
| | iv) | Island tapered markings | | 593.0 | m | $ 3.50 | $ 2,075.50 |
| 2 | **Supply and install signs** | | | | | | |
| | i) | Roundabout ahead sign (WA-39) | 706 & S.P. | 7 | each | $ 2,000.00 | $ 14,000.00 |
| | ii) | Advisory speed tap sign (WA-7T, 30 km/h) | | 7 | each | $ 320.00 | $ 2,240.00 |
| | iii) | Roundabout diagrammatic guide sign (IA-6) | | | | | |
| | | a) 1.8m x 1.2m (min. letter size 150mm) | | 5 | each | $ 350.00 | $ 1,750.00 |
| | | b) 2.4m x 1.2m (min. letter size 150mm) | | 3 | each | $ 360.00 | $ 1,080.00 |
| | iv) | Divided road starts sign (RA-25R) | | 12 | each | $ 365.00 | $ 4,380.00 |
| | v) | Object marker sign (WA-33L) | | 12 | each | $ 340.00 | $ 4,080.00 |
| | vi) | Pedestrian crossing ahead sign (WC-27R) | | 7 | each | $ 340.00 | $ 2,380.00 |
| | vii) | Reserved bicycle lane (RB-84A) | | 5 | each | $ 350.00 | $ 1,750.00 |
| | viii) | Begins tab sign (RB-84T) | | 5 | each | $ 340.00 | $ 1,700.00 |
| | ix) | Shared pathway sign (RB-71) | | 3 | each | $ 520.00 | $ 1,560.00 |
| | x) | Pedestrian crossing sign (RA-5R) | | 28 | each | $ 375.00 | $ 10,500.00 |
| | xi) | Pedestrian crossing sign (RA-5L) | | 42 | each | $ 240.00 | $ 10,080.00 |
| | xii) | Stop for pedestrians sign (RA-4T) | | 42 | each | $ 230.00 | $ 9,660.00 |
| | xiii) | Roundabout exit guide sign (IA-9) | | | | | |
| | | a) 1.1m x 0.4m (min. letter size 100mm) | | 5 | each | $ 660.00 | $ 3,300.00 |
| | | b) 1.2m x 0.4m (min. letter size 100mm) | | 3 | each | $ 800.00 | $ 2,400.00 |
| | xiv) | Yield sign (RA-2) | | 7 | each | $ 400.00 | $ 2,800.00 |
| | xv) | One way sign (RB-21) | | 3 | each | $ 340.00 | $ 1,020.00 |
| | xvi) | Roundabout directional sign (WA-38) | | 3 | each | $ 360.00 | $ 1,080.00 |
| | xvii) | Sidewalk closed sign (black and white) | | 5 | each | $ 360.00 | $ 1,800.00 |
| | xviii) | Re-install removed signs | | 73 | each | $ 345.00 | $ 25,185.00 |
| 3 | **Supply noise attenuation** | | | 1 | L.S. | $ 100,000.00 | $100,000.00 |
| 4 | **Supply and install guiderails** | | 922 & S.P. | 500.0 | m | $ 325.00 | $162,500.00 |

SUB-TOTAL PART "K" $ 379,017.50

TENDERER'S INITIALS ______________

**Table 4**

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "L"**<br>**UTILITIES (as per Hydro's specifications)** | | | | | |
| **1** | **Remove, relocate and rewire existing hydro, Videotron and Bell services for existing dwellings** | | 4 | each | $ 5,000.00 | $ 20,000.00 |
| **2** | **Supply and install ducts crossing (no concrete)** | | | | | |
| | i) 50mm polypipe | | 170.0 | m | $ 35.00 | $ 5,950.00 |
| **3** | **Utilities** | | | | | |
| | i) Excavate trench for utilities | 401, 603, 614 & S.P. | 1852.0 | m | $ 28.00 | $ 51,856.00 |
| | ii) Supply 50mm polypipe and place sand (0.75m wide x 0.45m) | | 1852.0 | m | $ 30.00 | $ 55,560.00 |
| | iii) Supply and install switch disconnect as per City of Ottawa drawing LID005A | | 2 | each | $ 3,400.00 | $ 6,800.00 |
| **4** | **Supply and install transformer base (including grounding wire)** | | 2 | each | $ 5,000.00 | $ 10,000.00 |
| **5** | **Supply and install hydro pole c/w cable** | | 25 | each | $ 75,000.00 | $ 1,875,000.00 |
| **6** | **Other utilities' relocation** | | 1 | L.S. | $ 200,000.00 | $ 200,000.00 |
| **7** | **Streetlighting** | | | | | |
| | i) Supply and install streetlight fixture c/w 1.4m elliptical arm (RPM-90W60LED-730-G1-R2M-UNV-DMG-PH8-GY3) | S.P. | 35 | each | $ 2,200.00 | $ 77,000.00 |
| | ii) Supply and install streetlight fixture c/w 1.4m elliptical arm (RPM-110W60LED-730-G1-R2M-UNV-DMG-PH8-GY3) | | 35 | each | $ 2,200.00 | $ 77,000.00 |
| | iii) Supply and install streetlight pole (HA-325-B-1-PG-10) | | 35 | each | $ 6,200.00 | $ 217,000.00 |
| | iv) Streelight cable (no. 8 gauge) | | 1542.0 | m | $ 35.00 | $ 53,970.00 |

SUB-TOTAL PART "L" $ 2,650,136.00

TENDERER'S INITIALS ______________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "M"**<br>**CENTENNIAL CONSTRUCTION ROCKLAND LTÉE** | | | | | |
| **REMOVALS (to be disposed off-site, unless specified)** | | | | | | |
| **1** | **Remove, relocate and rewire existing hydro and Bell services for existing dwellings** | 510 & S.P. | 2 | each | $ 5,000.00 | $ 10,000.00 |
| **2** | **Remove existing retaining wall and railing (approximately 3.5m high)** | 510 & S.P. | 6.5 | m | $ 5,000.00 | $ 32,500.00 |
| **3** | **Remove existing road structure** | | | | | |
| | i) Asphalt (to be hauled off-site) | 510 & S.P. | 180.0 | m² | $ 6.00 | $ 1,080.00 |
| | ii) Granulars (use on site as fill material) | | 80.0 | m³ | $ 9.00 | $ 720.00 |
| **4** | **Remove existing gate** | 510 & S.P. | 1 | L.S. | $ 1,500.00 | $ 1,500.00 |
| **STORM SEWER** | | | | | | |
| **5** | **Supply and install structures**<br>i) Road catchbasins c/w two 3.0m subdrains | 401, 402, 407, 410, 492 & S.P. | 1 | each | $ 5,000.00 | $ 5,000.00 |
| **6** | **Storm sewer**<br>i) 250mm dia. PVC SDR 35 | 401, 402, 407, 410, 492 & S.P. | 35.0 | m | $ 350.00 | $ 12,250.00 |
| **7** | **Gabion stone (100mm-200mm) 0.4m thick c/w geotextile, Terrafix non-woven 370RS or equivalent as per OPSS 511 & 1860** | 512 & S.P. | 40.0 | m² | $ 80.00 | $ 3,200.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| **8** | **Subexcavation for trench** | S.P. | 5.0 | m³ | $ 70.00 | $ 350.00 |
| **BASE COURSE** | | | | | | |
| **9** | **Subgrade preparation for roadway** | S.P. | 1794.0 | m² | $ 4.50 | $ 8,073.00 |
| **10** | **Supply, place and compact granulars** | | | | | |
| | i) 450mm-thick of granular 'B' | 314 & S.P. | 1794.0 | m² | $ 27.00 | $ 48,438.00 |
| | ii) 150mm-thick of granular 'A' | | 1603.0 | m² | $ 10.50 | $ 16,831.50 |
| **11** | **Supply, place and compact asphalt**<br>i) 50mm-thick HL8 for base course (with a minimum PG 58-34 or SP 19.0) | 310 & S.P. | 1603.0 | m² | $ 24.00 | $ 38,472.00 |
| **12** | **Iron work adjustment (initial)**<br>i) Catchbasin | | 1 | each | $ 850.00 | $ 850.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| **13** | **Supply and install high performance geogrid (TBX2500 or equivalent)** | S.P. | 897.0 | m² | $ 4.00 | $ 3,588.00 |
| **14** | **Supply and install filter fabric - Terrafix non-woven 270R or equivalent** | S.P. | 897.0 | m² | $ 2.50 | $ 2,242.50 |
| **15** | **Subexcavation for roadways** | 314 | 60.0 | m³ | $ 75.00 | $ 4,500.00 |
| **16** | **Subexcavation for soft spots** | 314 | 15.0 | m³ | $ 75.00 | $ 1,125.00 |

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "M"**<br>**CENTENNIAL CONSTRUCTION ROCKLAND LTÉE** | | | | | |
| **SERVICES** | | | | | | |
| **17** | **Connect existing dwelling services to new lines on St-Jean Street including disconnection of the pipe and connection with proper fittings**<br>-19mm dia. PEX water service<br>-125mm dia. PVC SDR 35 sanitary service | 401, 410, 441 & S.P. | 1 | each | $ 9,000.00 | $ 9,000.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| **18** | **Subexcavation for trench** | S.P. | 5.0 | $m^3$ | $ 70.00 | $ 350.00 |
| **CURB, SIDEWALK & LANDSCAPING** | | | | | | |
| **19** | **Supply and install concrete barrier curb (OPSD 600.110)** | 600 & S.P. | 111.0 | m | $ 95.00 | $ 10,545.00 |
| **20** | **Supply and install concrete retaining wall** | | 37.0 | $m^2$ | $ 800.00 | $ 29,600.00 |
| **21** | **Supply and install railing for retaining wall** | | 16.0 | m | $ 200.00 | $ 3,200.00 |
| **WEAR COURSE** | | | | | | |
| **22** | **Supply, place & compact asphalt**<br>i) 40mm-thick HL-3 for wear course (with a minimum PG 58-34 or SP 12.5) | 310 & S.P. | 1603.0 | $m^2$ | $ 22.00 | $ 35,266.00 |
| **23** | **Iron work adjustment (final)**<br>i) Catchbasin | | 1 | each | $ 900.00 | $ 900.00 |

| | |
|---|---|
| SUB-TOTAL PART "M" | $ 279,581.00 |
| TENDERER'S INITIALS | |

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "N"**<br>**LAND ACQUISITION** | | | | | |
| **1** | **Land acquisition** | | 1 | L.S. | N/incl. | N/incl. |

| | |
|---|---|
| SUB-TOTAL PART "N" | $ - |
| TENDERER'S INITIALS | |

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "O"**<br>**CONTINGENCY ALLOWANCE** | | | | | |
| **1** | **Contingency allowance (20%)** | | 1 | L.S. | $ 3,517,518.00 | $ 3,517,518.00 |

SUB-TOTAL PART "O" $ 3,517,518.00

TENDERER'S INITIALS ______________

**Table 4**

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "P"**<br>**ENGINEERING FEES** | | | | | |
| **1** | **Engineering fees (15%)** | | 1 | L.S. | $ 2,638,138.50 | $ 2,638,138.50 |

SUB-TOTAL PART "P" $ 2,638,138.50

TENDERER'S INITIALS ______________

| PRELIMINARY COST ESTIMATE - ST-JEAN STREET - PHASE 3 | |
|---|---|
| PROJECT NUMBER: 180801-3 | PREPARED BY: Atrel Engineering Ltd |
| PROJECT NAME: St-Jean Rehabilitation - Phase 3 | DATE: 23-Aug-23 |
| CLIENT: Spacebuilders Ottawa Ltd / City of Clarence-Rockland | BY: CED |

| PART | | TOTAL AMOUNT |
|---|---|---|
| PART "A" - SITE PREPARATION | | $ 527,885.00 |
| PART "B" - REMOVALS | | $ 190,185.00 |
| PART "C" - STORM SEWER | | $ 1,417,263.50 |
| PART "D" - MASS EARTH MOVEMENT | | $ 1,681,850.00 |
| PART "E" - BASE COURSE | | $ 1,928,649.50 |
| PART "F" - CURBS, SIDEWALKS & LANDSCAPING | | $ 1,169,651.00 |
| PART "G" - WEAR COURSE | | $ 351,575.50 |
| PART "H" - MISCELLANEOUS | | $ 107,111.00 |
| PART "I" - UTILITIES | | $ 2,583,302.50 |
| PART "J" - LAND ACQUISITION | | $ - |
| | SUBTOTAL (Phase 3) | $ 9,957,473.00 |
| PART "K" - CONTINGENCY ALLOWANCE (20%) | | $ 1,991,494.60 |
| PART "L" - ENGINEERING FEES (15%) | | $ 1,493,620.95 |
| | TOTAL (Phase 3-2023) | $ 13,442,588.55 |
| | TOTAL (Phase 3-2024-7% ADDED) | $ 14,383,569.75 |
| | TOTAL (Phase 3-2025-7% ADDED) | $ 15,390,419.63 |
| | TOTAL (Phase 3-2026-7% ADDED) | $ 16,467,749.01 |
| | TOTAL (Phase 3-2027-7% ADDED) | $ 17,620,491.44 |
| | TOTAL (Phase 3-2028-7% ADDED) | $ 18,853,925.84 |
| | TOTAL (Phase 3-2029-7% ADDED) | $ 20,173,700.64 |
| | TOTAL (Phase 3-2030-7% ADDED) | $ 21,585,859.69 |

NOTES:

1) CONTAMINED SOUND MATERIAL IS EXCLUDED; IT WILL REMAIN ON SITE
2) PROPERTY ACQUISITION IS EXCLUDED
3) UTILITY RELOCATION COST IS A VERY ROUGH ESTIMATE
4) ENGINEERING COST OF 15% IS INCLUDED
5) A CONTINGENCY ALLOWANCE OF 20% IS INCLUDED
6) TRAFFIC SIGNAL OPTION IS NOT PART OF THIS ESTIMATE
7) 7% IS ADDED PER YEAR TO ACCOUNT FOR INFLATION


ATREL Engineering Ltd Ltée
Engineers - Ingénieurs

ST-JEAN REHABILITATION

PHASE 3

| | | |
|---|---|---|
| SCALE: NTS | JOB No.: 180801-3 | |
| | 23/08/23 | SK-PH3 |

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "A"**<br>**SITE PREPARATION** | | | | | |
| 1 | **Mobilization (includes bonds, insurance and demobilization)** | S.P. | 1 | L.S. | $ 150,000.00 | $ 150,000.00 |
| 2 | **Pre-construction survey** | S.P. | 1 | L.S. | $ 5,000.00 | $ 5,000.00 |
| 3 | **Supply and install silt fence barrier** | 805 & S.P. | 1065.0 | m | $ 15.00 | $ 15,975.00 |
| 4 | **Straw bales (by location)** | 805 & S.P. | 6 | each | $ 1,000.00 | $ 6,000.00 |
| 5 | **Traffic control and signs** | S.P. | | | | |
| | i) Traffic control plan | | 1 | L.S. | $ 3,000.00 | $ 3,000.00 |
| | ii) Permanent large closing notice signs (TC-64) | | 4 | each | $ 1,000.00 | $ 4,000.00 |
| | iii) Permanant traffic control signs | | 1 | L.S. | $ 60,000.00 | $ 60,000.00 |
| | iv) PVMS (portable variable message sign) for 1 week | | 3 | each | $ 3,000.00 | $ 9,000.00 |
| 6 | **Temporary fencing (MODU-LOC or equivalent)** | S.P. | 1 | L.S. | $ 15,000.00 | $ 15,000.00 |
| 7 | **Topsoil stripping** | 206 & S.P. | | | | |
| | i) Topsoil stripping | | 18450.0 | $m^2$ | $ 4.00 | $ 73,800.00 |
| | ii) Topsoil loading and hauling off site | | 2770.0 | $m^3$ | $ 18.00 | $ 49,860.00 |
| 8 | **Tree clearing and removal** | | 1 | L.S. | $ 100,000.00 | $ 100,000.00 |
| 9 | **Grubbing** | 201 & S.P. | 1 | L.S. | $ 20,000.00 | $ 20,000.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| 11 | **Hydrovac** | | 50.0 | hrs | $ 325.00 | $ 16,250.00 |

SUB-TOTAL PART "A" $ 527,885.00

TENDERER'S INITIALS ______________

Table 1

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "B"**<br>**REMOVALS (to be disposed off-site, unless specified)** | | | | | |
| **1** | **Remove existing culverts** | 510 & S.P. | 40.5 | m | $ 30.00 | $ 1,215.00 |
| **2** | **Remove existing road structure** | | | | | |
| | i) Asphalt (to be hauled off-site) | 510 & S.P. | 5810.0 | m² | $ 7.00 | $ 40,670.00 |
| | ii) Granulars | | 2975.0 | m³ | $ 18.00 | $ 53,550.00 |
| **3** | **Remove existing street signs** | 510 & S.P. | 2 | each | $ 75.00 | $ 150.00 |
| **4** | **Remove and reinstall existing mailbox** | 510 & S.P. | 8 | each | $ 300.00 | $ 2,400.00 |
| **5** | **Remove and reinstall existing pedestals** | 510 & S.P. | 4 | each | $ 5,000.00 | $ 20,000.00 |
| **6** | **Remove and reinstall existing civic address post** | 510 & S.P. | 4 | each | $ 300.00 | $ 1,200.00 |
| **7** | **Remove and reinstall existing brick wall with lights at 1240 Poupart Street** | 510 & S.P. | 1 | L.S. | $ 3,000.00 | $ 3,000.00 |
| **8** | **Remove existing hydro pole and guy wire** | 510 & S.P. | 17 | each | $ 4,000.00 | $ 68,000.00 |

SUB-TOTAL PART "B" $ 190,185.00

TENDERER'S INITIALS ____________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "C"**<br>**STORM SEWER** | | | | | |
| **1** | **Connection to existing** | | | | | |
| | i) Connect STM MH 430 to existing STM MH 433 | | 1 | each | $ 3,000.00 | $ 3,000.00 |
| **2** | **Supply and install structures** | 401, 402, 407, 410, 492 & S.P. | | | | |
| | i) 1200mm dia. maintenance hole | | 7 | each | $ 8,000.00 | $ 56,000.00 |
| | ii) 1800mm dia. maintenance hole | | 1 | each | $ 13,000.00 | $ 13,000.00 |
| | iii) 3000mm dia. maintenance hole | | 1 | each | $ 30,000.00 | $ 30,000.00 |
| | ix) 1829mm x 2438mm box maintenance hole | | 1 | each | $ 35,000.00 | $ 35,000.00 |
| | x) Road curb inlet catchbasin c/w two 3.0m subdrains & 200mm dia. PVC SDR 35 lead | | 54 | each | $ 5,000.00 | $ 270,000.00 |
| | xi) Road catchbasin c/w two 3.0m subdrains & 200mm dia. PVC SDR 35 lead | | 10 | each | $ 3,500.00 | $ 35,000.00 |
| **3** | **Storm sewer** | 401, 402, 407, 410, 492 & S.P. | | | | |
| | i) 375mm dia. PVC SDR 35 | | 102.0 | m | $ 400.00 | $ 40,800.00 |
| | ii) 450mm dia. PVC SDR 35 | | 341.5 | m | $ 475.00 | $ 162,212.50 |
| | iii) 600mm dia. CONC 100D | | 275.0 | m | $ 600.00 | $ 165,000.00 |
| | iv) 900mm dia. CONC 100D | | 115.5 | m | $ 1,050.00 | $ 121,275.00 |
| | v) 1650mm dia. CONC 100D | | 120.0 | m | $ 2,400.00 | $ 288,000.00 |
| | vi) 1800mm dia. CONC 100D | | 52.0 | m | $ 2,600.00 | $ 135,200.00 |
| **4** | **Supply and install inlet control device, plug type (ICD)** | S.P. | | | | |
| | i) 70mm x 70mm Diamond opening ICD (RR-15.5) | | 64 | each | $ 500.00 | $ 32,000.00 |
| **5** | **Supply and install temporary inlet control device (ICD)** | | 1 | each | $ 600.00 | $ 600.00 |
| **6** | **Supply and install storm insulation** | 1605 & S.P. | | | | |
| | i) 50mm-thick, 1.2m-wide SM HI-40 | | 50.0 | m | $ 25.00 | $ 1,250.00 |
| | ii) 100mm-thick, 1.2m-wide SM HI-40 | | 50.0 | m | $ 30.00 | $ 1,500.00 |
| | iii) 150mm-thick, 1.2m-wide SM HI-40 | | 50.0 | m | $ 35.00 | $ 1,750.00 |
| **7** | **T.V. inspection and report** | 409 & S.P. | | | | |
| | i) Initial | | 1006.0 | m | $ 12.00 | $ 12,072.00 |
| | ii) Final (1 year after substantial completion) | | 1006.0 | m | $ 14.00 | $ 14,084.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| **8** | **Subexcavation for trench** | S.P. | 36.0 | $m^3$ | $ 70.00 | $ 2,520.00 |

SUB-TOTAL PART "C" $ 1,417,263.50

TENDERER'S INITIALS ____________

**Table 1**

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "D"**<br>**MASS EARTH MOVEMENT** | | | | | |
| 1 | **Rock removal (to be hauled off-site)** | S.P. | 3710.0 | $m^3$ | $ 55.00 | $ 204,050.00 |
| 2 | **Fill**<br>i) Excavate, haul, place and compact sound fill originating from site to fill low laying areas | S.P. | 16300.0 | $m^3$ | $ 18.00 | $ 293,400.00 |
| 3 | **Export excess material off-site** | S.P. | 28200.0 | $m^3$ | $ 42.00 | $ 1,184,400.00 |

SUB-TOTAL PART "D" $ 1,681,850.00

TENDERER'S INITIALS ______________

Table 1

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "E"**<br>**BASE COURSE** | | | | | |
| 1 | **Subgrade preparation for roadway** | S.P. | 21322.0 | $m^2$ | $ 4.50 | $ 95,949.00 |
| 2 | **Supply, place and compact granulars** | | | | | |
| | i) 600mm-thick of granular 'B' | 314 & S.P. | 21322.0 | m² | $ 35.00 | $ 746,270.00 |
| | ii) 150mm-thick of granular 'A' | | 14869.0 | m² | $ 10.50 | $ 156,124.50 |
| 3 | **Supply, place and compact asphalt** | | | | | |
| | i) 1st lift - 50mm-thick HL8 for base course (with a minimum PG 58-34 or SP 19.0) | 310 & S.P. | 14869.0 | m² | $ 24.00 | $ 356,856.00 |
| | ii) 2nd lift - 50mm-thick HL8 for base course (with a minimum PG 58-34 or SP 19.0) | | 14869.0 | m² | $ 24.00 | $ 356,856.00 |
| 4 | **Iron work adjustment (initial)** | | | | | |
| | i) Maintenance hole | 408 & S.P. | 10 | each | $ 850.00 | $ 8,500.00 |
| | ii) Catchbasin | | 64 | each | $ 850.00 | $ 54,400.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| 5 | **Supply and install high performance geogrid (TBX2500 or equivalent)** | S.P. | 10661.0 | m² | $ 4.00 | $ 42,644.00 |
| 6 | **Supply and install filter fabric - Terrafix non-woven 270R or equivalent** | S.P. | 10661.0 | m² | $ 2.50 | $ 26,652.50 |
| 7 | **Subexcavation for roadways** | 314 | 800.0 | $m^3$ | $ 75.00 | $ 60,000.00 |
| 8 | **Subexcavation for soft spots** | 314 | 200.0 | $m^3$ | $ 75.00 | $ 15,000.00 |
| 9 | **Temporary asphalt ramping** | | | | | |
| | i) Curbs (around the apron, sidewalk, exisitng driveways, and MUP depressions) | 314 | 214.5 | m | $ 35.00 | $ 7,507.50 |
| | ii) To match existing streets | | 54.0 | m | $ 35.00 | $ 1,890.00 |

SUB-TOTAL PART "E" $ 1,928,649.50

TENDERER'S INITIALS ______________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "F"**<br>**CURBS, SIDEWALKS & LANDSCAPING** | | | | | |
| **1** | **Supply and install concrete barrier curb (OPSD 600.110)** | 600 & S.P. | 3402.0 | m | $ 95.00 | $ 323,190.00 |
| **2** | **Supply and install concrete barrier curb with key for sidewalk (OPSD 600.110)** | 600 & S.P. | 278.5 | m | $ 95.00 | $ 26,457.50 |
| **3** | **Supply and install concrete semi-mountable curb with narrow gutter for roundabout truck apron with key for concrete (MTOD-600.091)** | 600 & S.P. | 125.5 | m | $ 155.00 | $ 19,452.50 |
| **4** | **Supply and install concrete barrier curb with narrow gutter for roundabout truck apron (MTOD-600.080)** | 600 & S.P. | 100.5 | m | $ 155.00 | $ 15,577.50 |
| **5** | **Supply and install concrete sidewalk (2.0m-wide) 125mm-thick concrete on 200mm compacted granular 'A'** | 310 & S.P. | 1683.0 | $m^2$ | $ 130.00 | $ 218,790.00 |
| **6** | **Supply and install asphalt pathway M.U.P. (2.5m-wide) 50mm-thick HL3 asphalt on 200mm compacted granular 'A'** | 310 & S.P. | 2100.0 | $m^2$ | $ 60.00 | $ 126,000.00 |
| **7** | **Supply and instal tactile walking surface indicators (TWSI)** | 351 & S.P. | 29.0 | $m^2$ | $ 1,200.00 | $ 34,800.00 |
| **8** | **Supply and install concrete for roundabout** | S.P. | | | | |
| | i) Coloured concrete (Intersta-Baja Red, RG-2827R) cap as per City of Ottawa Standard SC10.1 | | 452.0 | $m^2$ | $ 300.00 | $ 135,600.00 |
| | ii) Raised concrete splitter island (typ). OPSD 504.010 | | 863.5 | $m^2$ | $ 130.00 | $ 112,255.00 |
| | iii) Landscaping of the roundabout and boulevards | | 1 | each | $ 75,000.00 | $ 75,000.00 |
| **9** | **Entrances** | 310, 314 & S.P. | | | | |
| | i) At the existing driveways<br>a) 300mm-thick of granular 'A' | | 202.5 | $m^2$ | $ 60.00 | $ 12,150.00 |
| | b) 50mm-thick HL8 (with a minimum PG 58-34 or SP 12.5) | | 202.5 | $m^2$ | $ 55.00 | $ 11,137.50 |
| **10** | **Supply and place 100mm-thick topsoil and hydroseeding** | 803 & S.P. | 8,463.0 | $m^2$ | $ 7.00 | $ 59,241.00 |

| | |
|---|---|
| SUB-TOTAL PART "F" | $ 1,169,651.00 |
| TENDERER'S INITIALS | |

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "G"**<br>**WEAR COURSE** | | | | | |
| 1 | **Supply, place & compact asphalt** | | | | | |
| | i) 40mm-thick HL-3 for wear course (with a minimum PG 58-34 or SP 12.5) | 310 & S.P. | 14869.0 | $m^2$ | $ 22.00 | $ 327,118.00 |
| 2 | **Iron work adjustment (final)** | | | | | |
| | i) Maintenance hole | 408 & S.P. | 10 | each | $ 900.00 | $ 9,000.00 |
| | ii) Catchbasin | | 10 | each | $ 900.00 | $ 9,000.00 |
| 3 | **Provide grinding key at all asphalt matching areas** | | 54.0 | m | $ 60.00 | $ 3,240.00 |
| 4 | **Asphalt ramps removal** | | 214.5 | m | $ 15.00 | $ 3,217.50 |

SUB-TOTAL PART "G" $ 351,575.50

TENDERER'S INITIALS ______________

Table 1

| ITEM NO. | ITEM | | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|---|
| | **PART "H"** **MISCELLANEOUS** | | | | | | |
| **1** | **Road painting** | | | | | | |
| | i) | Line painting (single yellow centerline) | 710 & S.P. | 96.0 | m | $ 3.50 | $ 336.00 |
| | ii) | Stop bar (white) | | 0 | each | $ 140.00 | $ - |
| | iii) | Roundabout markings | | 1 | L.S. | $ 9,500.00 | $ 9,500.00 |
| | iv) | Island tapered markings | | 340.0 | m | $ 3.50 | $ 1,190.00 |
| **2** | **Supply and install signs** | | 706 & S.P. | | | | |
| | i) | Roundabout ahead sign (WA-39) | | 4 | each | $ 2,000.00 | $ 8,000.00 |
| | ii) | Advisory speed tap sign (WA-7T, 30 km/h) | | 4 | each | $ 320.00 | $ 1,280.00 |
| | iii) | Roundabout diagrammatic guide sign (IA-6) | | | | | |
| | | a) 1.8m x 1.2m (min. letter size 150mm) | | 3 | each | $ 350.00 | $ 1,050.00 |
| | | b) 2.4m x 1.2m (min. letter size 150mm) | | 2 | each | $ 360.00 | $ 720.00 |
| | iv) | Divided road starts sign (RA-25R) | | 7 | each | $ 365.00 | $ 2,555.00 |
| | v) | Object marker sign (WA-33L) | | 7 | each | $ 340.00 | $ 2,380.00 |
| | vi) | Pedestrian crossing ahead sign (WC-27R) | | 4 | each | $ 340.00 | $ 1,360.00 |
| | vii) | Reserved bicycle lane (RB-84A) | | 3 | each | $ 350.00 | $ 1,050.00 |
| | viii) | Begins tab sign (RB-84T) | | 3 | each | $ 340.00 | $ 1,020.00 |
| | ix) | Shared pathway sign (RB-71) | | 2 | each | $ 520.00 | $ 1,040.00 |
| | x) | Pedestrian crossing sign (RA-5R) | | 16 | each | $ 375.00 | $ 6,000.00 |
| | xi) | Pedestrian crossing sign (RA-5L) | | 24 | each | $ 240.00 | $ 5,760.00 |
| | xii) | Stop for pedestrians sign (RA-4T) | | 24 | each | $ 230.00 | $ 5,520.00 |
| | xiii) | Roundabout exit guide sign (IA-9) | | | | | |
| | | a) 1.1m x 0.4m (min. letter size 100mm) | | 3 | each | $ 660.00 | $ 1,980.00 |
| | | b) 1.2m x 0.4m (min. letter size 100mm) | | 2 | each | $ 800.00 | $ 1,600.00 |
| | xiv) | Yield sign (RA-2) | | 4 | each | $ 400.00 | $ 1,600.00 |
| | xv) | One way sign (RB-21) | | 2 | each | $ 340.00 | $ 680.00 |
| | xvi) | Roundabout directional sign (WA-38) | | 2 | each | $ 360.00 | $ 720.00 |
| | xvii) | Sidewalk closed sign (black and white) | | 3 | each | $ 360.00 | $ 1,080.00 |
| | xviii) | Re-install removed signs | | 2 | each | $ 345.00 | $ 690.00 |
| **3** | **Supply noise attenuation** | | | 1 | L.S. | $ 50,000.00 | $50,000.00 |

SUB-TOTAL PART "H" $ 107,111.00

TENDERER'S INITIALS ______________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "I"**<br>**UTILITIES (as per Hydro's specifications)** | | | | | |
| 1 | **Remove, relocate and rewire existing hydro, Videotron and Bell services for existing dwellings** | | 7 | each | $ 5,000.00 | $ 35,000.00 |
| 2 | **Supply and install ducts crossing (no concrete)** | | | | | |
| | i) 75mm duct | | 160.0 | m | $ 40.00 | $ 6,400.00 |
| 3 | **Utilities** | | | | | |
| | i) Excavate trench for utilities | 401, 603, 614 & S.P. | 1910.0 | m | $ 28.00 | $ 53,480.00 |
| | ii) Supply 75mm polypipe and place sand (0.75m wide x 0.45m) | | 1910.0 | m | $ 38.00 | $ 72,580.00 |
| | iii) Supply and install switch disconnect as per City of Ottawa drawing LID005A | | 2 | each | $ 3,400.00 | $ 6,800.00 |
| 4 | **Supply and install transformer base (including grounding wire)** | | 2 | each | $ 5,000.00 | $ 10,000.00 |
| 5 | **Supply and install hydro pole c/w cable** | | 27 | each | $ 75,000.00 | $ 2,025,000.00 |
| 6 | **Other utilities' relocation** | | 1 | L.S. | $ 100,000.00 | $ 100,000.00 |
| 7 | **Streetlighting** | | | | | |
| | i) Supply and install streetlight fixture c/w 1.4m elliptical arm (RPM-90W60LED-730-G1-R2M-UNV-DMG-PH8-GY3) | S.P. | 21 | each | $ 2,800.00 | $ 58,800.00 |
| | ii) Supply and install streetlight fixture c/w 1.4m elliptical arm (RPM-110W60LED-730-G1-R2M-UNV-DMG-PH8-GY3) | | 4 | each | $ 2,800.00 | $ 11,200.00 |
| | iii) Supply and install streetlight pole (HA-325-B-1-PG-10) | | 25 | each | $ 6,500.00 | $ 162,500.00 |
| | iv) Streelight cable (no. 4 gauge) | | 477.5 | m | $ 51.00 | $ 24,352.50 |
| | v) Streelight cable (no. 8 gauge) | | 477.5 | m | $ 36.00 | $ 17,190.00 |

SUB-TOTAL PART "I" $ 2,583,302.50

TENDERER'S INITIALS ____________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "J"**<br>**LAND ACQUISITION** | | | | | |
| **1** | **Land acquisition** | | 1 | L.S. | N/incl. | N/incl. |

SUB-TOTAL PART "J" $ -

TENDERER'S INITIALS ____________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "K"**<br>**CONTINGENCY ALLOWANCE** | | | | | |
| **1** | **Contingency allowance (20%)** | | 1 | L.S. | $1,991,494.60 | $1,991,494.60 |

SUB-TOTAL PART "K" $1,991,494.60

TENDERER'S INITIALS ______________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "L"**<br>**ENGINEERING FEES** | | | | | |
| **1** | **Engineering fees (15%)** | | 1 | L.S. | $1,493,620.95 | $1,493,620.95 |

SUB-TOTAL PART "L" $1,493,620.95

TENDERER'S INITIALS ______________

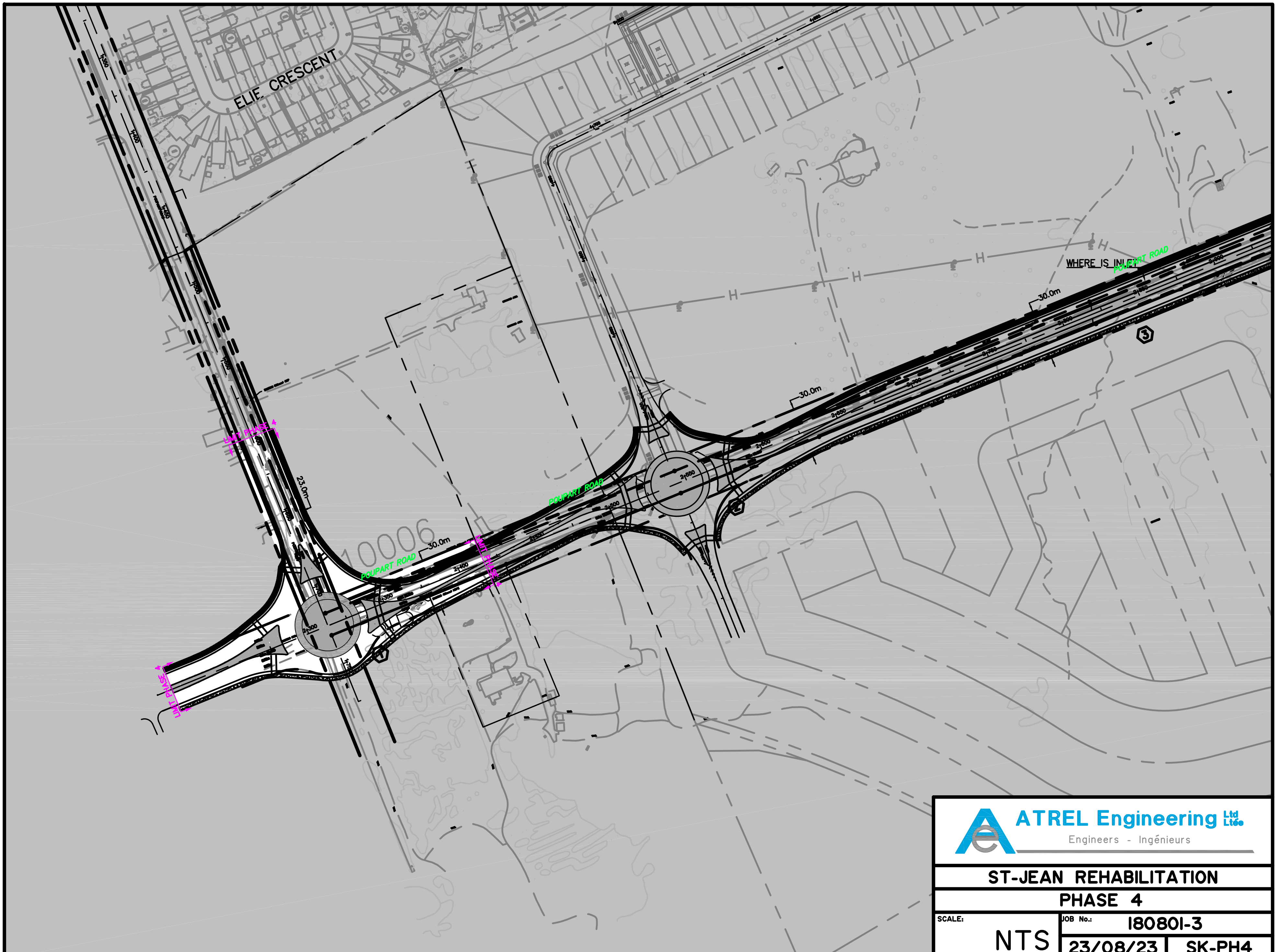
**Table 1**

| PRELIMINARY COST ESTIMATE - ST-JEAN STREET - PHASE 4 | |
|---|---|
| PROJECT NUMBER: 180801-4 | PREPARED BY: Atrel Engineering Ltd |
| PROJECT NAME: St-Jean Rehabilitation - Phase 4 | DATE: 23-Aug-23 |
| CLIENT: Spacebuilders Ottawa Ltd / City of Clarence-Rockland | BY: CED |

| PART | | TOTAL AMOUNT |
|---|---|---|
| PART "A" - SITE PREPARATION | | $ 274,860.00 |
| PART "B" - REMOVALS | | $ 53,755.00 |
| PART "C" - STORM SEWER | | $ 303,348.00 |
| PART "D" - MASS EARTH MOVEMENT | | $ 408,600.00 |
| PART "E" - BASE COURSE | | $ 765,179.50 |
| PART "F" - CURBS, SIDEWALKS & LANDSCAPING | | $ 580,474.00 |
| PART "G" - WEAR COURSE | | $ 138,046.00 |
| PART "H" - MISCELLANEOUS | | $ 58,489.00 |
| PART "I" - UTILITIES | | $ 832,743.00 |
| PART "J" - LAND ACQUISITION | | $ - |
| | SUBTOTAL (Phase 4) | $ 3,415,494.50 |
| PART "K" - CONTINGENCY ALLOWANCE (20%) | | $ 683,098.90 |
| PART "L" - ENGINEERING FEES (15%) | | $ 512,324.18 |
| | TOTAL (Phase 4-2023) | $ 4,610,917.58 |
| | TOTAL (Phase 4-2024-7% ADDED) | $ 4,933,681.81 |
| | TOTAL (Phase 4-2025-7% ADDED) | $ 5,279,039.53 |
| | TOTAL (Phase 4-2026-7% ADDED) | $ 5,648,572.30 |
| | TOTAL (Phase 4-2027-7% ADDED) | $ 6,043,972.36 |
| | TOTAL (Phase 4-2028-7% ADDED) | $ 6,467,050.42 |
| | TOTAL (Phase 4-2029-7% ADDED) | $ 6,919,743.95 |
| | TOTAL (Phase 4-2030-7% ADDED) | $ 7,404,126.03 |

NOTES:

1) CONTAMINED SOUND MATERIAL IS EXCLUDED; IT WILL REMAIN ON SITE
2) PROPERTY ACQUISITION IS EXCLUDED
3) UTILITY RELOCATION COST IS A VERY ROUGH ESTIMATE
4) ENGINEERING COST OF 15% IS INCLUDED
5) A CONTINGENCY ALLOWANCE OF 20% IS INCLUDED
6) TRAFFIC SIGNAL OPTION IS NOT PART OF THIS ESTIMATE
7) 7% IS ADDED PER YEAR TO ACCOUNT FOR INFLATION




ATREL Engineering Ltd Ltée

Engineers - Ingénieurs

ST-JEAN REHABILITATION

PHASE 4

| SCALE: | JOB No.: 180801-3 | |
|---|---|---|
| NTS | 23/08/23 | SK-PH4 |

**Table 1**

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "A"**<br>**SITE PREPARATION** | | | | | |
| **1** | **Mobilization (includes bonds, insurance and demobilization)** | S.P. | 1 | L.S. | $ 45,000.00 | $ 45,000.00 |
| **2** | **Pre-construction survey** | S.P. | 1 | L.S. | $ 5,000.00 | $ 5,000.00 |
| **3** | **Supply and install silt fence barrier** | 805 & S.P. | 370.0 | m | $ 15.00 | $ 5,550.00 |
| **4** | **Straw bales (by location)** | 805 & S.P. | 6 | each | $ 1,000.00 | $ 6,000.00 |
| **5** | **Traffic control and signs** | | | | | |
| | i) Traffic control plan | S.P. | 1 | L.S. | $ 3,000.00 | $ 3,000.00 |
| | ii) Permanent large closing notice signs (TC-64) | | 4 | each | $ 1,000.00 | $ 4,000.00 |
| | iii) Permanant traffic control signs | | 1 | L.S. | $ 60,000.00 | $ 60,000.00 |
| | iv) PVMS (portable variable message sign) for 1 week | | 3 | each | $ 3,000.00 | $ 9,000.00 |
| **6** | **Temporary fencing (MODU-LOC or equivalent)** | S.P. | 1 | L.S. | $ 15,000.00 | $ 15,000.00 |
| **7** | **Topsoil stripping** | | | | | |
| | i) Topsoil stripping | 206 & S.P. | 9340.0 | $m^2$ | $ 4.00 | $ 37,360.00 |
| | ii) Topsoil loading and hauling off site | | 1400.0 | $m^3$ | $ 18.00 | $ 25,200.00 |
| **8** | **Tree clearing and removal** | | 1 | L.S. | $ 30,000.00 | $ 30,000.00 |
| **9** | **Grubbing** | 201 & S.P. | 1 | L.S. | $ 20,000.00 | $ 20,000.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| **10** | **Hydrovac** | | 30.0 | hrs | $ 325.00 | $ 9,750.00 |

SUB-TOTAL PART "A" $ 274,860.00

TENDERER'S INITIALS ____________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "B"**<br>**REMOVALS (to be disposed off-site, unless specified)** | | | | | |
| **1** | **Remove existing culverts** | 510 & S.P. | 3.0 | m | $ 30.00 | $ 90.00 |
| **2** | **Remove existing road structure** | | | | | |
| | i) Asphalt (to be hauled off-site) | 510 & S.P. | 1545.0 | $m^2$ | $ 7.00 | $ 10,815.00 |
| | ii) Granulars | | 825.0 | $m^3$ | $ 18.00 | $ 14,850.00 |
| **3** | **Remove existing hydro pole and guy wire** | 510 & S.P. | 7 | each | $ 4,000.00 | $ 28,000.00 |

SUB-TOTAL PART "B" $ 53,755.00

TENDERER'S INITIALS ______________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "C"**<br>**STORM SEWER** | | | | | |
| 1 | **Supply and install structures** | | | | | |
| | i) 1800mm dia. maintenance hole | 401, 402, 407, 410, 492 & S.P. | 2 | each | $ 13,000.00 | $ 26,000.00 |
| | ii) Road curb inlet catchbasin c/w two 3.0m subdrains & 200mm dia. PVC SDR 35 lead | | 16 | each | $ 5,000.00 | $ 80,000.00 |
| | iii) Road catchbasin c/w two 3.0m subdrains & 200mm dia. PVC SDR 35 lead | | 2 | each | $ 3,500.00 | $ 7,000.00 |
| 2 | **Storm sewer** | 401, 402, 407, 410, 492 & S.P. | | | | |
| | i) 900mm dia. PVC SDR 35 | | 165.5 | m | $ 1,050.00 | $ 173,775.00 |
| 3 | **Supply and install inlet control device, plug type (ICD)** | S.P. | | | | |
| | i) 70mm x 70mm Diamond opening ICD (RR-15.5) | | 18 | each | $ 500.00 | $ 9,000.00 |
| 4 | **Supply and install temporary inlet control device (ICD)** | | 1 | each | $ 600.00 | $ 600.00 |
| 5 | **Supply and install storm insulation** | 1605 & S.P. | | | | |
| | i) 50mm-thick, 1.2m-wide SM HI-40 | | 25.0 | m | $ 25.00 | $ 625.00 |
| | ii) 100mm-thick, 1.2m-wide SM HI-40 | | 25.0 | m | $ 30.00 | $ 750.00 |
| | iii) 150mm-thick, 1.2m-wide SM HI-40 | | 25.0 | m | $ 35.00 | $ 875.00 |
| 6 | **T.V. inspection and report** | 409 & S.P. | | | | |
| | i) Initial | | 165.5 | m | $ 12.00 | $ 1,986.00 |
| | ii) Final (1 year after substantial completion) | | 165.5 | m | $ 14.00 | $ 2,317.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| 7 | **Subexcavation for trench** | S.P. | 6.0 | m³ | $ 70.00 | $ 420.00 |

SUB-TOTAL PART "E" $ 303,348.00

TENDERER'S INITIALS ____________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "D"**<br>**MASS EARTH MOVEMENT** | | | | | |
| **1** | **Rock removal (to be hauled off-site)** | S.P. | 360.0 | $m^3$ | $ 55.00 | $ 19,800.00 |
| **2** | **Fill**<br>i) Excavate, haul, place and compact sound fill originating from site to fill low laying areas | S.P. | 5500.0 | $m^3$ | $ 18.00 | $ 99,000.00 |
| **3** | **Export excess material off-site** | S.P. | 6900.0 | $m^3$ | $ 42.00 | $ 289,800.00 |

SUB-TOTAL PART "F" $ 408,600.00

TENDERER'S INITIALS ______________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "E"**<br>**BASE COURSE** | | | | | |
| **1** | **Subgrade preparation for roadway** | S.P. | 8546.0 | $m^2$ | $ 4.50 | $ 38,457.00 |
| **2** | **Supply, place and compact granulars** | | | | | |
| | i) 600mm-thick of granular 'B' | 314 & S.P. | 8546.0 | $m^2$ | $ 35.00 | $ 299,110.00 |
| | ii) 150mm-thick of granular 'A' | | 5908.0 | $m^2$ | $ 10.50 | $ 62,034.00 |
| **3** | **Supply, place and compact asphalt** | | | | | |
| | i) 1st lift - 50mm-thick HL8 for base course (with a minimum PG 58-34 or SP 19.0) | 310 & S.P. | 5908.0 | $m^2$ | $ 24.00 | $ 141,792.00 |
| | ii) 2nd lift - 50mm-thick HL8 for base course (with a minimum PG 58-34 or SP 19.0) | | 5908.0 | $m^2$ | $ 24.00 | $ 141,792.00 |
| **4** | **Iron work adjustment (initial)** | | | | | |
| | i) Maintenance hole | 408 & S.P. | 2 | each | $ 850.00 | $ 1,700.00 |
| | ii) Catchbasin | | 18 | each | $ 850.00 | $ 15,300.00 |
| | **PROVISIONAL ITEMS** | | | | | |
| **5** | **Supply and install high performance geogrid (TBX2500 or equivalent)** | S.P. | 4273.0 | $m^2$ | $ 4.00 | $ 17,092.00 |
| **6** | **Supply and install filter fabric - Terrafix non-woven 270R or equivalent** | S.P. | 4273.0 | $m^2$ | $ 2.50 | $ 10,682.50 |
| **7** | **Subexcavation for roadways** | 314 | 321.0 | $m^3$ | $ 75.00 | $ 24,075.00 |
| **8** | **Subexcavation for soft spots** | 314 | 81.0 | $m^3$ | $ 75.00 | $ 6,075.00 |
| **9** | **Temporary asphalt ramping** | | | | | |
| | i) Curbs (around the apron, sidewalk, MUP depression, and driveways) | 314 | 170.0 | m | $ 35.00 | $ 5,950.00 |
| | ii) To match existing streets | | 32.0 | m | $ 35.00 | $ 1,120.00 |

SUB-TOTAL PART "G" $ 765,179.50

TENDERER'S INITIALS ____________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "F"<br>CURBS, SIDEWALKS & LANDSCAPING** | | | | | |
| **1** | **Supply and install concrete barrier curb (OPSD 600.110)** | 600 & S.P. | 715.5 | m | $ 95.00 | $ 67,972.50 |
| **2** | **Supply and install concrete barrier curb with key for sidewalk (OPSD 600.110)** | 600 & S.P. | 293.5 | m | $ 95.00 | $ 27,882.50 |
| **3** | **Supply and install concrete semi-mountable curb with narrow gutter for roundabout truck apron with key for concrete (MTOD-600.091)** | 600 & S.P. | 125.5 | m | $ 155.00 | $ 19,452.50 |
| **4** | **Supply and install concrete barrier curb with narrow gutter for roundabout truck apron (MTOD-600.080)** | 600 & S.P. | 100.5 | m | $ 155.00 | $ 15,577.50 |
| **5** | **Supply and install concrete sidewalk (2.0m-wide) 125mm-thick concrete on 200mm compacted granular 'A'** | 310 & S.P. | 425.0 | m² | $ 130.00 | $ 55,250.00 |
| **6** | **Supply and install asphalt pathway M.U.P. (2.5m-wide) 50mm-thick HL3 asphalt on 200mm compacted granular 'A'** | 310 & S.P. | 719.0 | $m^2$ | $ 60.00 | $ 43,140.00 |
| **7** | **Supply and install asphalt pathway M.U.P. (1.8m-wide) 50mm-thick HL3 asphalt on 200mm compacted granular 'A'** | 310 & S.P. | 151.0 | m² | $ 55.00 | $ 8,305.00 |
| **8** | **Supply and instal tactile walking surface indicators (TWSI)** | 351 & S.P. | 22.0 | m² | $ 1,200.00 | $ 26,400.00 |
| **9** | **Supply and install concrete for roundabout**<br>i) Coloured concrete (Intersta-Baja Red, RG-2827R) cap as per City of Ottawa Standard SC10.1 | S.P. | 452.0 | m² | $ 300.00 | $ 135,600.00 |
| | ii) Raised concrete splitter island (typ). OPSD 504.010 | | 685.5 | m² | $ 130.00 | $ 89,115.00 |
| | iii) Landscaping of the roundabout and boulevards | | 1 | each | $ 75,000.00 | $ 75,000.00 |
| **10** | **Entrances**<br>i) At the existing driveways<br>a) 300mm-thick of granular 'A' | 310, 314 & S.P. | 35 | m² | $ 30.00 | $ 1,050.00 |
| | b) 50mm-thick HL3 (with a minimum PG 58-34 or SP 12.5) | | 35 | m² | $ 55.00 | $ 1,925.00 |
| **11** | **Supply and place 100mm-thick topsoil and hydroseeding** | 803 & S.P. | 1,972.0 | m² | $ 7.00 | $ 13,804.00 |

SUB-TOTAL PART "I" $ 580,474.00

TENDERER'S INITIALS ____________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "G"**<br>**WEAR COURSE** | | | | | |
| 1 | **Supply, place & compact asphalt** | | | | | |
| | i) 40mm-thick HL-3 for wear course (with a minimum PG 58-34 or SP 12.5) | 310 & S.P. | 5908.0 | $m^2$ | $ 22.00 | $ 129,976.00 |
| 2 | **Iron work adjustment (final)** | | | | | |
| | i) Maintenance hole | 408 & S.P. | 2 | each | $ 900.00 | $ 1,800.00 |
| | ii) Catchbasin | | 2 | each | $ 900.00 | $ 1,800.00 |
| 3 | **Provide grinding key at all asphalt matching areas** | | 32.0 | m | $ 60.00 | $ 1,920.00 |
| 4 | **Asphalt ramps removal** | | 170.0 | m | $ 15.00 | $ 2,550.00 |

SUB-TOTAL PART "J" $ 138,046.00

TENDERER'S INITIALS ______________

Table 1

| ITEM NO. | ITEM | | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|---|
| | **PART "H" MISCELLANEOUS** | | | | | | |
| **1** | **Road painting** | | | | | | |
| | i) | Line painting (single yellow centerline) | 710 & S.P. | 70.0 | m | $ 3.50 | $ 245.00 |
| | ii) | Stop bar (white) | | 0 | each | $ 140.00 | $ - |
| | iii) | Roundabout markings | | 1 | L.S. | $ 9,500.00 | $ 9,500.00 |
| | iv) | Island tapered markings | | 254.0 | m | $ 3.50 | $ 889.00 |
| **2** | **Supply and install signs** | | 706 & S.P. | | | | |
| | i) | Roundabout ahead sign (WA-39) | | 3 | each | $ 2,000.00 | $ 6,000.00 |
| | ii) | Advisory speed tap sign (WA-7T, 30 km/h) | | 3 | each | $ 320.00 | $ 960.00 |
| | iii) | Roundabout diagrammatic guide sign (IA-6) | | 0 | | | |
| | | a) 1.8m x 1.2m (min. letter size 150mm) | | 2 | each | $ 350.00 | $ 700.00 |
| | | b) 2.4m x 1.2m (min. letter size 150mm) | | 1 | each | $ 360.00 | $ 360.00 |
| | iv) | Divided road starts sign (RA-25R) | | 5 | each | $ 365.00 | $ 1,825.00 |
| | v) | Object marker sign (WA-33L) | | 5 | each | $ 340.00 | $ 1,700.00 |
| | vi) | Pedestrian crossing ahead sign (WC-27R) | | 3 | each | $ 340.00 | $ 1,020.00 |
| | vii) | Reserved bicycle lane (RB-84A) | | 2 | each | $ 350.00 | $ 700.00 |
| | viii) | Begins tab sign (RB-84T) | | 2 | each | $ 340.00 | $ 680.00 |
| | ix) | Shared pathway sign (RB-71) | | 1 | each | $ 520.00 | $ 520.00 |
| | x) | Pedestrian crossing sign (RA-5R) | | 12 | each | $ 375.00 | $ 4,500.00 |
| | xi) | Pedestrian crossing sign (RA-5L) | | 18 | each | $ 240.00 | $ 4,320.00 |
| | xii) | Stop for pedestrians sign (RA-4T) | | 18 | each | $ 230.00 | $ 4,140.00 |
| | xiii) | Roundabout exit guide sign (IA-9) | | 0 | | | |
| | | a) 1.1m x 0.4m (min. letter size 100mm) | | 2 | each | $ 660.00 | $ 1,320.00 |
| | | b) 1.2m x 0.4m (min. letter size 100mm) | | 1 | each | $ 800.00 | $ 800.00 |
| | xiv) | Yield sign (RA-2) | | 3 | each | $ 400.00 | $ 1,200.00 |
| | xv) | One way sign (RB-21) | | 1 | each | $ 340.00 | $ 340.00 |
| | xvi) | Roundabout directional sign (WA-38) | | 1 | each | $ 360.00 | $ 360.00 |
| | xvii) | Sidewalk closed sign (black and white) | | 2 | each | $ 360.00 | $ 720.00 |
| | xviii) | Re-install removed signs | | 2 | each | $ 345.00 | $ 690.00 |
| **3** | **Supply noise attenuation** | | | 1 | L.S. | $ 15,000.00 | $15,000.00 |

SUB-TOTAL PART "K" $ 58,489.00

TENDERER'S INITIALS ____________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "I"**<br>**UTILITIES (as per Hydro's specifications)** | | | | | |
| **1** | **Remove, relocate and rewire existing hydro, Videotron and Bell services for existing dwellings** | | 1 | each | $ 5,000.00 | $ 5,000.00 |
| **2** | **Supply and install ducts crossing (no concrete)** | | | | | |
| | i) 75mm duct | | 120.0 | m | $ 40.00 | $ 4,800.00 |
| **3** | **Utilities** | 401, 603, 614 & S.P. | | | | |
| | i) Excavate trench for utilities | | 542.0 | m | $ 28.00 | $ 15,176.00 |
| | ii) Supply 75mm polypipe and place sand (0.75m wide x 0.45m) | | 542.0 | m | $ 38.00 | $ 20,596.00 |
| | iii) Supply and install switch disconnect as per City of Ottawa drawing LID005A | | 2 | each | $ 3,400.00 | $ 6,800.00 |
| **4** | **Supply and install transformer base (including grounding wire)** | | 2 | each | $ 5,000.00 | $ 10,000.00 |
| **5** | **Supply and install hydro pole c/w cable** | | 8 | each | $ 75,000.00 | $ 600,000.00 |
| **6** | **Other utilities' relocation** | | 1 | L.S. | $ 50,000.00 | $ 50,000.00 |
| **7** | **Streetlighting** | S.P. | | | | |
| | i) Supply and install streetlight fixture c/w 1.4m elliptical arm (RPM-90W60LED-730-G1-R2M-UNV-DMG-PH8-GY3) | | 6 | each | $ 2,800.00 | $ 16,800.00 |
| | ii) Supply and install streetlight fixture c/w 1.4m elliptical arm (RPM-110W60LED-730-G1-R2M-UNV-DMG-PH8-GY3) | | 4 | each | $ 2,800.00 | $ 11,200.00 |
| | iii) Supply and install streetlight pole (HA-325-B-1-PG-10) | | 10 | each | $ 6,500.00 | $ 65,000.00 |
| | iv) Streelight cable (no. 4 gauge) | | 271.0 | m | $ 65.00 | $ 17,615.00 |
| | v) Streelight cable (no. 8 gauge) | | 271.0 | m | $ 36.00 | $ 9,756.00 |

SUB-TOTAL PART "L" $ 832,743.00

TENDERER'S INITIALS ____________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "J"**<br>**LAND ACQUISITION** | | | | | |
| **1** | **Land acquisition** | | 1 | L.S. | N/incl. | N/incl. |

SUB-TOTAL PART "N" $ -

TENDERER'S INITIALS ____________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "K"**<br>**CONTINGENCY ALLOWANCE** | | | | | |
| **1** | **Contingency allowance (20%)** | | 1 | L.S. | $ 683,098.90 | $ 683,098.90 |

SUB-TOTAL PART "O" $ 683,098.90

TENDERER'S INITIALS ______________

| ITEM NO. | ITEM | OPSS NO. | EST. QTY. | UNIT | UNIT PRICE | TOTAL AMOUNT |
|---|---|---|---|---|---|---|
| | **PART "L"**<br>**ENGINEERING FEES** | | | | | |
| **1** | **Engineering fees (15%)** | | 1 | L.S. | $ 512,324.18 | $ 512,324.18 |

| | |
|---|---|
| SUB-TOTAL PART "P" | $ 512,324.18 |
| TENDERER'S INITIALS | |

## APPENDIX "K"

## Drainage and Storm Water Management Strategy


MINOR DRAINAGE SYSTEM
30.0m
30.0m
STREET MAP
STREET MAP
ATREL Engineering Ltd Ltée
Engineers - Ingénieurs
POUPART ROAD - ST-JEAN STREET
SCALE:
1:1000
MINOR DRAINAGE
AUGUST 2023
180801-3-MIDI


MINOR DRAINAGE SYSTEM
ULTIMATE POND
43.50 - BOTTOM OF POND
45.00 - PERMANENT WATER LEVEL
45.45 - QUALITY WATER LEVEL
46.42 - 100 YR WATER LEVEL
47.00 - TOP OF POND
WALKWAY (BY OTHERS)
STREET MAP
POUPART ROAD
ST-JEAN ST
LAFONTAINE CREEK
DESCOTES CIR
RICHELIEU STREET
RUE ST-JEAN
DIAMOND
RUBY
COUNTY ROAD 21
ATREL Engineering Ltd Ltée
Engineers - Ingénieurs
POUPART ROAD - ST-JEAN STREET
SCALE:
1:1000
MINOR DRAINAGE
AUGUST 2023
180801-3-MID2


MAJOR DRAINAGE SYSTEM
30.0m
STREET MAP
STREET MAP
ATREL Engineering Ltd Ltée
Engineers - Ingénieurs
POUPART ROAD - ST-JEAN STREET
SCALE:
1:1000
MAJOR DRAINAGE
AUGUST 2023
180801-3-MADI


ATREL Engineering Ltd Ltée
Engineers - Ingénieurs

POUPART ROAD - ST-JEAN STREET

| SCALE: 1:1000 | MAJOR DRAINAGE | |
|---|---|---|
| | AUGUST 2023 | 180801-3-MAD2 |

# APPENDIX “L”

## Air Quality Assessment - RWDI

## January 29, 2024

DRAFT REPORT

# ST. JEAN STREET AND POUPART ROAD MCEA

ROCKLAND, ONTARIO

AIR QUALITY ASSESSMENT
RWDI # 2402039
January 29, 2024


**SUBMITTED TO**

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# 1 INTRODUCTION

RWDI was retained by Atrel Engineering Ltd. to conduct an air quality assessment for the proposed roadway improvements of a section of St. Jean Street and Poupart Road in Rockland, Ontario. These improvements were proposed as a part of the St. Jean Street and Poupart Road Municipal Class Environmental Assessment (MCEA) process, with the intention of accommodating the growing population within the area.

The scope of the study is itemized below:

- Use vehicle emissions modelling techniques to estimate tailpipe, brake wear, tire wear and road dust emissions associated with the traffic for 2031.
- Use a computer simulation of atmospheric dispersion to predict maximum contaminant concentrations at representative sensitive receptors due to vehicle emissions from the future conditions without the project (No-Build scenario), and future conditions with the project (Build scenario).
- Use representative historical monitoring data to establish background concentrations for each contaminant of interest due to various other sources in the surrounding area other than those associated with the proposed project.
- Combine the dispersion model results with the background concentrations and compare to applicable air quality thresholds for all scenarios.
- Conduct a semi-quantitative assessment to determine the incremental impact of greenhouse gases within the context of provincial emissions.

# 2 PROJECT DESCRIPTION

The project is described by roadway expansions to St. Jean Street and Poupart Road in Rockwood, Ontario. The undertaking covers the widening of a 1.6 km long section of St. Jean Street and Poupart Road from 10 m wide to 30 m wide representing a maximum of 15 m from the road's centre line. The existing single lanes will become double lanes in each direction along the main roadway from east to west, with a raised median at the center of the two double lanes. The undertaking also includes the addition of four roundabouts along St. Jean Street and Poupart Road: two in the western section of the roadway on Poupart Road, one at the intersection of St. Jean Street and Poupart Road, and one at the eastern end of the roadway where there is an existing bend in St. Jean Street. The addition of these four roundabouts accommodates new single lane roads, identified in this assessment as Stewart Village East, Stewart Village West, and Bronze Avenue, that provide access to proposed new residential development to the north and south of the main roadway corridor.

**Figure 1** shows the study area and its surrounding land use. The study area consists of residential and agricultural land uses, as well as forested land.

Existing sensitive receptors were identified within the study area based on the latest publicly available satellite imagery. Potential future sensitive receptors were identified based on proposed residential development north of St Jean Street and Poupart Road as shown on the Functional Plan included in **Appendix A**; additional future receptors were included south of St Jean Street and Poupart Road assuming similar residential development would occur in this area. These future sensitive receptors are identified with the suffix "_F" in **Figures 1** and **2**. The same receptors have been used for the No-Build and Build scenarios.

# 3 ASSESSMENT METHODOLOGY

This assessment generally followed the methodology described in the MTO "Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects" (May 2020) (the "MTO Air Quality Guide").

## 3.1 Modelled Scenarios

The assessment was undertaken for the following scenarios:

- **No-Build** of the proposed project for 2031; and,
- **Build** of the proposed project for 2031.

The assessment assumes that for the No-Build scenario, no major roadway improvements have occurred to the existing road alignments for the 2031 horizon year, with traffic volumes and average roadway network speeds provided by Castleglenn Consultants Inc. The Build scenario includes the proposed improvements to St. Jean Street and Poupart Road along with the traffic volumes and average speeds predicted for the 2031 horizon year across the local roadway network as provided by Castleglenn Consultants Inc. The traffic volumes and average roadway network speeds used in both the No-Build and Build scenarios are based on PM peak hour values which represent the worst-case for congestion across the roadway network. The traffic volumes remain the same from the No-Build to the Build scenario. The PM peak hour average roadway network speeds for the No-Build and Build scenarios were 6 kph and 28 kph respectively.

## 3.2 Modelled Roadways

The modelling included a 1.6 km long section of St. Jean Street and Poupart Road within the study area as well as existing and proposed residential access roads extending from this main corridor. The locations and lengths of the proposed residential access roads have been modelled in assumed locations based on the Functional Plan shown in **Appendix A**. The modelled roadways for the No-Build and Build scenarios are described in **Appendix A** and shown in **Figures 1 and 2** respectively.

## 3.3 Traffic Data

Future road traffic data was provided for St. Jean Street, Poupart Road, and existing and proposed residential access roads by Castleglenn Consultants Inc. for the horizon year 2031. There are no changes to the 2031 traffic volumes between the No-Build and Build scenarios, however there is a projected increase in average speed of 22 kph from the No-Build to the Build scenario.

In order to assign the vehicle distribution percentages to appropriate vehicle classes, the MOVES vehicle classification by source type was used. (See section 3.7 for discussion of MOVES emissions modelling.) It was conservatively assumed that 5% of all vehicles were trucks for all roadways in both the No-Build and Build scenarios. This 5% was distributed across the different truck types: 2% Light Commercial Trucks (MOVES Source Type 32), 2% Single Unit Short Haul Trucks (MOVES Source Type 52) and 1% Single Unit Long Haul Trucks (MOVES Source Type 53). The remaining 95% was assigned to Passenger Cars (MOVES Source Type 21).

A generic hourly profile was used to determine diurnal variation of traffic volumes. This generic profile was based on work previously completed by RWDI (Van Delden, et al., 2008) and was used to develop an hourly ratio of traffic relative to the PM peak hour. Analysis of PM peak traffic turnings was used in conjunction with the generic profile to develop hourly traffic volumes on each segment of the modelled roadways. **Table 1** provides a summary of the modelled traffic volumes and average roadway network speeds for each scenario. The worst-case average network speeds were used in modelling to ensure adequate capture of the maximum predicted contaminant concentrations at each receptor for the short-term averaging periods, one-hour or less. Since average network speeds will vary by hour of day and would likely approach posted speed limits during periods when traffic volume is much less than design capacity, this approach is conservative and will likely overestimate the maximum predicted concentrations for the longer-term averaging periods, 8-hour, 24-hour, and annual. **Appendix A** provides additional detail of raw traffic data counts, hourly traffic vehicle counts, and the ratios used to estimate hourly traffic on the modelled roadways.

## 3.4 Key Air Contaminants

Vehicular traffic produces a variety of air contaminants from fuel combustion inside the engine, evaporation of fuel from the tank, brake and tire wear, and re-suspension (also known as re-entrainment) of loose particles on the road surface (silt) as the vehicle travels over the road surface. The following key contaminants were assessed:

- Respirable particulate matter ($PM_{2.5}$)
- Inhalable particulate matter ($PM_{10}$)
- Nitrogen dioxide ($NO_2$)
- Acrolein
- Carbon monoxide (CO)
- Benzo(a)pyrene
- Acetaldehyde
- Formaldehyde
- Benzene
- 1,3-butadiene

## 3.5 Air Quality Thresholds

The Ontario Ministry of Environment, Conservation and Parks (MECP) has Ontario Ambient Air Quality Criteria (AAQC) for airborne concentrations of all contaminants considered in this assessment except $PM_{2.5}$. The Canadian Council of Ministers of the Environment (CCME) has established Canadian Ambient Air Quality Standards (CAAQS) for $PM_{2.5}$ (CCME, 2022). CCME also has established standards for 1-hour and annual concentrations of $NO_2$ that will come into effect in 2025. The AAQCs and CAAQS are collectively referred to as air quality thresholds in this report. The thresholds are summarized in **Table 2** (in micrograms per cubic metre, µg/m³).

The CAAQS were developed for use by provinces and territories to guide air zone management actions. They are not project-level regulatory standards; measures mandated to achieve the CAAQS should consider technical achievability, practicality, and implementation costs (CCME, 2019).

## 3.6 Background Air Quality Data

AERMOD was used to predict the contribution of the modelled roadways to concentrations of contaminants at nearby sensitive receptors. The predicted maximum concentrations were combined with estimated background concentrations that are due to other emission sources in the surrounding area, thus providing a prediction of maximum cumulative concentrations.

The ambient background data for each key contaminant were taken from representative air quality monitoring stations within the Environment and Climate Change Canada (ECCC) National Air Pollution Surveillance (NAPS) Program and MECP ambient air monitoring station network. A review of representative stations with relevant data for the key contaminants was completed.

The NAPS and MECP monitoring stations were selected based on proximity to the study area, land-use similarity with the study area, and data availability. Some contaminants, such as acrolein and benzo(a)pyrene, are only monitored at select monitoring stations. The sources of background monitoring data used for this study are presented in **Table 3.**

In the case of $NO_2$ and ozone ($O_3$), hourly monitoring data were available for the Ottawa Downtown monitoring station that allowed estimation of background concentration by hour of day. Project contribution of ozone was not assessed against air quality thresholds, but background ozone concentrations were used for converting nitrogen oxides ($NO_X$) to $NO_2$ using the Ozone Limiting Method (OLM). (See section 3.8.2 for discussion of OLM.) As background concentrations vary widely from day to day, a 90$^{th}$ percentile concentration was calculated for each hour of the day using 5 years of hourly monitoring data from 2016 to 2020, as this represents the most recent data set available. The resulting background concentrations represented the highest background conditions likely to coincide with maximum predicted concentrations from the roadways. They were used when predicting maximum 1-hour and 24-hour cumulative concentrations of $NO_2$. The hourly background concentrations for $NO_2$ and $O_3$ are presented in **Table 4**. For the annual averaging period the annual mean values were used.

For half-hour acetaldehyde and 1-hour acrolein, the background values were calculated from the corresponding 24-hour average background value following Section 4.4 of the Air Dispersion Modelling Guideline for Ontario. The summary of all background values used for the assessment is presented in **Table 5.**

## 3.7 Emissions Model

The standard approach for estimating vehicular emissions is to use computer simulation techniques that are based on extensive previous testing of a wide range of vehicles. Motor Vehicle Emission Simulator (MOVES3) is such a model that has been developed for this purpose by the U.S. Environmental Protection Agency (EPA). MOVES3 was used to generate vehicle emission factors for the year 2031.

Exhaust emissions vary widely by vehicle type and speed, and MOVES3 was configured to generate emission factors based on the vehicle type and travel speed. These individual emission factors were aggregated to produce a composite emission factor for each key air contaminant, representing the average vehicle for each road segment assessed.

For particulate matter, it is necessary to account for the re-suspension of dust as vehicles travel over a roadway surface, in addition to tailpipe emissions. The road dust emissions were calculated based on the revised version of U.S. EPA's AP-42, Chapter 13.2.1 (US EPA, 2011). The tailpipe emission factor for particulate matter, from MOVES3, was added to the road dust emission factor to account for both emission sources.

## 3.8 Dispersion Model

Air contaminants emitted from vehicles on a roadway will drift downwind and disperse as they travel. The degree to which the contaminants disperse depends on weather-related factors, such as wind speed and amount of turbulence. The typical approach to determine potential future downwind concentrations from a proposed project is to use a computer simulation that predicts the dispersal of air pollutants as they drift away from the roads. These simulations are referred to as dispersion models.

Dispersion modelling is a common approach for assessing local air quality near an emission source such as vehicular traffic. The dispersion model used in this study is the US EPA's AERMOD version 22112. This is a widely used dispersion model and is an approved model for regulatory purposes in Ontario. The model predicts how emissions from the vehicles travelling within each roadway segment disperse and contribute to air pollutant concentrations within the study area. The dispersion model requires information on emission rates for the air pollutants of interest, the layout of the project corridor, terrain elevation data, and hourly meteorological data.

Site-specific meteorological data were processed for input to the AERMOD model. Fully processed 5-year (2017-2021) meteorological data were prepared in-house at RWDI. Upper air weather data were obtained from the upper air monitoring station at Maniwaki, Quebec, and surface weather data were obtained from Ottawa Macdonald Cartier International Airport.

Terrain information for the study area was obtained from the Regional Meteorological and Terrain Data for Air Dispersion Modelling website of the MECP. The terrain data are based on the North American Datum 1983 (NAD83) horizontal reference datum. The rural dispersion coefficient was used in the dispersion modelling analysis.

### 3.8.1 Selection of Receptors

Sensitive receptors were identified within the study area based on the latest publicly available satellite imagery. The receptors were selected based on existing and future residences. Specifically, receptors R01 – R14 represent existing residences, and receptors R15_F – R28_F represent potential locations of future residential areas. **Figures 1 and 2** show the sensitive receptor locations within the study area.

### 3.8.2 Conversion of $NO_x$ to $NO_2$, Ozone Limiting Method

Any chemical reactions among pollutants are not considered in the assessment of local air quality impacts, except for the conversion of nitric oxide (NO) to $NO_2$ through reaction with ambient ground-level ozone ($O_3$). Vehicle exhausts initially consist mainly of NO. However, NO can convert to $NO_2$ once in the outside air. The Ozone Limiting Method (OLM) was used to estimate this conversion for the credible worst-case NO concentration.

The OLM assumes that the conversion of NO to $NO_2$ is limited only by the amount of ozone ($O_3$) present in the outside air. If the concentration of available $O_3$ (parts per billion or ppb) is less than that of the NO contributed by the modelled roadway emissions, then the portion of NO that is converted to $NO_2$ equals the available $O_3$. On the other hand, if the concentration of available $O_3$ exceeds that of the NO contributed by the modelled roadway, then all of the NO is converted to $NO_2$. For the credible worst-case analysis, a fixed hourly concentration of ozone was used in the OLM, shown in **Table 4**, corresponding to the $90^{th}$ percentile of measured values from historical monitoring data recorded at the Ottawa monitoring stations operated by the MECP.

## 3.9 Climate Change Assessment

The potential for the project to impact climate change was assessed by calculating the total annual emissions for the No-Build and Build scenarios in 2031. This analysis focused on the emissions of greenhouse gases, carbon dioxide ($CO_2$), methane ($CH_4$), and nitrous oxide ($N_2O$), in terms of $CO_2e$ ($CO_2$ equivalent).

This analysis included the emissions from modelled roadways within the study area.

In order to assess the effect of the project on regional air quality, annual project-related emissions were compared with the annual total Ontario-wide emissions of the same pollutants from transportation and other sources.

# 4 RESULTS

## 4.1 Assessment of Maximum Cumulative Concentrations

**Tables 6a and 6c** present a summary of the predicted maximum modelled project contribution without background at each of the sensitive receptors for the No-Build and Build scenarios, respectively. **Tables 6b and 6d** present a summary of the predicted maximum cumulative concentrations (maximum modelled project contribution plus the 90$^{th}$ percentile 1-hour, 24-hour, or annual background concentration) at each of the sensitive receptors for the No-Build and Build scenarios, respectively. The resultant concentrations are compared to the applicable thresholds in each of these tables.

The resultant concentrations for the Build scenario were less than the concentrations for the Future No-Build scenario as a result of the proposed double lanes and addition of four roundabouts, which allows for improved traffic flow and reduced vehicle idling.

For the No-Build scenario, the cumulative maximum predicted concentrations were below their respective thresholds for all contaminants except $PM_{10}$, 1-hour $NO_2$ and benzo(a)pyrene. For the Build scenario, the cumulative maximum predicted concentrations were below their respective thresholds for all contaminants except benzo(a)pyrene.

For the No-Build and Build scenarios, the cumulative maximum predicted concentrations for all contaminants and averaging periods are impacted to a varying degree by the contribution from the ambient background concentrations. The impact of background concentrations is more pronounced for the Build scenario because the modelled concentrations due to vehicle emissions are lower than No-Build. This impact is also more pronounced for some contaminants such as $PM_{2.5}$, acetaldehyde, acrolein, formaldehyde, benzene, and 1,3-butadiene, with background concentrations dominating the predicted contributions from vehicular traffic and representing over 80% of the cumulative maximum predicted concentration for the Build scenario.

As shown in Table 6a-d, the background levels of benzo(a)pyrene are 84% and 220% of the AAQC for 24-hour and annual averaging periods, respectively. The incremental change in the cumulative maximum predicted concentration of benzo(a)pyrene (24-hour) between No-Build and Build scenarios shows a decrease of up to 40%.

**Table 7** shows the relative change in cumulative maximum predicted concentrations for each contaminant at the most impacted receptor, with the percent change from the Build versus the No-Build scenario. The Build scenario is predicted to result in a decrease in concentrations for all contaminants.

## 4.2 Assessment of Regional Air Quality and Greenhouse Gas Emissions

The impact of the project on greenhouse gas emissions was assessed by calculating the total annual emissions associated with the modelled roadways within the study area as shown in **Table 8**. The annual regional greenhouse gas emissions are projected to decrease between the No-Build and Build scenarios due to the proposed improvements to the roadway that will result in better traffic flow and less vehicle idling. Overall, the emissions from this roadway network are small in relation to provincial totals.

## 4.3 Emissions During the Construction Phase

Construction activities involve heavy equipment that generates air pollutants and dust; however, these impacts are temporary in nature. The emissions are highly variable, difficult to predict, and depend on the specific activities that are taking place and the effectiveness of the mitigation measures. The best manner to deal with these emissions is through diligent implementation of operating procedures such as application of dust suppressants, reduced travel speeds for heavy vehicles, efficient staging of activities and minimization of haul distances, covering up stockpiles, etc. It is recommended that in order to minimize potential air quality impacts during construction, the construction tendering process should include requirements for implementation of an Air Quality Management Plan. Such a Plan would set out established best management practices for dust and other emissions. Some of the best practices include the following:

- Use of reformulated fuels, emulsified fuels, exhaust catalyst and filtration technologies, cleaner engine repowers, and new alternative-fueled trucks to reduce emissions from construction equipment.
- Regular cleaning of construction sites and access roads to remove construction-caused debris and dust.
- Dust suppression on unpaved haul roads and other traffic areas susceptible to dust, subject to the area being free of sensitive plant, water or other ecosystems that may be affected by dust suppression chemicals.
- Covered loads when hauling fine-grained materials.
- Prompt cleaning of paved streets/roads where tracking of soil, mud or dust has occurred.
- Tire washes and other methods to prevent trucks and other vehicles from tracking soil, mud or dust onto paved streets or roads.
- Covered stockpiles of soil, sand, and aggregate, as necessary.
- Compliance with posted speed limits and, as appropriate, further reductions in speeds when travelling sites on unpaved surfaces.

# 5 CONCLUSIONS

The proposed project is expected to cause improvements to local air contaminant levels at the most-impacted receptors, with the maximum predicted cumulative concentrations for most contaminants and averaging periods less than current respective thresholds. Annual and 24-hour average benzo(a)pyrene are predicted to exceed respective AAQC threshold but are significantly attributed to high ambient background concentrations. No mitigation measures are recommended, beyond those which are already in place through phased-in federal regulations for on-road vehicle and engine emissions, which are expected to reduce $NO_2$ and other tailpipe emissions beyond the 2031 horizon year used for emission factors in this assessment.

The emissions from the project compared to the regional provincial emissions of greenhouse gas $CO_2e$ are low (less than 0.2%) and therefore the project is not expected to have an impact on the regional air quality.

Construction phase impacts were addressed qualitatively. It is recommended that in order to minimize potential air quality impacts during construction, the construction tendering process should include requirements for implementation of an Air Quality Management Plan.

# 6 STATEMENT OF LIMITATIONS

This report entitled Air Quality Assessment – St. Jean Street and Poupart Road MCEA, was prepared by RWDI AIR Inc. (“RWDI”) for Atrel Engineering Ltd. (“Client”). The findings and conclusions presented in this report have been prepared for the Client and are specific to the project described herein (“Project”). The conclusions and recommendations contained in this report are based on the information available to RWDI when this report was prepared. Because the contents of this report may not reflect the final design of the Project or subsequent changes made after the date of this report, RWDI recommends that it be retained by Client during the final stages of the project to verify that the results and recommendations provided in this report have been correctly interpreted in the final design of the Project.

The conclusions and recommendations contained in this report have also been made for the specific purpose(s) set out herein. Should the Client or any other third party utilize the report and/or implement the conclusions and recommendations contained therein for any other purpose or project without the involvement of RWDI, the Client or such third party assumes any and all risk of any and all consequences arising from such use and RWDI accepts no responsibility for any liability, loss, or damage of any kind suffered by Client or any other third party arising therefrom.

Finally, it is imperative that the Client and/or any party relying on the conclusions and recommendations in this report carefully review the stated assumptions contained herein and to understand the different factors which may impact the conclusions and recommendations provided.

# 7 REFERENCES

1. Canada Council of Ministers of the Environment (CCME), 2019. Guidance Document on Air Zone Management. Accessed at https://ccme.ca/en/res/guidancedocumentonairzonemanagement_secured.pdf, December 2022.
2. CCME, 2022. CAAQS. Accessed at https://ccme.ca/en/air-quality-report, November 2022.
3. Lall et al. 2004. Estimation of Historical Annual $PM_{2.5}$ Exposures for Health Effects Assessment. January 2004.
4. MECP, 2017. Air Dispersion Modelling Guideline for Ontario, version 3.0, PIBs # 5165e03, February 2017.
5. MECP, 2022. Air Pollutant Data. Accessed at http://www.airqualityontario.com/history/index.php, November 2022.
6. MTO, 2013. Environmental Reference for Highway Design. June 2013.
7. MTO, 2020. Environmental Guide for Assessing and Mitigating the Air Quality Impacts and Greenhouse Gas Emissions of Provincial Transportation Projects. May 2020.
8. United States Environmental Protection Agency (US EPA), 2011. AP-42: Section 13.2.1 Paved Roads. January 2011.
9. US EPA, 2015. Transportation Conformity Guidance for Quantitative Hot-spot Analyses in $PM_{2.5}$ and $PM_{10}$ Nonattainment and Maintenance Areas. 160 pp.
10. US EPA, 2020. Air Toxic Emissions from Onroad Vehicles in MOVES3. Retrieved from https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P1010TJM.pdf, November 2022.
11. Van Delden P, Penton S, Haniff A. Typical hourly traffic distribution for noise modelling. Canadian Acoustics [Internet]. 2008 Sep. 1; 36(3):60-1. Available from: https://jcaa.caa-aca.ca/index.php/jcaa/article/view/2037

# TABLES

**Table 1:** 2031 Traffic Volumes and Speeds for the Study Area

| Road | Portion of Road | Description | Direction | No-Build PM Peak Volume | Build PM Peak Volume | Posted Speed Limit (km/hour) | No-Build PM Peak Speed (km/hour) | Build PM Peak Speed (km/hour) |
|---|---|---|---|---|---|---|---|---|
| St. Jean Street | to Stewart Village East | Existing | NB | 837 | 837 | 60 | 6 | 28 |
| | Stewart Village East to Bronze Ave | Existing and expansion | EB | 1,249 | 1,249 | 40 | 6 | 28 |
| | from Bronze Ave | Existing | NB | 453 | 453 | 40 | 6 | 28 |
| | from Stewart Village East | Existing | SB | 863 | 863 | 60 | 6 | 28 |
| | Bronze Ave to Stewart Village East | Existing and expansion | WB | 841 | 841 | 40 | 6 | 28 |
| | to Bronze Ave | Existing | SB | 446 | 446 | 40 | 6 | 28 |
| Poupart Road EW | to Poupart Rd NS | Extension | EB | 1,521 | 1,521 | 50 | 6 | 28 |
| | Poupart Rd NS to Stewart Village West | Existing and expansion | EB | 1,822 | 1,822 | 50 | 6 | 28 |
| | Stewart Village West to Stewart Village East | Existing and expansion | EB | 1,519 | 1,519 | 50 | 6 | 28 |
| | from Poupart Rd NS | Extension | WB | 954 | 954 | 50 | 6 | 28 |
| | Stewart Village West to Poupart Rd NS | Existing and expansion | WB | 1,139 | 1,139 | 50 | 6 | 28 |
| | Stewart Village East to Stewart Village West | Existing and expansion | WB | 993 | 993 | 50 | 6 | 28 |
| Poupart Road NS | to Poupart Rd EW | Existing | SB | 361 | 361 | 50 | 6 | 28 |
| | from Poupart Rd EW | Existing | NB | 245 | 245 | 50 | 6 | 28 |

| Road | Portion of Road | Description | Direction | No-Build PM Peak Volume | Build PM Peak Volume | Posted Speed Limit (km/hour) | No-Build PM Peak Speed (km/hour) | Build PM Peak Speed (km/hour) |
|---|---|---|---|---|---|---|---|---|
| Stewart Village West | to Poupart Rd EW | Extension | NB | 149 | 149 | 40 | 6 | 28 |
| | from Poupart Rd EW | Extension | NB | 206 | 206 | 40 | 6 | 28 |
| | from Poupart Rd EW | Extension | SB | 242 | 242 | 40 | 6 | 28 |
| | to Poupart Rd EW | Extension | SB | 128 | 128 | 40 | 6 | 28 |
| Stewart Village East | from Poupart Rd EW / St Jean St | Extension | NB | 239 | 239 | 40 | 6 | 28 |
| | to Poupart Rd EW / St Jean St | Extension | SB | 145 | 145 | 40 | 6 | 28 |
| Bronze Avenue | from Poupart Rd EW / St Jean St | Extension | EB | 1,014 | 1,014 | 40 | 6 | 28 |
| | to Poupart Rd EW / St Jean St | Extension | WB | 612 | 612 | 40 | 6 | 28 |

**Table 2:** Summary of Relevant Air Quality Thresholds (µg/m³)

| Pollutant | Criterion (µg/m³) | Averaging Period | Source of Threshold Value |
|---|---|---|---|
| $PM_{2.5}$ | 27 | 24-hour | CAAQS 2020 [1] |
| | 8.8 | Annual | CAAQS 2020 [2] |
| $PM_{10}$ | 50 | 24-hour | AAQC |
| CO | 36,200 | 1-hour | AAQC |
| | 15,700 | 8-hour | AAQC |
| $NO_2$ | 400 | 1-hour | AAQC |
| | 79 | 1-hour | CAAQS 2025 [3] |
| | 200 | 24-hour | AAQC |
| | 22.6 | Annual | CAAQS 2025 [4] |
| Benzo(a)pyrene | 5.0E-05 | 24-hour | AAQC |
| | 1.0E-05 | Annual | AAQC |
| Acetaldehyde | 500 | 0.5-hour | AAQC |
| | 500 | 24-hour | AAQC |
| Acrolein | 4.5 | 1-hour | AAQC |
| | 0.4 | 24-hour | AAQC |
| Formaldehyde | 65 | 24-hour | AAQC |
| Benzene | 2.3 | 24-hour | AAQC |
| | 0.45 | Annual | AAQC |
| 1,3-Butadiene | 10 | 24-hour | AAQC |
| | 2 | Annual | AAQC |

Notes:

[1] The 3-year average of the annual 98th percentile of the daily 24-hour average concentrations.

[2] The 3-year average of the annual average concentrations.

[3] The 3-year average of the annual 98th percentile daily maximum 1-hour average concentrations.

[4] The average over a single calendar year of all the 1-hour average concentrations.

**Table 3:** Source of Background Monitoring Data Used

| Contaminant | NAPS ID and Location | Years Included [1] [2] |
|---|---|---|
| $PM_{2.5}$ | 60104 – OTTAWA DOWNTOWN | 2016, 2017, 2018, 2019, 2020 |
| $PM_{10}$ | 60104 – OTTAWA DOWNTOWN | 2016, 2017, 2018, 2019, 2020 |
| CO | 60104 – OTTAWA DOWNTOWN | 2016, 2017, 2018, 2019, 2020 |
| $NO_2$ | 60104 – OTTAWA DOWNTOWN | 2016, 2017, 2018, 2019, 2020 |
| Benzo(a)pyrene | 62601 – EXPERIMENTAL FARM _SIMCOE_ | 2016, 2017, 2018, 2019, 2020 |
| Acetaldehyde | 60211 – WINDSOR WEST | 2015, 2016, 2017, 2018, 2019 |
| Acrolein | 60211 – WINDSOR WEST | 2014, 2015, 2016, 2017 |
| Formaldehyde | 60211 – WINDSOR WEST | 2015, 2016, 2017, 2018, 2019 |
| Benzene | 60104 – OTTAWA DOWNTOWN | 2015, 2016, 2017, 2018, 2019 |
| 1,3-Butadiene | 60104 – OTTAWA DOWNTOWN | 2015, 2016, 2017, 2018, 2019 |

Notes:

[1] For some contaminants, data availability from 2020 were insufficient for use in estimating a background value.

[2] The most recent years with valid data were used. No data for Acrolein after 2017.

[3] TSP and $PM_{10}$ background data will be based on $PM_{2.5}$.

**Table 4:** 90th Percentile Background $NO_2$ and Ozone by Hour of Day

| Hour of Day | $NO_2$ (ppb) | $O_3$ (ppb) |
|---|---|---|
| 1 | 15.9 | 37.0 |
| 2 | 15.0 | 36.0 |
| 3 | 15.0 | 36.0 |
| 4 | 14.6 | 35.0 |
| 5 | 14.5 | 34.0 |
| 6 | 15.8 | 33.0 |
| 7 | 17.3 | 32.0 |
| 8 | 18.1 | 33.0 |
| 9 | 17.0 | 35.0 |
| 10 | 14.0 | 38.0 |
| 11 | 12.3 | 40.0 |
| 12 | 11.0 | 42.0 |
| 13 | 10.0 | 43.0 |
| 14 | 10.0 | 44.0 |
| 15 | 10.2 | 45.0 |
| 16 | 11.5 | 44.0 |
| 17 | 13.0 | 44.0 |
| 18 | 14.7 | 43.0 |
| 19 | 16.0 | 42.0 |
| 20 | 17.0 | 40.0 |
| 21 | 17.6 | 38.7 |
| 22 | 17.9 | 38.0 |
| 23 | 17.6 | 38.0 |
| 24 | 16.1 | 37.0 |

**Table 5:** Summary of Background Concentrations

| Pollutant | Averaging Period | Adopted Background Value (µg/m³) | Description | Criterion (µg/m³) | % of Threshold | Source of Threshold Value |
|---|---|---|---|---|---|---|
| $PM_{2.5}$ | 24-hour | 10 | 90th Percentile | 27 | 37% | CAAQS 2020 |
| | Annual | 6 | Annual Average | 8.8 | 68% | CAAQS 2020 |
| $PM_{10}$ | 24-hour | 18.5 | 90th Percentile | 50 | 37% | AAQC |
| CO | 1-hour | 325 | 90th Percentile | 36,200 | 1% | AAQC |
| | 8-hour | 340 | 90th Percentile | 15,700 | 2% | AAQC |
| $NO_2$ | 1-hour | 29.3 | 90th Percentile | 400 | 7% | AAQC |
| | 1-hour | 29.3 | 90th Percentile | 79 | 37% | CAAQS 2025 |
| | 24-hour | 27.2 | 90th Percentile | 200 | 14% | AAQC |
| | Annual | 13.4 | Annual Average | 22.6 | 59% | CAAQS 2025 |
| Benzo(a)pyrene | 24-hour | 4.2E-05 | 90th Percentile | 5.0E-05 | 83% | AAQC |
| | Annual | 2.2E-05 | Annual Average | 1.0E-05 | 215% | AAQC |
| Acetaldehyde [1] | 0.5-hour | 4.24 | 90th Percentile | 500 | 1% | AAQC |
| | 24-hour | 1.44 | 90th Percentile | 500 | 0.3% | AAQC |
| Acrolein [2] | 1-hour | 0.14 | 90th Percentile | 4.5 | 3% | AAQC |
| | 24-hour | 0.06 | 90th Percentile | 0.4 | 14% | AAQC |
| Formaldehyde | 24-hour | 2.38 | 90th Percentile | 65 | 4% | AAQC |
| Benzene | 24-hour | 0.67 | 90th Percentile | 2.3 | 29% | AAQC |
| | Annual | 0.39 | Annual Average | 0.45 | 88% | AAQC |
| 1,3-Butadiene | 24-hour | 0.05 | 90th Percentile | 10 | 0.5% | AAQC |
| | Annual | 0.03 | Annual Average | 2 | 1% | AAQC |

Notes: [1] 0.5-hour average converted from 24-hour average background following Section 4.4 of the Air Dispersion Modelling Guideline for Ontario.
[2] 1-hour average converted from 24-hour average background value following Section 4.4 of the Air Dispersion Modelling Guideline for Ontario.

**Table 6a: Maximum Predicted Concentrations (in µg/m³) for the 2031 No-Build Scenario Without Background**

| | $PM_{2.5}$ | | $PM_{10}$ | CO | | $NO_2$ | | | | Benzo-a-pyrene | | Acetaldehyde | | Acrolein | | Formaldehyde | Benzene | | 1,3-Butadiene | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Averaging Period >> | 24-hour | Annual | 24-hour | 1-hour | 8-hour | 1-hour | 1-hour | 24-hour | Annual | 24-hour | Annual | 0.5-hour | 24-hour | 1-hour | 24-hour | 24-hour | 24-hour | Annual | 24-hour | Annual |
| Ambient Background >> | 10.0 | 6.0 | 18.5 | 325 | 340 | 29.3 | 29.3 | 27.2 | 13.4 | 4.15E-05 | 2.15E-05 | 4.2 | 1.4 | 0.14 | 0.06 | 2.4 | 0.67 | 0.39 | 0.05 | 0.03 |
| Threshold >> | 27.0 | 8.8 | 50.0 | 36,200 | 15,700 | 400 | 79 | 200 | 22.6 | 5.00E-05 | 1.00E-05 | 500 | 500 | 4.50 | 0.40 | 65 | 2.30 | 0.45 | 10.0 | 2.0 |
| Source of Threshold Value >> | CAAQS 2020 | CAAQS 2020 | AAQC | AAQC | AAQC | AAQC | CAAQS 2025 | AAQC | CAAQS 2025 | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC |
| Maximum Predicted % of Threshold >> | 23.7% | 13.3% | 74.9% | 7.7% | 5.1% | 22.3% | 113.1% | 11.6% | 19.4% | 440.2% | 400.6% | 0.17% | 0.02% | 2.4% | 3.8% | 0.3% | 5.8% | 5.3% | 0.05% | 0.05% |
| **Receptor** | | | | | | | | | | | | | | | | | | | | |
| R01 | 2.7 | 0.3 | 15.2 | 721 | 273 | 30.5 | 30.5 | 9.7 | 1.1 | 8.8E-05 | 1.0E-05 | 2.2E-01 | 3.9E-02 | 2.8E-02 | 6.1E-03 | 7.9E-02 | 5.3E-02 | 6.2E-03 | 2.1E-03 | 2.5E-04 |
| R02 | 2.1 | 0.3 | 12.3 | 668 | 245 | 28.9 | 28.9 | 8.1 | 1.0 | 7.3E-05 | 9.5E-06 | 2.0E-01 | 3.3E-02 | 2.6E-02 | 5.1E-03 | 6.6E-02 | 4.4E-02 | 5.7E-03 | 1.7E-03 | 2.3E-04 |
| R03 | 4.9 | 0.5 | 28.4 | 1619 | 448 | 46.7 | 46.7 | 18.1 | 2.0 | 1.6E-04 | 1.8E-05 | 4.9E-01 | 7.3E-02 | 6.3E-02 | 1.1E-02 | 1.5E-01 | 9.8E-02 | 1.1E-02 | 3.9E-03 | 4.3E-04 |
| R04 | 4.9 | 0.8 | 29.0 | 1705 | 599 | 69.7 | 69.7 | 19.0 | 3.1 | 1.7E-04 | 2.8E-05 | 5.2E-01 | 7.7E-02 | 6.7E-02 | 1.2E-02 | 1.6E-01 | 1.0E-01 | 1.7E-02 | 4.1E-03 | 6.7E-04 |
| R05 | 5.0 | 0.8 | 29.3 | 1694 | 599 | 70.1 | 70.1 | 19.3 | 3.1 | 1.7E-04 | 2.8E-05 | 5.2E-01 | 7.8E-02 | 6.6E-02 | 1.2E-02 | 1.6E-01 | 1.0E-01 | 1.7E-02 | 4.2E-03 | 6.8E-04 |
| R06 | 5.0 | 0.8 | 29.1 | 1656 | 590 | 71.2 | 71.2 | 19.1 | 3.1 | 1.7E-04 | 2.8E-05 | 5.1E-01 | 7.8E-02 | 6.5E-02 | 1.2E-02 | 1.6E-01 | 1.0E-01 | 1.7E-02 | 4.1E-03 | 6.6E-04 |
| R07 | 5.4 | 0.9 | 31.6 | 1916 | 652 | 78.0 | 78.0 | 20.6 | 3.5 | 1.9E-04 | 3.2E-05 | 5.9E-01 | 8.4E-02 | 7.5E-02 | 1.3E-02 | 1.7E-01 | 1.1E-01 | 1.9E-02 | 4.5E-03 | 7.6E-04 |
| R08 | 5.1 | 0.9 | 29.7 | 2174 | 611 | 74.3 | 74.3 | 19.3 | 3.4 | 1.7E-04 | 3.1E-05 | 6.6E-01 | 7.8E-02 | 8.5E-02 | 1.2E-02 | 1.6E-01 | 1.0E-01 | 1.8E-02 | 4.2E-03 | 7.3E-04 |
| R09 | 4.7 | 0.8 | 27.6 | 2072 | 578 | 68.7 | 68.7 | 18.0 | 2.9 | 1.6E-04 | 2.7E-05 | 6.3E-01 | 7.3E-02 | 8.1E-02 | 1.1E-02 | 1.5E-01 | 9.8E-02 | 1.6E-02 | 3.9E-03 | 6.3E-04 |
| R10 | 4.7 | 0.7 | 27.3 | 2104 | 589 | 70.5 | 70.5 | 17.8 | 2.9 | 1.6E-04 | 2.6E-05 | 6.4E-01 | 7.2E-02 | 8.2E-02 | 1.1E-02 | 1.5E-01 | 9.7E-02 | 1.6E-02 | 3.8E-03 | 6.1E-04 |
| R11 | 5.1 | 0.6 | 29.9 | 2232 | 651 | 64.3 | 64.3 | 17.8 | 2.3 | 1.7E-04 | 2.1E-05 | 6.8E-01 | 7.9E-02 | 8.6E-02 | 1.2E-02 | 1.6E-01 | 1.1E-01 | 1.3E-02 | 4.2E-03 | 5.0E-04 |
| R12 | 5.3 | 0.5 | 31.2 | 2053 | 615 | 70.8 | 70.8 | 19.4 | 2.0 | 1.8E-04 | 1.8E-05 | 6.3E-01 | 8.3E-02 | 7.9E-02 | 1.3E-02 | 1.7E-01 | 1.1E-01 | 1.1E-02 | 4.4E-03 | 4.3E-04 |
| R13 | 3.4 | 0.5 | 20.2 | 1477 | 433 | 50.8 | 50.8 | 13.2 | 2.0 | 1.2E-04 | 1.8E-05 | 4.5E-01 | 5.4E-02 | 5.8E-02 | 8.3E-03 | 1.1E-01 | 7.2E-02 | 1.1E-02 | 2.8E-03 | 4.2E-04 |
| R14 | 4.5 | 0.4 | 26.7 | 1734 | 483 | 63.2 | 63.2 | 17.3 | 1.6 | 1.6E-04 | 1.4E-05 | 5.3E-01 | 7.1E-02 | 6.8E-02 | 1.1E-02 | 1.4E-01 | 9.5E-02 | 8.8E-03 | 3.8E-03 | 3.5E-04 |
| R15_F | 4.8 | 0.7 | 28.4 | 1726 | 514 | 66.2 | 66.2 | 18.5 | 2.8 | 1.7E-04 | 2.5E-05 | 5.3E-01 | 7.5E-02 | 6.8E-02 | 1.2E-02 | 1.5E-01 | 1.0E-01 | 1.5E-02 | 4.0E-03 | 5.9E-04 |
| R16_F | 4.3 | 0.7 | 25.3 | 1614 | 464 | 55.6 | 55.6 | 16.5 | 2.6 | 1.5E-04 | 2.3E-05 | 4.9E-01 | 6.7E-02 | 6.3E-02 | 1.0E-02 | 1.4E-01 | 9.0E-02 | 1.4E-02 | 3.6E-03 | 5.5E-04 |
| R17_F | 4.0 | 0.7 | 23.6 | 1577 | 461 | 54.0 | 54.0 | 15.4 | 2.5 | 1.4E-04 | 2.3E-05 | 4.8E-01 | 6.2E-02 | 6.2E-02 | 9.7E-03 | 1.3E-01 | 8.3E-02 | 1.4E-02 | 3.3E-03 | 5.4E-04 |
| R18_F | 3.5 | 0.5 | 20.5 | 1262 | 329 | 44.8 | 44.8 | 13.4 | 1.8 | 1.2E-04 | 1.6E-05 | 3.9E-01 | 5.5E-02 | 4.9E-02 | 8.5E-03 | 1.1E-01 | 7.3E-02 | 9.7E-03 | 2.9E-03 | 3.8E-04 |
| R19_F | 3.3 | 0.5 | 19.6 | 1261 | 353 | 42.1 | 42.1 | 12.8 | 1.8 | 1.2E-04 | 1.6E-05 | 3.9E-01 | 5.2E-02 | 4.9E-02 | 8.1E-03 | 1.1E-01 | 7.0E-02 | 9.7E-03 | 2.8E-03 | 3.8E-04 |
| R20_F | 5.6 | 0.9 | 31.8 | 1609 | 487 | 61.7 | 61.7 | 19.2 | 3.2 | 1.7E-04 | 2.9E-05 | 4.9E-01 | 7.8E-02 | 6.3E-02 | 1.2E-02 | 1.6E-01 | 1.0E-01 | 1.7E-02 | 4.1E-03 | 6.8E-04 |
| R21_F | 5.6 | 1.0 | 32.0 | 1887 | 626 | 72.8 | 72.8 | 20.0 | 3.6 | 1.8E-04 | 3.3E-05 | 5.8E-01 | 8.1E-02 | 7.4E-02 | 1.3E-02 | 1.6E-01 | 1.1E-01 | 2.0E-02 | 4.3E-03 | 7.9E-04 |
| R22_F | 5.7 | 1.0 | 33.1 | 1856 | 702 | 81.5 | 81.5 | 21.2 | 3.6 | 1.9E-04 | 3.3E-05 | 5.7E-01 | 8.6E-02 | 7.3E-02 | 1.3E-02 | 1.7E-01 | 1.2E-01 | 2.0E-02 | 4.6E-03 | 7.8E-04 |
| R23_F | 4.6 | 0.9 | 27.0 | 1863 | 618 | 64.2 | 64.2 | 17.8 | 3.4 | 1.6E-04 | 3.1E-05 | 5.7E-01 | 7.2E-02 | 7.3E-02 | 1.1E-02 | 1.5E-01 | 9.6E-02 | 1.9E-02 | 3.8E-03 | 7.3E-04 |
| R24_F | 6.4 | 1.2 | 37.4 | 2794 | 808 | 89.4 | 89.4 | 23.1 | 4.4 | 2.2E-04 | 4.0E-05 | 8.5E-01 | 9.9E-02 | 1.1E-01 | 1.5E-02 | 2.0E-01 | 1.3E-01 | 2.4E-02 | 5.2E-03 | 9.5E-04 |
| R25_F | 6.0 | 1.1 | 34.9 | 2446 | 738 | 88.6 | 88.6 | 21.8 | 4.3 | 2.0E-04 | 3.9E-05 | 7.5E-01 | 9.2E-02 | 9.5E-02 | 1.4E-02 | 1.9E-01 | 1.2E-01 | 2.3E-02 | 4.9E-03 | 9.2E-04 |
| R26_F | 6.0 | 1.1 | 35.3 | 2696 | 777 | 88.7 | 88.7 | 22.1 | 4.0 | 2.1E-04 | 3.7E-05 | 8.2E-01 | 9.3E-02 | 1.1E-01 | 1.4E-02 | 1.9E-01 | 1.2E-01 | 2.2E-02 | 4.9E-03 | 8.7E-04 |
| R27_F | 5.3 | 0.9 | 30.9 | 2208 | 664 | 78.0 | 78.0 | 19.6 | 3.5 | 1.8E-04 | 3.2E-05 | 6.7E-01 | 8.2E-02 | 8.6E-02 | 1.3E-02 | 1.6E-01 | 1.1E-01 | 1.9E-02 | 4.3E-03 | 7.6E-04 |
| R28_F | 5.0 | 0.9 | 29.0 | 1943 | 619 | 75.6 | 75.6 | 18.7 | 3.6 | 1.7E-04 | 3.3E-05 | 5.9E-01 | 7.6E-02 | 7.6E-02 | 1.2E-02 | 1.5E-01 | 1.0E-01 | 2.0E-02 | 4.1E-03 | 7.8E-04 |

**Table 6b: Maximum Predicted Concentrations (in µg/m³) for the 2031 No-Build Scenario With Background**

| | $PM_{2.5}$ | | $PM_{10}$ | CO | | $NO_2$ | | | | Benzo-a-pyrene | | Acetaldehyde | | Acrolein | | Formaldehyde | Benzene | | 1,3-Butadiene | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Averaging Period >> | 24-hour | Annual | 24-hour | 1-hour | 8-hour | 1-hour | 1-hour | 24-hour | Annual | 24-hour | Annual | 0.5-hour | 24-hour | 1-hour | 24-hour | 24-hour | 24-hour | Annual | 24-hour | Annual |
| Ambient Background >> | 10.0 | 6.0 | 18.5 | 325 | 340 | 29.3 | 29.3 | 27.2 | 13.4 | 4.15E-05 | 2.15E-05 | 4.2 | 1.4 | 0.14 | 0.06 | 2.4 | 0.67 | 0.39 | 0.05 | 0.03 |
| Threshold >> | 27.0 | 8.8 | 50.0 | 36,200 | 15,700 | 400 | 79 | 200 | 22.6 | 5.00E-05 | 1.00E-05 | 500 | 500 | 4.50 | 0.40 | 65 | 2.30 | 0.45 | 10.0 | 2.0 |
| Source of Threshold Value >> | CAAQS 2020 | CAAQS 2020 | AAQC | AAQC | AAQC | AAQC | CAAQS 2025 | AAQC | CAAQS 2025 | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC |
| Maximum Predicted % of Threshold >> | 60.7% | 81.5% | 111.9% | 8.6% | 7.3% | 29.7% | 150.5% | 25.3% | 78.8% | 523.2% | 615.8% | 1.0% | 0.3% | 5.5% | 18.0% | 4.0% | 34.9% | 92.9% | 0.5% | 1.4% |
| **Receptor** | | | | | | | | | | | | | | | | | | | | |
| R01 | 12.7 | 6.3 | 33.8 | 1046 | 613 | 60.8 | 60.8 | 37.0 | 14.6 | 1.3E-04 | 3.2E-05 | 4.5 | 1.5 | 1.7E-01 | 6.3E-02 | 2.5 | 7.2E-01 | 4.0E-01 | 5.1E-02 | 2.8E-02 |
| R02 | 12.1 | 6.3 | 30.9 | 994 | 585 | 56.6 | 56.6 | 35.1 | 14.5 | 1.1E-04 | 3.1E-05 | 4.4 | 1.5 | 1.6E-01 | 6.2E-02 | 2.4 | 7.1E-01 | 4.0E-01 | 5.1E-02 | 2.8E-02 |
| R03 | 14.9 | 6.5 | 46.9 | 1945 | 788 | 76.8 | 76.8 | 46.5 | 15.4 | 2.1E-04 | 4.0E-05 | 4.7 | 1.5 | 2.0E-01 | 6.8E-02 | 2.5 | 7.7E-01 | 4.0E-01 | 5.3E-02 | 2.8E-02 |
| R04 | 14.9 | 6.8 | 47.5 | 2030 | 939 | 94.2 | 94.2 | 45.5 | 16.6 | 2.1E-04 | 5.0E-05 | 4.8 | 1.5 | 2.0E-01 | 6.9E-02 | 2.5 | 7.7E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R05 | 15.0 | 6.8 | 47.9 | 2020 | 938 | 97.7 | 97.7 | 45.7 | 16.6 | 2.2E-04 | 5.0E-05 | 4.8 | 1.5 | 2.0E-01 | 6.9E-02 | 2.5 | 7.7E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R06 | 15.0 | 6.8 | 47.6 | 1981 | 930 | 98.8 | 98.8 | 45.6 | 16.5 | 2.1E-04 | 4.9E-05 | 4.7 | 1.5 | 2.0E-01 | 6.9E-02 | 2.5 | 7.7E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R07 | 15.4 | 6.9 | 50.1 | 2241 | 992 | 105.7 | 105.7 | 47.1 | 17.0 | 2.3E-04 | 5.4E-05 | 4.8 | 1.5 | 2.1E-01 | 7.0E-02 | 2.6 | 7.8E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R08 | 15.1 | 6.9 | 48.2 | 2500 | 951 | 99.9 | 99.9 | 46.7 | 16.8 | 2.2E-04 | 5.2E-05 | 4.9 | 1.5 | 2.2E-01 | 6.9E-02 | 2.5 | 7.7E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R09 | 14.7 | 6.8 | 46.1 | 2397 | 918 | 94.2 | 94.2 | 45.3 | 16.4 | 2.0E-04 | 4.8E-05 | 4.9 | 1.5 | 2.2E-01 | 6.8E-02 | 2.5 | 7.7E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R10 | 14.7 | 6.7 | 45.8 | 2429 | 929 | 95.2 | 95.2 | 45.1 | 16.3 | 2.0E-04 | 4.7E-05 | 4.9 | 1.5 | 2.2E-01 | 6.8E-02 | 2.5 | 7.7E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R11 | 15.1 | 6.6 | 48.4 | 2557 | 990 | 96.3 | 96.3 | 45.4 | 15.7 | 2.2E-04 | 4.2E-05 | 4.9 | 1.5 | 2.2E-01 | 6.9E-02 | 2.5 | 7.8E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R12 | 15.3 | 6.5 | 49.7 | 2378 | 955 | 98.2 | 98.2 | 47.0 | 15.4 | 2.2E-04 | 3.9E-05 | 4.9 | 1.5 | 2.2E-01 | 6.9E-02 | 2.6 | 7.8E-01 | 4.0E-01 | 5.3E-02 | 2.8E-02 |
| R13 | 13.4 | 6.5 | 38.7 | 1803 | 773 | 79.3 | 79.3 | 40.5 | 15.4 | 1.6E-04 | 3.9E-05 | 4.7 | 1.5 | 2.0E-01 | 6.5E-02 | 2.5 | 7.4E-01 | 4.0E-01 | 5.2E-02 | 2.8E-02 |
| R14 | 14.5 | 6.4 | 45.2 | 2059 | 823 | 90.1 | 90.1 | 44.9 | 15.0 | 2.0E-04 | 3.6E-05 | 4.8 | 1.5 | 2.1E-01 | 6.8E-02 | 2.5 | 7.6E-01 | 4.0E-01 | 5.3E-02 | 2.8E-02 |
| R15_F | 14.8 | 6.7 | 46.9 | 2051 | 854 | 87.8 | 87.8 | 46.9 | 16.2 | 2.1E-04 | 4.6E-05 | 4.8 | 1.5 | 2.1E-01 | 6.8E-02 | 2.5 | 7.7E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R16_F | 14.3 | 6.7 | 43.8 | 1940 | 804 | 82.7 | 82.7 | 44.9 | 16.0 | 1.9E-04 | 4.5E-05 | 4.7 | 1.5 | 2.0E-01 | 6.7E-02 | 2.5 | 7.6E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R17_F | 14.0 | 6.7 | 42.1 | 1903 | 801 | 81.6 | 81.6 | 43.7 | 15.9 | 1.8E-04 | 4.4E-05 | 4.7 | 1.5 | 2.0E-01 | 6.6E-02 | 2.5 | 7.5E-01 | 4.1E-01 | 5.2E-02 | 2.8E-02 |
| R18_F | 13.5 | 6.5 | 39.0 | 1587 | 669 | 73.0 | 73.0 | 41.8 | 15.2 | 1.6E-04 | 3.8E-05 | 4.6 | 1.5 | 1.9E-01 | 6.5E-02 | 2.5 | 7.4E-01 | 4.0E-01 | 5.2E-02 | 2.8E-02 |
| R19_F | 13.3 | 6.5 | 38.1 | 1587 | 693 | 72.0 | 72.0 | 41.2 | 15.2 | 1.6E-04 | 3.8E-05 | 4.6 | 1.5 | 1.9E-01 | 6.5E-02 | 2.5 | 7.4E-01 | 4.0E-01 | 5.2E-02 | 2.8E-02 |
| R20_F | 15.6 | 6.9 | 50.3 | 1935 | 827 | 89.4 | 89.4 | 46.7 | 16.6 | 2.2E-04 | 5.0E-05 | 4.7 | 1.5 | 2.0E-01 | 6.9E-02 | 2.5 | 7.7E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R21_F | 15.6 | 7.0 | 50.5 | 2212 | 966 | 99.3 | 99.3 | 47.5 | 17.1 | 2.2E-04 | 5.5E-05 | 4.8 | 1.5 | 2.1E-01 | 6.9E-02 | 2.5 | 7.8E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R22_F | 15.7 | 7.0 | 51.6 | 2181 | 1042 | 110.3 | 110.3 | 48.7 | 17.1 | 2.3E-04 | 5.4E-05 | 4.8 | 1.5 | 2.1E-01 | 7.0E-02 | 2.6 | 7.8E-01 | 4.1E-01 | 5.4E-02 | 2.8E-02 |
| R23_F | 14.6 | 6.9 | 45.5 | 2188 | 958 | 94.2 | 94.2 | 45.2 | 16.8 | 2.0E-04 | 5.2E-05 | 4.8 | 1.5 | 2.1E-01 | 6.8E-02 | 2.5 | 7.7E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R24_F | 16.4 | 7.2 | 56.0 | 3120 | 1148 | 118.9 | 118.9 | 50.6 | 17.8 | 2.6E-04 | 6.2E-05 | 5.1 | 1.5 | 2.5E-01 | 7.2E-02 | 2.6 | 8.0E-01 | 4.2E-01 | 5.4E-02 | 2.8E-02 |
| R25_F | 16.0 | 7.1 | 53.4 | 2771 | 1078 | 116.4 | 116.4 | 49.4 | 17.7 | 2.5E-04 | 6.0E-05 | 5.0 | 1.5 | 2.3E-01 | 7.1E-02 | 2.6 | 7.9E-01 | 4.2E-01 | 5.4E-02 | 2.8E-02 |
| R26_F | 16.0 | 7.1 | 53.8 | 3021 | 1117 | 115.9 | 115.9 | 49.4 | 17.5 | 2.5E-04 | 5.8E-05 | 5.1 | 1.5 | 2.4E-01 | 7.1E-02 | 2.6 | 7.9E-01 | 4.2E-01 | 5.4E-02 | 2.8E-02 |
| R27_F | 15.3 | 6.9 | 49.4 | 2533 | 1004 | 107.1 | 107.1 | 47.0 | 16.9 | 2.2E-04 | 5.3E-05 | 4.9 | 1.5 | 2.2E-01 | 6.9E-02 | 2.5 | 7.8E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |
| R28_F | 15.0 | 6.9 | 47.6 | 2269 | 959 | 104.2 | 104.2 | 46.2 | 17.0 | 2.1E-04 | 5.4E-05 | 4.8 | 1.5 | 2.1E-01 | 6.9E-02 | 2.5 | 7.7E-01 | 4.1E-01 | 5.3E-02 | 2.8E-02 |

**Table 6c: Maximum Predicted Concentrations (in µg/m³) for the 2031 Build Scenario Without Background**

| | $PM_{2.5}$ | | $PM_{10}$ | CO | | $NO_2$ | | | | Benzo-a-pyrene | | Acetaldehyde | | Acrolein | | Formaldehyde | Benzene | | 1,3-Butadiene | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Averaging Period >> | 24-hour | Annual | 24-hour | 1-hour | 8-hour | 1-hour | 1-hour | 24-hour | Annual | 24-hour | Annual | 0.5-hour | 24-hour | 1-hour | 24-hour | 24-hour | 24-hour | Annual | 24-hour | Annual |
| Ambient Background >> | 10.0 | 6.0 | 18.5 | 325 | 340 | 29.3 | 29.3 | 27.2 | 13.4 | 4.15E-05 | 2.15E-05 | 4.2 | 1.4 | 0.14 | 0.06 | 2.4 | 0.67 | 0.39 | 0.05 | 0.03 |
| Threshold >> | 27.0 | 8.8 | 50.0 | 36,200 | 15,700 | 400 | 79 | 200 | 22.6 | 5.00E-05 | 1.00E-05 | 500 | 500 | 4.50 | 0.40 | 65 | 2.30 | 0.45 | 10.0 | 2.0 |
| Source of Threshold Value >> | CAAQS 2020 | CAAQS 2020 | AAQC | AAQC | AAQC | AAQC | CAAQS 2025 | AAQC | CAAQS 2025 | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC |
| Maximum Predicted % of Threshold >> | 14.7% | 8.2% | 41.0% | 5.0% | 3.5% | 12.0% | 60.6% | 5.7% | 9.3% | 205.4% | 188.2% | 0.07% | 0.01% | 0.9% | 1.3% | 0.1% | 3.2% | 3.0% | 0.02% | 0.02% |
| **Receptor** | | | | | | | | | | | | | | | | | | | | |
| R01 | 1.5 | 0.2 | 7.5 | 365 | 143 | 11.8 | 11.8 | 4.0 | 0.4 | 3.6E-05 | 4.0E-06 | 6.5E-02 | 1.3E-02 | 7.9E-03 | 1.8E-03 | 2.6E-02 | 2.6E-02 | 2.9E-03 | 5.9E-04 | 7.0E-05 |
| R02 | 1.1 | 0.1 | 5.4 | 387 | 125 | 10.8 | 10.8 | 3.0 | 0.4 | 2.7E-05 | 3.6E-06 | 6.9E-02 | 9.9E-03 | 7.4E-03 | 1.2E-03 | 2.0E-02 | 2.0E-02 | 2.6E-03 | 4.4E-04 | 6.0E-05 |
| R03 | 2.5 | 0.3 | 12.8 | 898 | 237 | 20.0 | 20.0 | 6.8 | 0.9 | 6.1E-05 | 7.7E-06 | 1.6E-01 | 2.2E-02 | 1.9E-02 | 3.1E-03 | 4.5E-02 | 4.4E-02 | 5.6E-03 | 1.0E-03 | 1.3E-04 |
| R04 | 2.4 | 0.4 | 12.2 | 872 | 305 | 25.1 | 25.1 | 7.0 | 1.2 | 6.3E-05 | 1.0E-05 | 1.6E-01 | 2.3E-02 | 1.9E-02 | 2.7E-03 | 4.6E-02 | 4.6E-02 | 7.5E-03 | 1.0E-03 | 1.7E-04 |
| R05 | 2.4 | 0.4 | 12.4 | 871 | 306 | 25.8 | 25.8 | 7.1 | 1.2 | 6.4E-05 | 1.0E-05 | 1.6E-01 | 2.3E-02 | 1.9E-02 | 2.8E-03 | 4.7E-02 | 4.6E-02 | 7.6E-03 | 1.1E-03 | 1.7E-04 |
| R06 | 2.4 | 0.4 | 12.5 | 856 | 302 | 26.6 | 26.6 | 7.1 | 1.1 | 6.4E-05 | 1.0E-05 | 1.5E-01 | 2.3E-02 | 1.9E-02 | 2.8E-03 | 4.7E-02 | 4.6E-02 | 7.5E-03 | 1.1E-03 | 1.7E-04 |
| R07 | 2.7 | 0.5 | 14.1 | 983 | 336 | 29.0 | 29.0 | 8.0 | 1.3 | 7.2E-05 | 1.2E-05 | 1.8E-01 | 2.6E-02 | 2.1E-02 | 3.3E-03 | 5.3E-02 | 5.2E-02 | 8.7E-03 | 1.2E-03 | 2.0E-04 |
| R08 | 2.6 | 0.5 | 13.6 | 1146 | 329 | 28.1 | 28.1 | 7.6 | 1.3 | 6.9E-05 | 1.2E-05 | 2.1E-01 | 2.5E-02 | 2.5E-02 | 3.4E-03 | 5.0E-02 | 5.0E-02 | 8.8E-03 | 1.1E-03 | 2.0E-04 |
| R09 | 2.4 | 0.4 | 12.5 | 1105 | 314 | 27.3 | 27.3 | 7.0 | 1.2 | 6.3E-05 | 1.0E-05 | 2.0E-01 | 2.3E-02 | 2.4E-02 | 3.1E-03 | 4.6E-02 | 4.6E-02 | 7.6E-03 | 1.0E-03 | 1.7E-04 |
| R10 | 2.4 | 0.4 | 12.2 | 1132 | 323 | 28.0 | 28.0 | 6.9 | 1.1 | 6.2E-05 | 1.0E-05 | 2.0E-01 | 2.2E-02 | 2.5E-02 | 3.1E-03 | 4.5E-02 | 4.5E-02 | 7.4E-03 | 1.0E-03 | 1.7E-04 |
| R11 | 2.3 | 0.3 | 11.8 | 1289 | 378 | 26.4 | 26.4 | 6.6 | 0.9 | 5.9E-05 | 7.7E-06 | 2.3E-01 | 2.2E-02 | 2.8E-02 | 2.2E-03 | 4.3E-02 | 4.3E-02 | 5.6E-03 | 9.7E-04 | 1.3E-04 |
| R12 | 2.5 | 0.3 | 13.0 | 1264 | 309 | 28.7 | 28.7 | 7.3 | 0.8 | 6.5E-05 | 7.4E-06 | 2.3E-01 | 2.4E-02 | 2.4E-02 | 2.6E-03 | 4.8E-02 | 4.8E-02 | 5.4E-03 | 1.1E-03 | 1.2E-04 |
| R13 | 1.8 | 0.3 | 9.1 | 795 | 235 | 20.1 | 20.1 | 5.1 | 0.8 | 4.6E-05 | 6.9E-06 | 1.4E-01 | 1.7E-02 | 1.8E-02 | 2.2E-03 | 3.4E-02 | 3.4E-02 | 5.0E-03 | 7.6E-04 | 1.1E-04 |
| R14 | 2.4 | 0.2 | 12.2 | 1120 | 307 | 27.3 | 27.3 | 6.8 | 0.7 | 6.2E-05 | 6.1E-06 | 2.0E-01 | 2.2E-02 | 2.0E-02 | 2.5E-03 | 4.5E-02 | 4.5E-02 | 4.4E-03 | 1.0E-03 | 1.0E-04 |
| R15_F | 2.5 | 0.4 | 13.0 | 947 | 284 | 26.5 | 26.5 | 7.4 | 1.1 | 6.6E-05 | 1.0E-05 | 1.7E-01 | 2.4E-02 | 2.1E-02 | 3.2E-03 | 4.9E-02 | 4.8E-02 | 7.3E-03 | 1.1E-03 | 1.6E-04 |
| R16_F | 2.2 | 0.3 | 11.5 | 904 | 253 | 22.2 | 22.2 | 6.5 | 1.0 | 5.9E-05 | 9.2E-06 | 1.6E-01 | 2.1E-02 | 2.0E-02 | 2.9E-03 | 4.3E-02 | 4.3E-02 | 6.7E-03 | 9.7E-04 | 1.5E-04 |
| R17_F | 2.1 | 0.3 | 10.9 | 893 | 251 | 21.5 | 21.5 | 6.2 | 1.0 | 5.5E-05 | 8.9E-06 | 1.6E-01 | 2.0E-02 | 1.9E-02 | 2.7E-03 | 4.1E-02 | 4.0E-02 | 6.5E-03 | 9.1E-04 | 1.5E-04 |
| R18_F | 1.8 | 0.3 | 9.3 | 675 | 190 | 17.6 | 17.6 | 5.3 | 0.7 | 4.8E-05 | 6.7E-06 | 1.2E-01 | 1.7E-02 | 1.5E-02 | 2.3E-03 | 3.5E-02 | 3.5E-02 | 4.9E-03 | 7.8E-04 | 1.1E-04 |
| R19_F | 1.7 | 0.2 | 8.9 | 686 | 190 | 16.3 | 16.3 | 5.0 | 0.7 | 4.5E-05 | 6.3E-06 | 1.2E-01 | 1.7E-02 | 1.5E-02 | 2.2E-03 | 3.3E-02 | 3.3E-02 | 4.6E-03 | 7.5E-04 | 1.0E-04 |
| R20_F | 3.2 | 0.5 | 15.9 | 802 | 276 | 24.4 | 24.4 | 7.5 | 1.3 | 6.8E-05 | 1.2E-05 | 1.4E-01 | 2.5E-02 | 1.7E-02 | 3.3E-03 | 5.0E-02 | 4.9E-02 | 8.5E-03 | 1.1E-03 | 1.9E-04 |
| R21_F | 3.0 | 0.5 | 14.9 | 1204 | 383 | 27.1 | 27.1 | 7.3 | 1.3 | 6.5E-05 | 1.2E-05 | 2.2E-01 | 2.4E-02 | 2.6E-02 | 3.1E-03 | 4.8E-02 | 4.7E-02 | 8.5E-03 | 1.1E-03 | 1.9E-04 |
| R22_F | 3.4 | 0.6 | 17.4 | 1303 | 507 | 28.9 | 28.9 | 9.0 | 1.6 | 8.1E-05 | 1.4E-05 | 2.3E-01 | 2.9E-02 | 2.8E-02 | 3.9E-03 | 5.9E-02 | 5.9E-02 | 1.0E-02 | 1.3E-03 | 2.3E-04 |
| R23_F | 2.3 | 0.4 | 11.9 | 996 | 316 | 24.7 | 24.7 | 6.8 | 1.3 | 6.1E-05 | 1.2E-05 | 1.8E-01 | 2.2E-02 | 1.9E-02 | 3.3E-03 | 4.5E-02 | 4.4E-02 | 8.5E-03 | 1.0E-03 | 1.9E-04 |
| R24_F | 4.0 | 0.7 | 20.5 | 1821 | 545 | 47.9 | 47.9 | 11.4 | 2.1 | 1.0E-04 | 1.9E-05 | 3.3E-01 | 3.7E-02 | 4.0E-02 | 5.4E-03 | 7.5E-02 | 7.5E-02 | 1.4E-02 | 1.7E-03 | 3.1E-04 |
| R25_F | 3.6 | 0.7 | 18.7 | 1406 | 469 | 41.0 | 41.0 | 10.4 | 2.0 | 9.4E-05 | 1.8E-05 | 2.5E-01 | 3.4E-02 | 3.1E-02 | 4.8E-03 | 6.9E-02 | 6.8E-02 | 1.3E-02 | 1.5E-03 | 3.0E-04 |
| R26_F | 3.4 | 0.6 | 17.8 | 1669 | 496 | 41.0 | 41.0 | 10.0 | 1.8 | 9.0E-05 | 1.6E-05 | 3.0E-01 | 3.3E-02 | 3.6E-02 | 4.5E-03 | 6.6E-02 | 6.5E-02 | 1.2E-02 | 1.5E-03 | 2.6E-04 |
| R27_F | 3.1 | 0.5 | 15.8 | 1224 | 392 | 33.7 | 33.7 | 8.8 | 1.6 | 7.9E-05 | 1.4E-05 | 2.2E-01 | 2.9E-02 | 2.7E-02 | 4.0E-03 | 5.8E-02 | 5.7E-02 | 1.0E-02 | 1.3E-03 | 2.3E-04 |
| R28_F | 2.6 | 0.5 | 13.6 | 1018 | 346 | 31.3 | 31.3 | 7.6 | 1.5 | 6.8E-05 | 1.4E-05 | 1.8E-01 | 2.5E-02 | 2.4E-02 | 3.6E-03 | 5.0E-02 | 5.0E-02 | 1.0E-02 | 1.1E-03 | 2.3E-04 |

**Table 6d: Maximum Predicted Concentrations (in µg/m³) for the 2031 Build Scenario With Background**

| | $PM_{2.5}$ | | $PM_{10}$ | CO | | $NO_2$ | | | | Benzo-a-pyrene | | Acetaldehyde | | Acrolein | | Formaldehyde | Benzene | | 1,3-Butadiene | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Averaging Period >> | 24-hour | Annual | 24-hour | 1-hour | 8-hour | 1-hour | 1-hour | 24-hour | Annual | 24-hour | Annual | 0.5-hour | 24-hour | 1-hour | 24-hour | 24-hour | 24-hour | Annual | 24-hour | Annual |
| Ambient Background >> | 10.0 | 6.0 | 18.5 | 325 | 340 | 29.3 | 29.3 | 27.2 | 13.4 | 4.15E-05 | 2.15E-05 | 4.2 | 1.4 | 0.14 | 0.06 | 2.4 | 0.67 | 0.39 | 0.05 | 0.03 |
| Threshold >> | 27.0 | 8.8 | 50.0 | 36,200 | 15,700 | 400 | 79 | 200 | 22.6 | 5.00E-05 | 1.00E-05 | 500 | 500 | 4.50 | 0.40 | 65 | 2.30 | 0.45 | 10.0 | 2.0 |
| Source of Threshold Value >> | CAAQS 2020 | CAAQS 2020 | AAQC | AAQC | AAQC | AAQC | CAAQS 2025 | AAQC | CAAQS 2025 | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC | AAQC |
| Maximum Predicted % of Threshold >> | 51.7% | 76.4% | 78.1% | 5.9% | 5.6% | 18.6% | 94.0% | 19.4% | 68.6% | 288.4% | 403.4% | 0.9% | 0.3% | 3.9% | 15.5% | 3.8% | 32.4% | 90.6% | 0.5% | 1.4% |
| **Receptor** | | | | | | | | | | | | | | | | | | | | |
| R01 | 11.5 | 6.2 | 26.1 | 690 | 483 | 41.7 | 41.7 | 31.3 | 13.9 | 7.7E-05 | 2.6E-05 | 4.3 | 1.4 | 1.5E-01 | 5.8E-02 | 2.4 | 7.0E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R02 | 11.1 | 6.1 | 23.9 | 712 | 465 | 40.6 | 40.6 | 30.5 | 13.8 | 6.9E-05 | 2.5E-05 | 4.3 | 1.4 | 1.5E-01 | 5.8E-02 | 2.4 | 6.9E-01 | 4.0E-01 | 4.9E-02 | 2.7E-02 |
| R03 | 12.5 | 6.3 | 31.3 | 1223 | 577 | 48.5 | 48.5 | 35.1 | 14.3 | 1.0E-04 | 2.9E-05 | 4.4 | 1.5 | 1.6E-01 | 6.0E-02 | 2.4 | 7.1E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R04 | 12.4 | 6.4 | 30.8 | 1197 | 645 | 52.2 | 52.2 | 34.1 | 14.6 | 1.0E-04 | 3.2E-05 | 4.4 | 1.5 | 1.6E-01 | 5.9E-02 | 2.4 | 7.2E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R05 | 12.4 | 6.4 | 30.9 | 1197 | 646 | 53.6 | 53.6 | 34.0 | 14.6 | 1.1E-04 | 3.2E-05 | 4.4 | 1.5 | 1.6E-01 | 5.9E-02 | 2.4 | 7.2E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R06 | 12.4 | 6.4 | 31.0 | 1181 | 642 | 54.2 | 54.2 | 33.8 | 14.6 | 1.1E-04 | 3.2E-05 | 4.4 | 1.5 | 1.6E-01 | 5.9E-02 | 2.4 | 7.2E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R07 | 12.7 | 6.5 | 32.6 | 1309 | 676 | 56.6 | 56.6 | 34.5 | 14.8 | 1.1E-04 | 3.4E-05 | 4.4 | 1.5 | 1.6E-01 | 6.0E-02 | 2.4 | 7.2E-01 | 4.0E-01 | 5.0E-02 | 2.8E-02 |
| R08 | 12.6 | 6.5 | 32.2 | 1472 | 669 | 57.2 | 57.2 | 35.7 | 14.8 | 1.1E-04 | 3.4E-05 | 4.4 | 1.5 | 1.6E-01 | 6.0E-02 | 2.4 | 7.2E-01 | 4.0E-01 | 5.0E-02 | 2.8E-02 |
| R09 | 12.4 | 6.4 | 31.0 | 1431 | 654 | 55.5 | 55.5 | 35.4 | 14.6 | 1.0E-04 | 3.2E-05 | 4.4 | 1.5 | 1.6E-01 | 6.0E-02 | 2.4 | 7.2E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R10 | 12.4 | 6.4 | 30.7 | 1458 | 662 | 55.9 | 55.9 | 35.3 | 14.6 | 1.0E-04 | 3.2E-05 | 4.4 | 1.5 | 1.6E-01 | 6.0E-02 | 2.4 | 7.1E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R11 | 12.3 | 6.3 | 30.3 | 1614 | 718 | 57.3 | 57.3 | 34.4 | 14.3 | 1.0E-04 | 2.9E-05 | 4.5 | 1.5 | 1.7E-01 | 5.9E-02 | 2.4 | 7.1E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R12 | 12.5 | 6.3 | 31.5 | 1590 | 649 | 59.3 | 59.3 | 35.2 | 14.2 | 1.1E-04 | 2.9E-05 | 4.5 | 1.5 | 1.6E-01 | 5.9E-02 | 2.4 | 7.2E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R13 | 11.8 | 6.3 | 27.6 | 1120 | 575 | 49.5 | 49.5 | 33.1 | 14.2 | 8.8E-05 | 2.8E-05 | 4.4 | 1.5 | 1.6E-01 | 5.9E-02 | 2.4 | 7.0E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R14 | 12.4 | 6.2 | 30.7 | 1445 | 647 | 57.4 | 57.4 | 34.9 | 14.1 | 1.0E-04 | 2.8E-05 | 4.4 | 1.5 | 1.6E-01 | 5.9E-02 | 2.4 | 7.1E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R15_F | 12.5 | 6.4 | 31.5 | 1273 | 624 | 52.5 | 52.5 | 35.7 | 14.5 | 1.1E-04 | 3.2E-05 | 4.4 | 1.5 | 1.6E-01 | 6.0E-02 | 2.4 | 7.2E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R16_F | 12.2 | 6.3 | 30.0 | 1229 | 593 | 50.7 | 50.7 | 34.9 | 14.4 | 1.0E-04 | 3.1E-05 | 4.4 | 1.5 | 1.6E-01 | 6.0E-02 | 2.4 | 7.1E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R17_F | 12.1 | 6.3 | 29.5 | 1218 | 591 | 50.8 | 50.8 | 34.5 | 14.4 | 9.7E-05 | 3.0E-05 | 4.4 | 1.5 | 1.6E-01 | 5.9E-02 | 2.4 | 7.1E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R18_F | 11.8 | 6.3 | 27.8 | 1000 | 530 | 48.5 | 48.5 | 33.7 | 14.2 | 8.9E-05 | 2.8E-05 | 4.4 | 1.5 | 1.5E-01 | 5.9E-02 | 2.4 | 7.0E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R19_F | 11.7 | 6.2 | 27.4 | 1012 | 530 | 46.9 | 46.9 | 33.4 | 14.1 | 8.7E-05 | 2.8E-05 | 4.4 | 1.5 | 1.5E-01 | 5.9E-02 | 2.4 | 7.0E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R20_F | 13.2 | 6.5 | 34.4 | 1127 | 616 | 52.2 | 52.2 | 34.9 | 14.7 | 1.1E-04 | 3.3E-05 | 4.4 | 1.5 | 1.6E-01 | 6.0E-02 | 2.4 | 7.2E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R21_F | 13.0 | 6.5 | 33.4 | 1530 | 723 | 58.1 | 58.1 | 34.7 | 14.7 | 1.1E-04 | 3.3E-05 | 4.5 | 1.5 | 1.6E-01 | 6.0E-02 | 2.4 | 7.2E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R22_F | 13.4 | 6.6 | 35.9 | 1629 | 847 | 60.8 | 60.8 | 36.5 | 15.0 | 1.2E-04 | 3.5E-05 | 4.5 | 1.5 | 1.7E-01 | 6.1E-02 | 2.4 | 7.3E-01 | 4.0E-01 | 5.0E-02 | 2.8E-02 |
| R23_F | 12.3 | 6.4 | 30.4 | 1322 | 656 | 56.2 | 56.2 | 34.3 | 14.7 | 1.0E-04 | 3.3E-05 | 4.4 | 1.5 | 1.6E-01 | 6.0E-02 | 2.4 | 7.1E-01 | 4.0E-01 | 5.0E-02 | 2.7E-02 |
| R24_F | 14.0 | 6.7 | 39.0 | 2146 | 885 | 74.3 | 74.3 | 38.9 | 15.5 | 1.4E-04 | 4.0E-05 | 4.6 | 1.5 | 1.8E-01 | 6.2E-02 | 2.5 | 7.4E-01 | 4.1E-01 | 5.1E-02 | 2.8E-02 |
| R25_F | 13.6 | 6.7 | 37.2 | 1732 | 809 | 69.2 | 69.2 | 37.8 | 15.4 | 1.4E-04 | 4.0E-05 | 4.5 | 1.5 | 1.7E-01 | 6.1E-02 | 2.5 | 7.4E-01 | 4.1E-01 | 5.1E-02 | 2.8E-02 |
| R26_F | 13.4 | 6.6 | 36.3 | 1994 | 836 | 68.5 | 68.5 | 37.7 | 15.2 | 1.3E-04 | 3.7E-05 | 4.5 | 1.5 | 1.7E-01 | 6.1E-02 | 2.4 | 7.3E-01 | 4.1E-01 | 5.1E-02 | 2.8E-02 |
| R27_F | 13.1 | 6.5 | 34.3 | 1549 | 732 | 62.6 | 62.6 | 36.1 | 15.0 | 1.2E-04 | 3.5E-05 | 4.5 | 1.5 | 1.7E-01 | 6.1E-02 | 2.4 | 7.3E-01 | 4.0E-01 | 5.0E-02 | 2.8E-02 |
| R28_F | 12.6 | 6.5 | 32.1 | 1343 | 685 | 58.3 | 58.3 | 34.9 | 14.9 | 1.1E-04 | 3.5E-05 | 4.4 | 1.5 | 1.6E-01 | 6.0E-02 | 2.4 | 7.2E-01 | 4.0E-01 | 5.0E-02 | 2.8E-02 |

**Table 7:** Relative Change in the Worst-Case Concentrations between Scenarios – 2031

| Pollutant | Receptor | Averaging Period | Predicted Cumulative Concentration (µg/m³) | | % Change of Build Relative to No-Build |
|---|---|---|---|---|---|
| | | | No-Build (2031) | Build (2031) | |
| $PM_{2.5}$ | R24_F | 24-hour | 16.4 | 14.0 | - 14.8% |
| | R24_F | Annual | 7.2 | 6.7 | - 6.2% |
| $PM_{10}$ | R24_F | 24-hour | 56.0 | 39.0 | - 30.2% |
| CO | R24_F | 1-hour | 3120 | 2146 | - 31.2% |
| | R24_F | 8-hour | 1148 | 885 | - 22.9% |
| $NO_2$ | R24_F | 1-hour | 118.9 | 74.3 | - 37.5% |
| | R24_F | 24-hour | 50.6 | 38.9 | - 23.2% |
| | R24_F | Annual | 17.8 | 15.5 | - 12.9% |
| Benzo-a-pyrene | R24_F | 24-hour | 2.6E-04 | 1.4E-04 | - 44.9% |
| | R24_F | Annual | 6.2E-05 | 4.0E-05 | - 34.5% |
| Acetaldehyde | R24_F | 0.5-hour | 5.1 | 4.6 | - 10.3% |
| | R24_F | 24-hour | 1.5 | 1.5 | - 4.0% |
| Acrolein | R24_F | 1-hour | 0.25 | 0.18 | - 28.1% |
| | R24_F | 24-hour | 0.072 | 0.062 | - 13.9% |
| Formaldehyde | R24_F | 24-hour | 2.6 | 2.5 | - 4.8% |
| Benzene | R24_F | 24-hour | 0.80 | 0.74 | - 7.2% |
| | R24_F | Annual | 0.42 | 0.41 | - 2.5% |
| 1,3-Butadiene | R24_F | 24-hour | 0.054 | 0.051 | - 6.5% |
| | R24_F | Annual | 0.028 | 0.028 | - 2.3% |

**Table 8:** Total Annual Greenhouse Gas Emissions for Project Year 2031 Compared to Ontario's Total Annual Greenhouse Gas Emissions

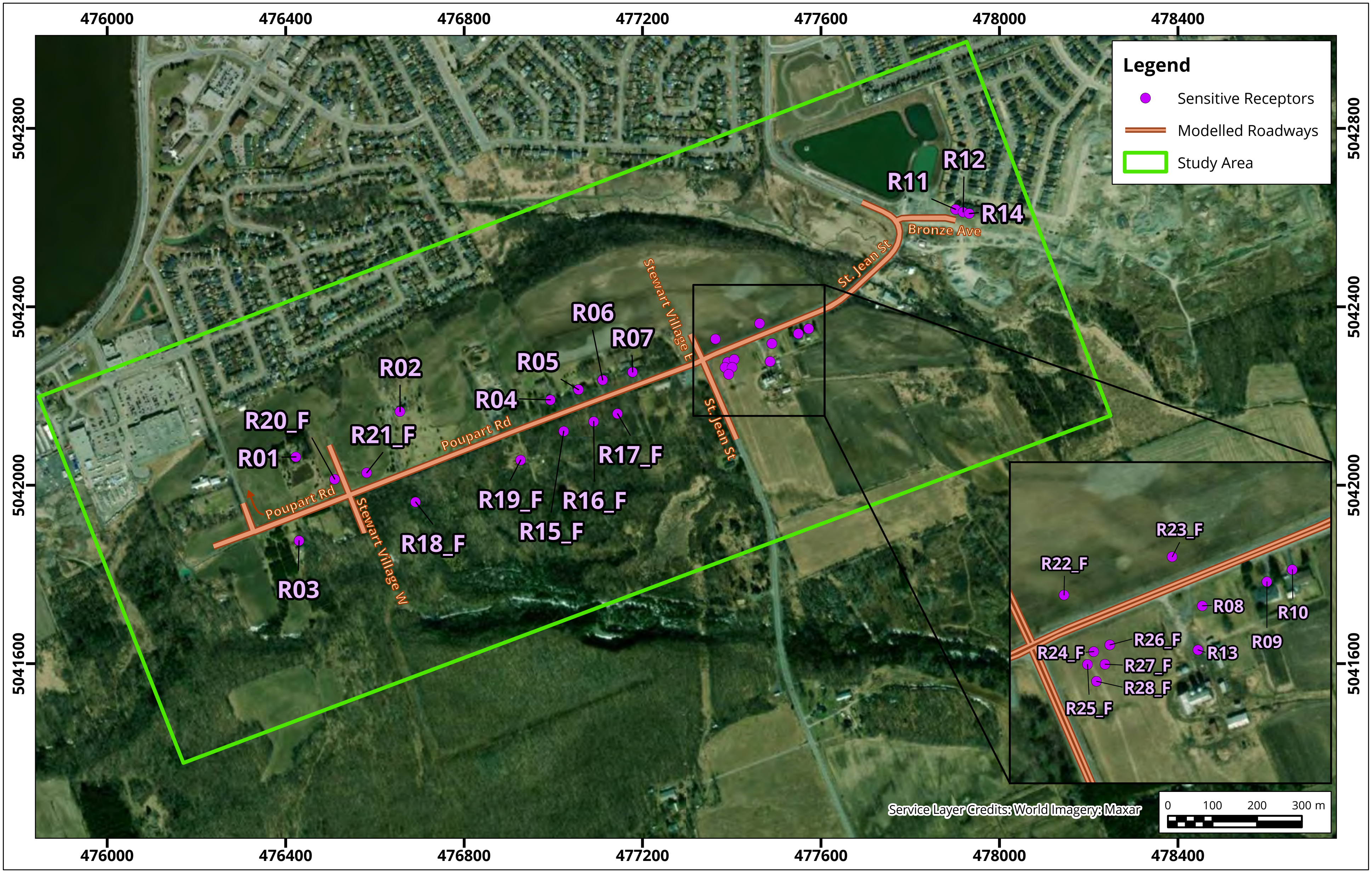
| Pollutant | Ontario Emissions (tonnes/year) | Ontario Emissions: Transportation Sector (tonnes/year) | Ontario Emissions: Road Transportation Sector (tonnes/year) | Emissions: 2031 No-Build (tonnes/year) | Emissions: 2031 Build (tonnes/year) | Change in Emissions due to the Project [2] (tonnes/year) |
|---|---|---|---|---|---|---|
| $CO_2e$ [1] | 151,000,000 | 52,400,000 | 38,800,000 | 357,937 | 130,699 | - 0.15% |

Notes:

[1] $CO_2e$ emissions obtained from Environment and Climate Change Canada National Inventory Report – 2023 Edition, with data from 2021.

[2] Relative to total Ontario emissions.

# FIGURES




Map Document: C:\WorkingFolder\Jobs_Americas\P2402039_StJeanPoupartRdEA\P2402039_StJeanPoupartRdEA.aprx

## Area Plan for No-Build Scenario Showing Study Area, Modelled Roadways, and Sensitive Receptors

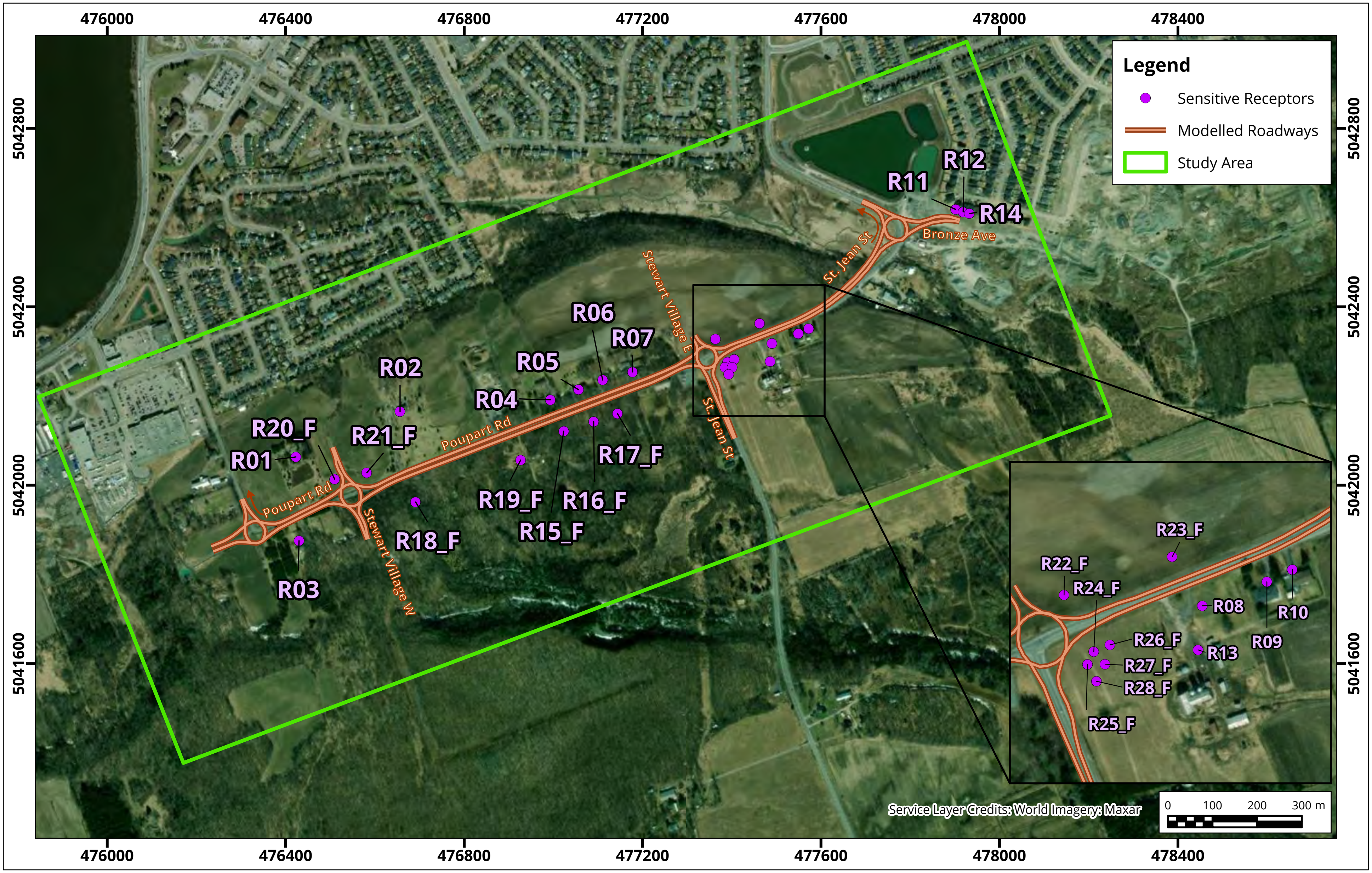
Map Projection: NAD 1983 UTM Zone 18N

St Jean St & Poupart Rd - Rockland, Ontario

True North

Project #: 1700000

| | |
|---|---|
| Drawn by: PIP | Figure: 1 |
| Approx. Scale: 1:12,000 | |
| Date Revised: Jan 24, 2024 | |




# Area Plan for Build Scenario Showing Study Area, Modelled Roadways, and Sensitive Receptors

Map Projection: NAD 1983 UTM Zone 18N

St Jean St & Poupart Rd - Rockland, Ontario

True North

Project #: 1700000

| | |
|---|---|
| Drawn by: PIP | Figure: 2 |
| Approx. Scale: 1:12,000 | |
| Date Revised: Jan 24, 2024 | |

Map Document: C:\WorkingFolder\Jobs_Americas\P2402039_StJeanPoupartRdEA\P2402039_StJeanPoupartRdEA.aprx

# APPENDIX A

**Appendix A.1: Year 2031 No Build Scenario Traffic Data, St Jean Steet and Poupart Road Improvements EA**
**Traffic Volumes used in the Air Quality Assessment**

RWDI#2402039

| | | | | | No Build | Build | PM Peak Volume by Vehicle | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Road | Portion of Road | Segment Source # | Description | Direction | PM Peak Volume | PM Peak Volume | PassengerCar | LightCommercialTruck | SingleUnitShortHaulTruck | SingleUnitLongHaulTruck | PM Peak Hour Network Speed (km/hour) |
| St Jean Street | to Stewart Village East | L1 | | NB | 837 | 837 | 795 | 17 | 17 | 8 | 6 |
| | Stewart Village East to Bronze | L2 | | EB | 1,249 | 1,249 | 1,187 | 25 | 25 | 12 | 6 |
| | from Bronze Ave | L3 | | NB | 453 | 453 | 430 | 9 | 9 | 5 | 6 |
| | from Stewart Village East | L4 | | SB | 863 | 863 | 820 | 17 | 17 | 9 | 6 |
| | Bronze to Stewart Village East | L5 | | WB | 841 | 841 | 799 | 17 | 17 | 8 | 6 |
| | to Bronze Ave | L6 | | SB | 446 | 446 | 424 | 9 | 9 | 4 | 6 |
| Poupart Road EW | to Poupart Rd NS | L7 | | EB | 1,521 | 1,521 | 1,445 | 30 | 30 | 15 | 6 |
| | Poupart Rd NS to Stewart Village West | L8 | | EB | 1,822 | 1,822 | 1,731 | 36 | 36 | 18 | 6 |
| | Stewart Village West to Stewart Village East | L9 | | EB | 1,519 | 1,519 | 1,443 | 30 | 30 | 15 | 6 |
| | from Poupart Rd NS | L10 | | WB | 954 | 954 | 906 | 19 | 19 | 10 | 6 |
| | Stewart Village West to Poupart Rd NS | L11 | | WB | 1,139 | 1,139 | 1,082 | 23 | 23 | 11 | 6 |
| | Stewart Village East to Stewart Village West | L12 | | WB | 993 | 993 | 943 | 20 | 20 | 10 | 6 |
| Poupart Road NS | to Poupart Rd EW | L13 | | SB | 361 | 361 | 343 | 7 | 7 | 4 | 6 |
| | from Poupart Rd EW | L14 | | NB | 245 | 245 | 233 | 5 | 5 | 2 | 6 |
| Stewart Village West | to Poupart Rd EW | L15 | | NB | 149 | 149 | 142 | 3 | 3 | 1 | 6 |
| | from Poupart Rd EW | L16 | | NB | 206 | 206 | 196 | 4 | 4 | 2 | 6 |
| | from Poupart Rd EW | L17 | | SB | 242 | 242 | 230 | 5 | 5 | 2 | 6 |
| | to Poupart Rd EW | L18 | | SB | 128 | 128 | 122 | 3 | 3 | 1 | 6 |
| Stewart Village East | from Poupart Rd EW / St Jean St | L19 | | NB | 239 | 239 | 227 | 5 | 5 | 2 | 6 |
| | to Poupart Rd EW / St Jean St | L20 | | SB | 145 | 145 | 138 | 3 | 3 | 1 | 6 |
| Bronze Avenue | from Poupart Rd EW / St Jean St | L21 | | EB | 1,014 | 1,014 | 963 | 20 | 20 | 10 | 6 |
| | to Poupart Rd EW / St Jean St | L22 | | WB | 612 | 612 | 581 | 12 | 12 | 6 | 6 |

**Appendix A.2: Year 2031 No Build Scenario Traffic Data, St Jean Steet and Poupart Road Improvements EA** **RWDI#2402039**
**Traffic Volumes used in the Air Quality Assessment**

| | | | | | No Build | Build | PM Peak Volume by Vehicle | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Road | Portion of Road | Segment Source # | Description | Direction | PM Peak Volume | PM Peak Volume | PassengerCar | LightCommercialTruck | SingleUnitShortHaulTruck | SingleUnitLongHaulTruck | PM Peak Hour Network Speed (km/hour) |
| St Jean Street | to Stewart Village East | L1 | | NB | 837 | 837 | 795 | 17 | 17 | 8 | 28 |
| | Stewart Village East to Bronze | L2 | | EB | 1,249 | 1,249 | 1,187 | 25 | 25 | 12 | 28 |
| | from Bronze Ave | L3 | | NB | 453 | 453 | 430 | 9 | 9 | 5 | 28 |
| | from Stewart Village East | L4 | | SB | 863 | 863 | 820 | 17 | 17 | 9 | 28 |
| | Bronze to Stewart Village East | L5 | | WB | 841 | 841 | 799 | 17 | 17 | 8 | 28 |
| | to Bronze Ave | L6 | | SB | 446 | 446 | 424 | 9 | 9 | 4 | 28 |
| Poupart Road EW | to Poupart Rd NS | L7 | | EB | 1,521 | 1,521 | 1,445 | 30 | 30 | 15 | 28 |
| | Poupart Rd NS to Stewart Village West | L8 | | EB | 1,822 | 1,822 | 1,731 | 36 | 36 | 18 | 28 |
| | Stewart Village West to Stewart Village East | L9 | | EB | 1,519 | 1,519 | 1,443 | 30 | 30 | 15 | 28 |
| | from Poupart Rd NS | L10 | | WB | 954 | 954 | 906 | 19 | 19 | 10 | 28 |
| | Stewart Village West to Poupart Rd NS | L11 | | WB | 1,139 | 1,139 | 1,082 | 23 | 23 | 11 | 28 |
| | Stewart Village East to Stewart Village West | L12 | | WB | 993 | 993 | 943 | 20 | 20 | 10 | 28 |
| Poupart Road NS | to Poupart Rd EW | L13 | | SB | 361 | 361 | 343 | 7 | 7 | 4 | 28 |
| | from Poupart Rd EW | L14 | | NB | 245 | 245 | 233 | 5 | 5 | 2 | 28 |
| Stewart Village West | to Poupart Rd EW | L15 | | NB | 149 | 149 | 142 | 3 | 3 | 1 | 28 |
| | from Poupart Rd EW | L16 | | NB | 206 | 206 | 196 | 4 | 4 | 2 | 28 |
| | from Poupart Rd EW | L17 | | SB | 242 | 242 | 230 | 5 | 5 | 2 | 28 |
| | to Poupart Rd EW | L18 | | SB | 128 | 128 | 122 | 3 | 3 | 1 | 28 |
| Stewart Village East | from Poupart Rd EW / St Jean St | L19 | | NB | 239 | 239 | 227 | 5 | 5 | 2 | 28 |
| | to Poupart Rd EW / St Jean St | L20 | | SB | 145 | 145 | 138 | 3 | 3 | 1 | 28 |
| Bronze Avenue | from Poupart Rd EW / St Jean St | L21 | | EB | 1,014 | 1,014 | 963 | 20 | 20 | 10 | 28 |
| | to Poupart Rd EW / St Jean St | L22 | | WB | 612 | 612 | 581 | 12 | 12 | 6 | 28 |

**Appendix A.3: Hourly Traffic Distribution for Segment #L1, St Jean Street, NB**

| | |
|---|---|
| **2031 PM Peak No-Build Volume:** | 837 |
| **2031 PM Peak Build Volume:** | 837 |

| Hour of Day (Hour Ending) | Hourly Ratio of Traffic to Peak Hour (PM) [1] | No-Build Scenario Hourly Traffic Volume | Build Scenario Hourly Traffic Volume |
|---|---|---|---|
| 1 | 11.1% | 93 | 93 |
| 2 | 6.3% | 52 | 52 |
| 3 | 4.6% | 39 | 39 |
| 4 | 3.8% | 32 | 32 |
| 5 | 4.6% | 39 | 39 |
| 6 | 12.1% | 102 | 102 |
| 7 | 35.2% | 294 | 294 |
| 8 | 64.6% | 541 | 541 |
| 9 | 83.8% | 701 | 701 |
| 10 | 71.9% | 602 | 602 |
| 11 | 70.3% | 589 | 589 |
| 12 | 77.2% | 646 | 646 |
| 13 | 82.9% | 694 | 694 |
| 14 | 80.1% | 670 | 670 |
| 15 | 84.4% | 706 | 706 |
| 16 | 94.8% | 793 | 793 |
| 17 | 100.0% | 837 | 837 |
| 18 | 97.8% | 819 | 819 |
| 19 | 80.2% | 671 | 671 |
| 20 | 65.5% | 548 | 548 |
| 21 | 52.3% | 438 | 438 |
| 22 | 43.6% | 365 | 365 |
| 23 | 30.8% | 258 | 258 |
| 24 | 21.4% | 179 | 179 |

Notes:

[1] Van Delden P, Penton S, Haniff A. Typical hourly traffic distribution for noise modelling. Canadian Acoustics [Internet]. 2008 Sep. 1 [cited 2023 Nov. 13];36(3):60-1. Available from: https://jcaa.caa-aca.ca/index.php/jcaa/article/view/2037

**Appendix A.4: 2031 No-Build and Build Scenario PM Peak Traffic Counts**

| Intersection | INTID | NBL | NBT | NBR | SBL | SBT | SBR | EBL | EBT | EBR | WBL | WBT | WBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| St Jean Street & Poupart Side Road | 3 | 397 | 42 | 398 | 27 | 26 | 92 | 151 | 824 | 545 | 292 | 503 | 46 |
| Poupart Side Road EW & Poupart Side Road NS | 5 | | | | 331 | | 30 | 30 | 1491 | | | 924 | 215 |
| Poupart Side Road & Stewart Village West | 12 | 122 | | 27 | 18 | | 110 | 178 | 1474 | 196 | 46 | 919 | 28 |
| St Jean Street & Bronze Avenue | 16 | | 380 | 869 | 145 | 301 | | | | | 539 | | 73 |


CONCEPT PLAN
FOR DISCUSSION ONLY

| CONSULTANT | LEGEND | SCALE | | |
|---|---|---|---|---|
| Castleglenn Consultants<br>Engineers, Project Managers & Planners | | HORIZ 1:1250 | CITY OF CLARENCE-ROCKLAND<br>ST JEAN STREET AND MONTEE POUPART<br>FUNCTIONAL PLAN<br>DESIGN AND POSTED SPEED | Clarence-Rockland |
| DESIGNED BY A.P. / CHECKED BY | | PLAN NUMBER | STATUS DRAFT / DATE 2023-12-08 / SHEET 01 OF 01 | |
| CONSULTANTS JOB NO. 7307 | | | | |

Do-Nothing – AM Peak Hour
Montee Poupart Side Road NS
Stewart Village
Montee Poupart Side Road EW
St. Jean Street
St. Jean Street
Bronze Ave
N

Do-Nothing – PM Peak Hour
N
Montee Poupart Side Road NS
Stewart Village
Montee Poupart Side Road EW
St. Jean Street
St. Jean Street
Bronze Ave
215
924
331
30
30
1491
28
919
46
110
0
18
27
0
122
178
1474
196
46
503
292
27
26
92
398
42
397
151
824
545
73
539
146
301
869
380

Ultimate Roundabouts – AM Peak Hour
N
Montee Poupart Side Road NS
Stewart Village
Montee Poupart Side Road EW
St. Jean Street
St. Jean Street
Bronze Ave
Lafontaine Creek
Lemay Circle
Descôtes Circle
Cecile Crescent
Poupart Rd
Richelieu St
Diamond St
Mattiew Dr
21
105
30
292
1414
30
449
8
1351
13
28
0
171
52
442
59
43
0
186
13
766
332
43
41
145
44
253
215
209
13
461
133
816
47
295
273
232

Ultimate Roundabouts – PM Peak Hour
Montee Poupart Side Road NS
Stewart Village
Montee Poupart Side Road EW
St. Jean Street
St. Jean Street
Bronze Ave
N
331
30
215
924
30
1491
18
0
110
28
919
46
178
1474
196
27
0
122
46
503
292
27
26
92
151
824
545
398
42
397
73
539
145
301
869
380
Lafontane Creek
Descotes Circle
Lemay Circle
Cecile Crescent
Poupart Rd
Richelieu St
Descotes Circle
Diamond St
Lafontaine Creek
Mattiew Dr
St Jean St
21

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Start Time | 6:40 | 6:40 | 6:40 | 6:40 | 6:40 | 6:40 | 6:40 |
| End Time | 8:00 | 8:00 | 8:00 | 8:00 | 8:00 | 8:00 | 8:00 |
| Total Time (min) | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 2227 | 2272 | 2244 | 2221 | 2254 | 2288 | 2241 |
| Vehs Exited | 2218 | 2246 | 2257 | 2246 | 2199 | 2276 | 2221 |
| Starting Vehs | 252 | 239 | 241 | 277 | 236 | 246 | 248 |
| Ending Vehs | 261 | 265 | 228 | 252 | 291 | 258 | 268 |
| Travel Distance (km) | 2637 | 2690 | 2681 | 2676 | 2677 | 2687 | 2573 |
| Travel Time (hr) | 946.3 | 915.6 | 919.4 | 966.4 | 895.8 | 891.9 | 1001.4 |
| Total Delay (hr) | 889.8 | 857.9 | 862.0 | 908.9 | 838.5 | 834.3 | 946.2 |
| Total Stops | 4761 | 4835 | 5058 | 4479 | 4719 | 4553 | 4404 |
| Fuel Used (l) | 974.1 | 950.7 | 948.9 | 993.1 | 929.6 | 930.6 | 1017.6 |

## Summary of All Intervals

| Run Number | 8 | 9 | 10 | Avg |
|---|---|---|---|---|
| Start Time | 6:40 | 6:40 | 6:40 | 6:40 |
| End Time | 8:00 | 8:00 | 8:00 | 8:00 |
| Total Time (min) | 80 | 80 | 80 | 80 |
| Time Recorded (min) | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 |
| Vehs Entered | 2261 | 2310 | 2289 | 2261 |
| Vehs Exited | 2272 | 2315 | 2231 | 2249 |
| Starting Vehs | 283 | 250 | 242 | 246 |
| Ending Vehs | 272 | 245 | 300 | 262 |
| Travel Distance (km) | 2695 | 2733 | 2672 | 2672 |
| Travel Time (hr) | 924.4 | 919.5 | 978.5 | 935.9 |
| Total Delay (hr) | 866.7 | 860.7 | 921.0 | 878.6 |
| Total Stops | 4943 | 4399 | 4721 | 4685 |
| Fuel Used (l) | 956.5 | 955.8 | 1001.4 | 965.8 |

## Interval #0 Information  Seeding

| | |
|---|---|
| Start Time | 6:40 |
| End Time | 7:00 |
| Total Time (min) | 20 |

Volumes adjusted by Growth Factors.

No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 7:00 |
| End Time | 8:00 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Vehs Entered | 2227 | 2272 | 2244 | 2221 | 2254 | 2288 | 2241 |
| Vehs Exited | 2218 | 2246 | 2257 | 2246 | 2199 | 2276 | 2221 |
| Starting Vehs | 252 | 239 | 241 | 277 | 236 | 246 | 248 |
| Ending Vehs | 261 | 265 | 228 | 252 | 291 | 258 | 268 |
| Travel Distance (km) | 2637 | 2690 | 2681 | 2676 | 2677 | 2687 | 2573 |
| Travel Time (hr) | 946.3 | 915.6 | 919.4 | 966.4 | 895.8 | 891.9 | 1001.4 |
| Total Delay (hr) | 889.8 | 857.9 | 862.0 | 908.9 | 838.5 | 834.3 | 946.2 |
| Total Stops | 4761 | 4835 | 5058 | 4479 | 4719 | 4553 | 4404 |
| Fuel Used (l) | 974.1 | 950.7 | 948.9 | 993.1 | 929.6 | 930.6 | 1017.6 |

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 7:00 |
| End Time | 8:00 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 8 | 9 | 10 | Avg |
|---|---|---|---|---|
| Vehs Entered | 2261 | 2310 | 2289 | 2261 |
| Vehs Exited | 2272 | 2315 | 2231 | 2249 |
| Starting Vehs | 283 | 250 | 242 | 246 |
| Ending Vehs | 272 | 245 | 300 | 262 |
| Travel Distance (km) | 2695 | 2733 | 2672 | 2672 |
| Travel Time (hr) | 924.4 | 919.5 | 978.5 | 935.9 |
| Total Delay (hr) | 866.7 | 860.7 | 921.0 | 878.6 |
| Total Stops | 4943 | 4399 | 4721 | 4685 |
| Fuel Used (l) | 956.5 | 955.8 | 1001.4 | 965.8 |

## 3: St. Jean Street & Montee Poupart Side Road Performance by movement

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 31.5 | 187.6 | 153.3 | 45.1 | 101.0 | 1.6 | 58.1 | 1.7 | 27.8 | 7.5 | 6.8 | 25.0 |
| Travel Time (hr) | 1.2 | 6.8 | 5.5 | 11.2 | 24.8 | 0.4 | 141.3 | 4.3 | 65.5 | 0.6 | 0.5 | 1.5 |
| Avg Speed (kph) | 26 | 27 | 28 | 4 | 4 | 4 | 3 | 3 | 3 | 13 | 13 | 17 |

## 3: St. Jean Street & Montee Poupart Side Road Performance by movement

| Movement | All |
|---|---|
| Travel Dist (km) | 647.0 |
| Travel Time (hr) | 263.6 |
| Avg Speed (kph) | 8 |

## 5: Montee Poupart Side Road EW & Montee Poupart Side Road NS Performance by movement

| Movement | EBL | EBT | WBT | WBR | SBL | SBR | All |
|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 3.7 | 52.8 | 216.7 | 47.0 | 14.9 | 4.1 | 339.2 |
| Travel Time (hr) | 6.2 | 84.6 | 12.5 | 2.7 | 4.1 | 1.0 | 111.1 |
| Avg Speed (kph) | 2 | 3 | 17 | 17 | 4 | 4 | 9 |

## 12: Montee Poupart Side Road EW/Montee Poupart Side Road & Stewart Village Performance by moven

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBR | SBL | SBR | All |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 10.3 | 83.7 | 11.4 | 6.2 | 680.3 | 3.1 | 27.3 | 7.0 | 4.1 | 24.7 | 858.1 |
| Travel Time (hr) | 1.7 | 11.8 | 1.7 | 0.2 | 24.3 | 0.1 | 5.9 | 1.5 | 0.4 | 2.3 | 50.0 |
| Avg Speed (kph) | 6 | 7 | 7 | 27 | 28 | 30 | 5 | 5 | 10 | 11 | 17 |

## 16: St Jean Street & Bronze Street Performance by movement

| Movement | WBL | WBR | NBT | NBR | SBL | SBT | All |
|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 33.5 | 5.3 | 3.2 | 3.9 | 0.4 | 2.8 | 49.2 |
| Travel Time (hr) | 11.4 | 1.6 | 1.1 | 0.7 | 0.4 | 2.3 | 17.5 |
| Avg Speed (kph) | 3 | 3 | 3 | 5 | 1 | 1 | 3 |

## Total Network Performance

| | |
|---|---|
| Travel Dist (km) | 2672.2 |
| Travel Time (hr) | 935.9 |
| Avg Speed (kph) | 10 |

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Start Time | 3:40 | 3:40 | 3:40 | 3:40 | 3:40 | 3:40 | 3:40 |
| End Time | 5:00 | 5:00 | 5:00 | 5:00 | 5:00 | 5:00 | 5:00 |
| Total Time (min) | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 2021 | 2046 | 2068 | 2026 | 1970 | 1955 | 1965 |
| Vehs Exited | 2014 | 1999 | 2016 | 1943 | 1941 | 1976 | 1888 |
| Starting Vehs | 331 | 301 | 315 | 301 | 324 | 379 | 334 |
| Ending Vehs | 338 | 348 | 367 | 384 | 353 | 358 | 411 |
| Travel Distance (km) | 2418 | 2448 | 2434 | 2341 | 2356 | 2338 | 2284 |
| Travel Time (hr) | 1932.0 | 1941.6 | 1912.4 | 1884.1 | 1983.0 | 1938.2 | 2095.9 |
| Total Delay (hr) | 1879.9 | 1888.9 | 1860.1 | 1833.9 | 1932.5 | 1887.8 | 2046.8 |
| Total Stops | 4352 | 4308 | 4274 | 4267 | 3839 | 4109 | 4054 |
| Fuel Used (l) | 1799.3 | 1805.8 | 1783.1 | 1753.2 | 1837.1 | 1795.5 | 1925.7 |

## Summary of All Intervals

| Run Number | 8 | 9 | 10 | Avg |
|---|---|---|---|---|
| Start Time | 3:40 | 3:40 | 3:40 | 3:40 |
| End Time | 5:00 | 5:00 | 5:00 | 5:00 |
| Total Time (min) | 80 | 80 | 80 | 80 |
| Time Recorded (min) | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 |
| Vehs Entered | 2069 | 1949 | 2015 | 2009 |
| Vehs Exited | 1994 | 1874 | 1939 | 1958 |
| Starting Vehs | 301 | 328 | 297 | 321 |
| Ending Vehs | 376 | 403 | 373 | 369 |
| Travel Distance (km) | 2439 | 2293 | 2351 | 2370 |
| Travel Time (hr) | 1850.5 | 1896.7 | 2014.1 | 1944.8 |
| Total Delay (hr) | 1798.3 | 1847.3 | 1963.6 | 1893.9 |
| Total Stops | 4499 | 4039 | 4185 | 4191 |
| Fuel Used (l) | 1730.8 | 1760.3 | 1865.2 | 1805.6 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 3:40 |
| End Time | 4:00 |
| Total Time (min) | 20 |

Volumes adjusted by Growth Factors.

No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 4:00 |
| End Time | 5:00 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Vehs Entered | 2021 | 2046 | 2068 | 2026 | 1970 | 1955 | 1965 |
| Vehs Exited | 2014 | 1999 | 2016 | 1943 | 1941 | 1976 | 1888 |
| Starting Vehs | 331 | 301 | 315 | 301 | 324 | 379 | 334 |
| Ending Vehs | 338 | 348 | 367 | 384 | 353 | 358 | 411 |
| Travel Distance (km) | 2418 | 2448 | 2434 | 2341 | 2356 | 2338 | 2284 |
| Travel Time (hr) | 1932.0 | 1941.6 | 1912.4 | 1884.1 | 1983.0 | 1938.2 | 2095.9 |
| Total Delay (hr) | 1879.9 | 1888.9 | 1860.1 | 1833.9 | 1932.5 | 1887.8 | 2046.8 |
| Total Stops | 4352 | 4308 | 4274 | 4267 | 3839 | 4109 | 4054 |
| Fuel Used (l) | 1799.3 | 1805.8 | 1783.1 | 1753.2 | 1837.1 | 1795.5 | 1925.7 |

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 4:00 |
| End Time | 5:00 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 8 | 9 | 10 | Avg |
|---|---|---|---|---|
| Vehs Entered | 2069 | 1949 | 2015 | 2009 |
| Vehs Exited | 1994 | 1874 | 1939 | 1958 |
| Starting Vehs | 301 | 328 | 297 | 321 |
| Ending Vehs | 376 | 403 | 373 | 369 |
| Travel Distance (km) | 2439 | 2293 | 2351 | 2370 |
| Travel Time (hr) | 1850.5 | 1896.7 | 2014.1 | 1944.8 |
| Total Delay (hr) | 1798.3 | 1847.3 | 1963.6 | 1893.9 |
| Total Stops | 4499 | 4039 | 4185 | 4191 |
| Fuel Used (l) | 1730.8 | 1760.3 | 1865.2 | 1805.6 |

## 3: St. Jean Street & Montee Poupart Side Road Performance by movement

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 61.1 | 332.3 | 211.1 | 20.4 | 31.7 | 3.0 | 38.6 | 4.5 | 37.3 | 4.6 | 5.2 | 16.0 |
| Travel Time (hr) | 10.1 | 56.0 | 35.1 | 15.3 | 23.2 | 2.2 | 162.0 | 18.4 | 158.3 | 0.6 | 0.7 | 1.3 |
| Avg Speed (kph) | 6 | 6 | 6 | 1 | 1 | 1 | 3 | 3 | 3 | 7 | 8 | 12 |

## 3: St. Jean Street & Montee Poupart Side Road Performance by movement

| Movement | All |
|---|---|
| Travel Dist (km) | 765.9 |
| Travel Time (hr) | 483.1 |
| Avg Speed (kph) | 4 |

## 5: Montee Poupart Side Road EW & Montee Poupart Side Road NS Performance by movement

| Movement | EBL | EBT | WBT | WBR | SBL | SBR | All |
|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 2.2 | 104.0 | 111.8 | 26.4 | 24.9 | 2.4 | 271.6 |
| Travel Time (hr) | 12.9 | 631.9 | 4.0 | 1.0 | 124.6 | 12.0 | 786.4 |
| Avg Speed (kph) | 5 | 6 | 28 | 27 | 1 | 1 | 6 |

## 12: Montee Poupart Side Road EW/Montee Poupart Side Road & Stewart Village Performance by moven

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBR | SBL | SBR | All |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 19.3 | 160.0 | 22.0 | 15.0 | 321.7 | 9.4 | 17.1 | 4.6 | 2.6 | 15.9 | 587.5 |
| Travel Time (hr) | 3.3 | 28.9 | 3.8 | 0.5 | 8.5 | 0.2 | 2.8 | 0.7 | 0.4 | 1.1 | 50.1 |
| Avg Speed (kph) | 8 | 8 | 8 | 33 | 38 | 39 | 6 | 7 | 7 | 14 | 15 |

## 16: St Jean Street & Bronze Street Performance by movement

| Movement | WBL | WBR | NBT | NBR | SBL | SBT | All |
|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 13.7 | 2.0 | 3.3 | 7.3 | 0.4 | 0.8 | 27.6 |
| Travel Time (hr) | 12.4 | 1.6 | 0.8 | 1.3 | 1.0 | 1.9 | 18.9 |
| Avg Speed (kph) | 1 | 1 | 4 | 6 | 0 | 0 | 1 |

## Total Network Performance

| | |
|---|---|
| Travel Dist (km) | 2370.1 |
| Travel Time (hr) | 1944.8 |
| Avg Speed (kph) | 6 |

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Start Time | 6:40 | 6:40 | 6:40 | 6:40 | 6:40 | 6:40 | 6:40 |
| End Time | 8:00 | 8:00 | 8:00 | 8:00 | 8:00 | 8:00 | 8:00 |
| Total Time (min) | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 3173 | 3250 | 3291 | 3205 | 3214 | 3358 | 3236 |
| Vehs Exited | 3159 | 3230 | 3276 | 3217 | 3220 | 3337 | 3231 |
| Starting Vehs | 110 | 103 | 133 | 120 | 122 | 105 | 119 |
| Ending Vehs | 124 | 123 | 148 | 108 | 116 | 126 | 124 |
| Travel Distance (km) | 4078 | 4207 | 4214 | 4133 | 4158 | 4266 | 4150 |
| Travel Time (hr) | 112.4 | 116.8 | 117.5 | 115.2 | 114.7 | 119.4 | 114.3 |
| Total Delay (hr) | 17.7 | 19.3 | 20.0 | 19.3 | 18.1 | 20.6 | 17.9 |
| Total Stops | 1953 | 2062 | 2112 | 2044 | 1993 | 2172 | 1958 |
| Fuel Used (l) | 362.9 | 377.4 | 378.4 | 370.8 | 368.4 | 384.6 | 370.6 |

## Summary of All Intervals

| Run Number | 8 | 9 | 10 | Avg |
|---|---|---|---|---|
| Start Time | 6:40 | 6:40 | 6:40 | 6:40 |
| End Time | 8:00 | 8:00 | 8:00 | 8:00 |
| Total Time (min) | 80 | 80 | 80 | 80 |
| Time Recorded (min) | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 |
| Vehs Entered | 3219 | 3256 | 3318 | 3252 |
| Vehs Exited | 3260 | 3258 | 3325 | 3253 |
| Starting Vehs | 145 | 124 | 112 | 117 |
| Ending Vehs | 104 | 122 | 105 | 116 |
| Travel Distance (km) | 4142 | 4197 | 4344 | 4189 |
| Travel Time (hr) | 114.7 | 116.8 | 122.0 | 116.4 |
| Total Delay (hr) | 18.7 | 19.4 | 21.3 | 19.2 |
| Total Stops | 1958 | 2045 | 2260 | 2054 |
| Fuel Used (l) | 372.0 | 375.5 | 388.7 | 374.9 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 6:40 |
| End Time | 7:00 |
| Total Time (min) | 20 |
| Volumes adjusted by Growth Factors. | |
| No data recorded this interval. | |

## Interval #1 Information  Recording

| | |
|---|---|
| Start Time | 7:00 |
| End Time | 8:00 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Vehs Entered | 3173 | 3250 | 3291 | 3205 | 3214 | 3358 | 3236 |
| Vehs Exited | 3159 | 3230 | 3276 | 3217 | 3220 | 3337 | 3231 |
| Starting Vehs | 110 | 103 | 133 | 120 | 122 | 105 | 119 |
| Ending Vehs | 124 | 123 | 148 | 108 | 116 | 126 | 124 |
| Travel Distance (km) | 4078 | 4207 | 4214 | 4133 | 4158 | 4266 | 4150 |
| Travel Time (hr) | 112.4 | 116.8 | 117.5 | 115.2 | 114.7 | 119.4 | 114.3 |
| Total Delay (hr) | 17.7 | 19.3 | 20.0 | 19.3 | 18.1 | 20.6 | 17.9 |
| Total Stops | 1953 | 2062 | 2112 | 2044 | 1993 | 2172 | 1958 |
| Fuel Used (l) | 362.9 | 377.4 | 378.4 | 370.8 | 368.4 | 384.6 | 370.6 |

## Interval #1 Information  Recording

| | |
|---|---|
| Start Time | 7:00 |
| End Time | 8:00 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 8 | 9 | 10 | Avg |
|---|---|---|---|---|
| Vehs Entered | 3219 | 3256 | 3318 | 3252 |
| Vehs Exited | 3260 | 3258 | 3325 | 3253 |
| Starting Vehs | 145 | 124 | 112 | 117 |
| Ending Vehs | 104 | 122 | 105 | 116 |
| Travel Distance (km) | 4142 | 4197 | 4344 | 4189 |
| Travel Time (hr) | 114.7 | 116.8 | 122.0 | 116.4 |
| Total Delay (hr) | 18.7 | 19.4 | 21.3 | 19.2 |
| Total Stops | 1958 | 2045 | 2260 | 2054 |
| Fuel Used (l) | 372.0 | 375.5 | 388.7 | 374.9 |

## 3: St. Jean Street & Montee Poupart Side Road Performance by movement

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 40.0 | 218.3 | 193.0 | 82.5 | 185.6 | 3.2 | 76.7 | 2.4 | 35.3 | 6.4 | 6.4 | 21.1 |
| Travel Time (hr) | 1.0 | 5.2 | 4.5 | 3.2 | 5.0 | 0.1 | 3.0 | 0.1 | 1.0 | 0.4 | 0.4 | 1.0 |
| Avg Speed (kph) | 42 | 42 | 43 | 26 | 37 | 38 | 26 | 25 | 36 | 18 | 17 | 21 |

## 3: St. Jean Street & Montee Poupart Side Road Performance by movement

| Movement | All |
|---|---|
| Travel Dist (km) | 871.0 |
| Travel Time (hr) | 24.7 |
| Avg Speed (kph) | 35 |

## 5: Montee Poupart Side Road EW & Montee Poupart Side Road NS Performance by movement

| Movement | EBL | EBT | WBT | WBR | SBL | SBR | All |
|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 3.8 | 56.0 | 342.3 | 70.8 | 12.7 | 4.0 | 489.4 |
| Travel Time (hr) | 0.1 | 1.7 | 11.0 | 2.3 | 0.7 | 0.2 | 16.0 |
| Avg Speed (kph) | 32 | 33 | 31 | 30 | 17 | 21 | 31 |

## 12: Montee Poupart Side Road EW/Montee Poupart Side Road & Stewart Village Performance by moven

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBR | SBL | SBR | All |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 13.0 | 114.9 | 15.6 | 11.5 | 1156.5 | 7.2 | 22.4 | 5.6 | 3.5 | 19.6 | 1369.9 |
| Travel Time (hr) | 0.4 | 3.4 | 0.5 | 0.3 | 28.7 | 0.2 | 0.8 | 0.2 | 0.2 | 1.1 | 35.8 |
| Avg Speed (kph) | 33 | 33 | 34 | 41 | 40 | 40 | 28 | 30 | 14 | 17 | 38 |

## 16: St Jean Street & Bronze Street Performance by movement

| Movement | WBL | WBR | NBL | NBR | SEL | SER | All |
|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 54.2 | 8.7 | 3.8 | 4.9 | 0.8 | 5.6 | 78.1 |
| Travel Time (hr) | 2.6 | 0.3 | 0.2 | 0.2 | 0.1 | 0.4 | 3.7 |
| Avg Speed (kph) | 21 | 28 | 21 | 22 | 11 | 15 | 21 |

## Total Network Performance

| | |
|---|---|
| Travel Dist (km) | 4189.1 |
| Travel Time (hr) | 116.4 |
| Avg Speed (kph) | 36 |

## Summary of All Intervals

| Run Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Start Time | 3:40 | 3:40 | 3:40 | 3:40 | 3:40 | 3:40 | 3:40 |
| End Time | 5:00 | 5:00 | 5:00 | 5:00 | 5:00 | 5:00 | 5:00 |
| Total Time (min) | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| Time Recorded (min) | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Vehs Entered | 4111 | 4079 | 4248 | 4119 | 4104 | 4138 | 4129 |
| Vehs Exited | 4109 | 4102 | 4177 | 4119 | 4101 | 4103 | 4097 |
| Starting Vehs | 182 | 202 | 157 | 191 | 182 | 143 | 183 |
| Ending Vehs | 184 | 179 | 228 | 191 | 185 | 178 | 215 |
| Travel Distance (km) | 5344 | 5360 | 5423 | 5317 | 5346 | 5299 | 5349 |
| Travel Time (hr) | 275.7 | 280.3 | 252.4 | 237.8 | 237.6 | 197.6 | 256.1 |
| Total Delay (hr) | 153.0 | 157.2 | 128.0 | 115.2 | 114.7 | 75.9 | 133.1 |
| Total Stops | 4223 | 4072 | 4576 | 4344 | 4555 | 3900 | 4771 |
| Fuel Used (l) | 591.4 | 596.5 | 574.0 | 552.8 | 556.3 | 519.8 | 570.2 |

## Summary of All Intervals

| Run Number | 8 | 9 | 10 | Avg |
|---|---|---|---|---|
| Start Time | 3:40 | 3:40 | 3:40 | 3:40 |
| End Time | 5:00 | 5:00 | 5:00 | 5:00 |
| Total Time (min) | 80 | 80 | 80 | 80 |
| Time Recorded (min) | 60 | 60 | 60 | 60 |
| # of Intervals | 2 | 2 | 2 | 2 |
| # of Recorded Intervals | 1 | 1 | 1 | 1 |
| Vehs Entered | 4121 | 4161 | 4142 | 4135 |
| Vehs Exited | 4100 | 4203 | 4047 | 4114 |
| Starting Vehs | 180 | 238 | 173 | 180 |
| Ending Vehs | 201 | 196 | 268 | 199 |
| Travel Distance (km) | 5279 | 5359 | 5357 | 5343 |
| Travel Time (hr) | 209.7 | 222.0 | 325.2 | 249.4 |
| Total Delay (hr) | 88.1 | 98.8 | 202.2 | 126.6 |
| Total Stops | 4175 | 4304 | 4698 | 4363 |
| Fuel Used (l) | 527.2 | 541.6 | 631.3 | 566.1 |

## Interval #0 Information Seeding

| | |
|---|---|
| Start Time | 3:40 |
| End Time | 4:00 |
| Total Time (min) | 20 |

Volumes adjusted by Growth Factors.

No data recorded this interval.

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 4:00 |
| End Time | 5:00 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|
| Vehs Entered | 4111 | 4079 | 4248 | 4119 | 4104 | 4138 | 4129 |
| Vehs Exited | 4109 | 4102 | 4177 | 4119 | 4101 | 4103 | 4097 |
| Starting Vehs | 182 | 202 | 157 | 191 | 182 | 143 | 183 |
| Ending Vehs | 184 | 179 | 228 | 191 | 185 | 178 | 215 |
| Travel Distance (km) | 5344 | 5360 | 5423 | 5317 | 5346 | 5299 | 5349 |
| Travel Time (hr) | 275.7 | 280.3 | 252.4 | 237.8 | 237.6 | 197.6 | 256.1 |
| Total Delay (hr) | 153.0 | 157.2 | 128.0 | 115.2 | 114.7 | 75.9 | 133.1 |
| Total Stops | 4223 | 4072 | 4576 | 4344 | 4555 | 3900 | 4771 |
| Fuel Used (l) | 591.4 | 596.5 | 574.0 | 552.8 | 556.3 | 519.8 | 570.2 |

## Interval #1 Information Recording

| | |
|---|---|
| Start Time | 4:00 |
| End Time | 5:00 |
| Total Time (min) | 60 |

Volumes adjusted by Growth Factors.

| Run Number | 8 | 9 | 10 | Avg |
|---|---|---|---|---|
| Vehs Entered | 4121 | 4161 | 4142 | 4135 |
| Vehs Exited | 4100 | 4203 | 4047 | 4114 |
| Starting Vehs | 180 | 238 | 173 | 180 |
| Ending Vehs | 201 | 196 | 268 | 199 |
| Travel Distance (km) | 5279 | 5359 | 5357 | 5343 |
| Travel Time (hr) | 209.7 | 222.0 | 325.2 | 249.4 |
| Total Delay (hr) | 88.1 | 98.8 | 202.2 | 126.6 |
| Total Stops | 4175 | 4304 | 4698 | 4363 |
| Fuel Used (l) | 527.2 | 541.6 | 631.3 | 566.1 |

## 3: St. Jean Street & Montee Poupart Side Road Performance by movement

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 128.6 | 711.8 | 465.8 | 71.9 | 123.1 | 12.3 | 57.6 | 6.6 | 57.8 | 3.7 | 4.2 | 14.1 |
| Travel Time (hr) | 5.4 | 27.5 | 16.9 | 2.3 | 3.2 | 0.3 | 47.2 | 5.3 | 29.8 | 0.1 | 0.2 | 0.5 |
| Avg Speed (kph) | 24 | 26 | 28 | 32 | 39 | 39 | 3 | 3 | 15 | 26 | 26 | 31 |

## 3: St. Jean Street & Montee Poupart Side Road Performance by movement

| Movement | All |
|---|---|
| Travel Dist (km) | 1657.6 |
| Travel Time (hr) | 138.6 |
| Avg Speed (kph) | 20 |

## 5: Montee Poupart Side Road EW & Montee Poupart Side Road NS Performance by movement

| Movement | EBL | EBT | WBT | WBR | SBL | SBR | All |
|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 3.1 | 181.3 | 219.3 | 48.6 | 38.7 | 3.8 | 494.7 |
| Travel Time (hr) | 0.3 | 11.3 | 6.7 | 1.5 | 2.4 | 0.2 | 22.4 |
| Avg Speed (kph) | 11 | 16 | 33 | 32 | 16 | 17 | 22 |

## 12: Montee Poupart Side Road EW/Montee Poupart Side Road & Stewart Village Performance by moven

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBR | SBL | SBR | All |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 44.6 | 369.7 | 49.4 | 35.5 | 755.5 | 21.7 | 13.9 | 3.4 | 2.2 | 13.6 | 1309.5 |
| Travel Time (hr) | 1.5 | 12.3 | 1.6 | 0.9 | 18.2 | 0.5 | 1.4 | 0.3 | 0.1 | 0.5 | 37.4 |
| Avg Speed (kph) | 30 | 30 | 30 | 41 | 41 | 41 | 10 | 12 | 25 | 27 | 35 |

## 16: St Jean Street & Bronze Street Performance by movement

| Movement | WBL | WBR | NBL | NBT | NBR | SEL | SER | All |
|---|---|---|---|---|---|---|---|---|
| Travel Dist (km) | 35.7 | 4.7 | 5.9 | 0.0 | 15.1 | 2.9 | 5.9 | 70.3 |
| Travel Time (hr) | 1.6 | 0.2 | 0.4 | 0.0 | 0.7 | 0.2 | 0.4 | 3.5 |
| Avg Speed (kph) | 22 | 28 | 16 | 34 | 21 | 12 | 16 | 20 |

## Total Network Performance

| | |
|---|---|
| Travel Dist (km) | 5343.4 |
| Travel Time (hr) | 249.4 |
| Avg Speed (kph) | 28 |

**APPENDIX "M"**

**Climate Resilience & Quality GHG Analysis,**

**CIMA+**

**August, 2023**

# Atrel Engineering Ltd.

## Climate Resilience and Qualitative GHG Analysis of the St. Jean Street Expansion Project

St. Jean Street

Rockland (ON)

N/Ref.: A001263A

Project number CIMA+: A001263A
AUGUST 2023 – Version 01

# Atrel Engineering Ltd.

## Climate Resiliency and Qualitative GHG Analysis of the St. Jean Street Expansion Project

St. Jean Street

Rockland (ON)

N/Ref.: A001263A

Prepared by : Aleksandra Lazarevic

Aleksandra Lazarevic, MES., LEED Green Associate
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Project number CIMA+: A001263A
August 2023 – Version 01

# PROJECT TEAM

## *CIMA+*

| | |
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## Ownership and confidentiality



## Limitation of the study

This report has been prepared at the request and for the exclusive use of Atrel Engineering Ltd. in the context determined by the specific terms of the mandate granted to CIMA+ S.E.N.C. by the St. Jean Street expansion project and according to the agreement reached between the two parties. CIMA+ S.E.N.C. assumes no responsibility for any use of this report by a third party.

As part of the search for available information related to the effects of climate change on the climate parameters identified in this study, CIMA+ S.E.N.C. consulted a number of documents and references in order to document the applicable climate changes for the study site. This was done in a diligent manner in the context of this study. CIMA+ S.E.N.C. cannot be held responsible for the consequences of missing or unavailable information in the context of this study.

Many future climate projections are not supported by local studies and have a significant element of uncertainty. As the conclusions and recommendations of this report are related to these predictions, CIMA+ S.E.N.C. cannot be held responsible for possible deviations due to this uncertainty.

Information, data and climatic analyses have been consulted. This information was considered valid but was not specifically verified by CIMA+ S.E.N.C. CIMA+ S.E.N.C. is not responsible for any information that may be false or incomplete. The findings presented in this report are strictly based on the information consulted.

The conclusions and recommendations based on the findings of this study represent our professional opinion, to the best of our knowledge, at the time of preparing this report.

In no event shall CIMA+ be liable for damages resulting from the absence of information relevant to the assessment of the effects of climate change on the study site or from the inaccuracy of such information. Moreover, it is not possible to predict future impacts with absolute certainty. Thus, the contents of this report should not be taken as a definitive, complete, or final judgment of the future climate at the study site.

| Record of versions | | | |
|---|---|---|---|
| Version number | Revised by | Date | Description of the modification and/or issue |
| 01 | JH | Aug 29, 2023 | Final report revision |
| | | | |
| | | | |
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# 1. Introduction

The City of Rockland, Ontario is expanding the St. Jean Street – Poupart roadway in aims of accommodating the growing population within the municipality, with the project to be executed and completed by Atrel Engineering Ltd. It is therefore imperative to not only analyze and consider the existing and future impacts of the expansion on the local economy and society, but to the surrounding environment as well as climate change.

## 1.1 Objectives

Per the Provincial regulations and guidelines "Companion Guide for Municipal Class EA Manual" and "Consideration of Climate Change in Environmental Assessment in Ontario (CC Guide)", this report has been conducted to understand the possible risks and vulnerabilities associated with the existing roadway and to propose adaption measures for future climate risk scenarios (i.e. flooding, extreme temperatures). This study includes an assessment of the key climate hazards and vulnerabilities and provide recommendations for minimizing future risks and increasing resiliency.

In addition to this, this report outlines a qualitative analysis of the greenhouse gas (GHG) emissions anticipated to be released into the atmosphere from the construction and operation of the roadway's expansion (construction). The analyses proposes high-level mitigation measures to reduce the GHG emissions for the expansion of the roadway and its impacts surrounding carbon sinks as they play a critical role in the environment's carbon sequestration.

## 1.2 Description of Proposed Infrastructure Project

The St. Jean Street – Poupart Road widening project located within with City of Rockland consists of the widening of the existing right-of-way (RoW) of approximately 10 – 30 m. The street alignment will remain as is, with the widening of the road restricted to the lands within 15 m from the roads centre line. To date, there are certain options being investigated, consisting of including or excluding the divided lane, roundabouts or intersections.

## 1.3 Site Location and Boundary

St. Jean Street – Poupart Roadway is identified within Figure 1 through the red shaded line, running approximately 1.6 km in length. The roadway is primarily bordered by agricultural lands on the north, west and east directions, while running parallel to a forest land on the south. The southwestern end of the study zone is 620 m from the Ottawa River.


*Figure 1: Site Location – St. Jean Street – Poupart Rd., Rockland ON*

## 1.4 Service Life

This resilience analysis is based on a service life of 60 years, according the best practices of a climate resiliency analysis for roadways to include future climate change considerations.

# 2. Climate Resiliency Analysis

## 2.1 Procedure

To produce a portrait specific to this sector and increase the climate change resilience of this expansion project, information pertaining to the region, its current climate and climate projections were obtained. This portrait can be used to identify means of adapting to applicable climate hazards.

For the purpose of identifying the sector's vulnerabilities to climate change, our analysis considers two climate projection scenarios ("Representative Concentration Pathways" or RCPs). The moderate projection corresponds to the RCP 4.5 scenario, with 650 ppm of atmospheric $CO_2$ by 2100, for a global temperature rise of 2.4º C, which nearly corresponds to the Paris Accord's goal of keeping global warming below 2º C, and preferably 1.5º C. To achieve this result, emissions must stabilize despite population growth, increased buying power and the quality of life of lower-income households. The pessimistic forecast corresponds to the RCP 8.5 scenario, with 1,370 ppm of atmospheric $CO_2$ by 2100, for a global temperature rise of 4.9º C. This scenario implies that few emission reduction measures have been applied, and that the quantity of emissions has continued to surge. The climate projection period considered for this study is 2071-2100 or 2080, because an infrastructure's service life is usually at least 60 years.

The projection data used in this study come from the following sources. Priority was given to sources with greater geographic precision. In cases where local data is lacking, data from adjacent sectors are used. Such exactitude allows for effective assessment of future climate change for the St. Jean Street expansion project, since the impact of climate change is highly variable on an Ontario-wide scale, which is why local data were used.

Once future climate conditions and hazards were identified, the vulnerabilities of roadways to these hazards were taken or inspired from Chapter 6: Ontario, Climate Risks and Adaptions for the Canadian Transportation Sector (Woudsma et al., 2017) and ONEIAs Resilient, Infrastructure, Economy and Future (ONEIA, 2022) reports. The probability and gravity of the consequences of climate hazards were combined in order to classify the risk level and identify those significant to the project. Finally, adaptive measures were taken from both reports indicated above. Furthermore, these extremely general measures were adapted and filtered based on the realities of the current project. The team also took the liberty of adding additional adaptive measures that are not mentioned in the guide to enhance the potential climate resilience of the project.

*Table 1: Sources of Information for the Climactic Data Used in the Various Scenarios*

| Number | Sources |
|---|---|
| 1 | Climate Data Canada (Environment and Climate Change Canada, 2021) |
| 2 | Climate Atlas of Canada (Government of Canada, 2021a) |
| 3 | CCDP - Ontario Climate Change Data Portal (University of Regina, 2021) |
| 4 | Canada's Changing Climate Report (Bush and Lemmen, 2019) |
| 5 | Climate-Resilient Buildings and Core Public Infrastructure . . . (Cannon and al., 2020) |

## 2.2 Climate History and Projections (Climate Hazards)

### 2.2.1 Temperature

According to climate projections, the Ontario province will see an increase in annual mean temperature of 2.3º C by 2050 and 6.3º C by 2080 with a high emission scenario (Bush and Lemmen, 2019). The data shown in the following table detail this increase specifically for the sector in which the roadway is located. Research suggests that longitudinal cracking and rutting of the roadway will worsen over time as a result of the changes in freeze-thaw cycles and extreme temperatures, as shown below (Woudsma and Towns, 2017).

*Table 2: Climate Projection Data for 2080, Based on Various Temperature-Related Parameters*

| Climate Parameter | Units | Historic Values (1981-2010) | Moderate | Range (moderate) | Pessimistic | Range (pessimistic) |
|---|---|---|---|---|---|---|
| Annual average[1] | º C | 6.0 | 9.7 | 8.9 to 11.3 | 12.2 | 11.0 to 14.7 |
| Winter average[1] | º C | -8.8 | -4.4 | -5.4 to -2.4 | -1.4 | -3.1 to -1.0 |
| Summer average[1] | º C | 19.2 | 22.7 | 21.3 to 24.4 | 25.4 | 23.1 to 27.7 |
| Avg. max. temperature change[5] | º C | N/A | 2.7 | 2.4 to 2.9 | 3.9 | 3.5 to 4.2 |
| Avg. min. temperature change[5] | º C | N/A | 6.5 | 6.0 to 7.0 | 9.4 | 9.0 to 9.9 |
| No. of days per year over 30 º C[1] | Days | 12 | 45 | 28 to 66 | 78 | 49 to 105 |
| No. of heatwaves (>30 º C T. max. 3 days in a row)[2] | No. | 1.1 | 4.7 | 4.4 to 5 | 6.4 | 6 to 6.8 |
| Extremely hot days (+32 º C)[1] | Days | 4 | 25 | 12 to 40 | 53 | 27 to 83 |
| Max. summer temperature[1] | º C | 25.4 | 29.0 | 27.4 to 31.0 | 31.8 | 29.1 to 34.4 |
| Frost days[1] | Days | 160 | 123 | 107 to 137 | 101 | 71 to 117 |
| Annual freeze-thaw cycles[1] | Days | 69 | 64 | 53 to 69 | 54 | 41 to 69 |

Between 1948 and 2016, the average annual temperature had already risen by 1.7º C for Canada and 1.3º C for the Ontario region (Bush and Lemmen, 2019). The most significant warming was 2º C or more during the winter. Snowpack is projected to decrease by 5-10% per decade for southern Canada (Bush and Lemmen, 2019).

In light of the climate projections, modelling suggests that winter temperature extremes should be less pronounced, while summer temperature extremes should increase drastically. The number of annual days in excess of 32º C by 2080 should be multiplied by 6 for the optimistic scenario and by 12 for the more pessimistic scenario. There should be somewhat less annual freeze-thaw events, and they would gradually occur primarily during the winter, rather than the fall or spring, as usually seen. Creating an increase in the frequency of these events. According to the pessimistic scenario, with the marked increase in winter temperatures, the winter should be 6 weeks shorter in 2080 (Government of Canada, 2021a).

### 2.2.2 Precipitation

Precipitation modelling studies present a greater degree of uncertainty than those for temperature, for which the level of confidence is medium (Bush and Lemmen, 2019). However, annual precipitation has already increased by 9.7% from 1948 to 2012 (Bush and Lemmen, 2019).

*Table 3: Climate Projection Data for Various Precipitation Parameters in 2080*

| Climate Parameter | Units | Historic Values (1981-2010) | Moderate | Range (moderate) | Pessimistic | Range (pessimistic) |
|---|---|---|---|---|---|---|
| Annual precipitation[1] | mm | 944 | 1,045 | 1,009 to 1,082 | 1,090 | 1,047 to 1,158 |
| Change in total annual rainfall[5] | % | NA | 12.6 | 9.2 to 15.8 | 19.2 | 15.6 to 22.7 |
| Summer precipitation[1] | mm | 264 | 270 | 251 to 294 | 266 | 236 to 299 |
| Winter precipitation[2] | mm | 215 | 257 | 233 to 271 | 279 | 259 to 307 |
| Days of heavy precipitation (1 mm)[1] | Days | 141 | 143 | 139 to 146 | 142 | 135 to 147 |
| Days of heavy precipitation (20 mm)[1] | Days | 8 | 9 | 9 to 11 | 11 | 9 to 13 |
| Maximum precipitation over 1 day[1] | mm | 41 | 48 | 44 to 50 | 52 | 47 to 59 |
| Maximum precipitation over 3 days[2] | mm | 56 | 61.4 | 57.2 to 67.8 | 64.9 | 59.7 to 71.4 |
| Maximum precipitation over 5 days[1] | mm | 69 | 80 | 76 to 87 | 86 | 80 to 97 |

A warmer atmosphere can hold more water vapour, and therefore, additional tropical humidity will be carried to Ontario, resulting in increased annual rainfall accompanied by a larger number of heavy rainfalls. The information in the table above suggests a significant rise in annual rainfall but no change in summer precipitation. This could mean a greater risk of drought during hotter summers with the same amount of rainfall as before.

Intensity-Density-Frequency (IDF) curves illustrate the relationship between rainfall intensity over a given interval and the frequency of such an event occurring. The curves show that high-intensity events occur less frequently than lighter rainfalls. Climate change should cause a rise in the 2-, 5-, 10-, 20-, 50- and 100-year curves. The following figure has been taken from the University of Western Ontario's Tool for Updating Intensity Duration Frequency Curves to Climate Change, representing the values of historical precipitation rates (mm/h) within the Angers weather station. The intensity of precipitation should increase by ~16% on average, which can be observed between each intensity in the present and future climate in the figures to follow (Simonovic et al., 2015).

| T (years) | 2 | 5 | 10 | 20 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|---|
| 5 min | 77.99 | 105.50 | 123.66 | 141.04 | 146.55 | 163.50 | 180.29 |
| 10 min | 59.59 | 79.48 | 91.85 | 103.14 | 106.61 | 116.97 | 126.79 |
| 15 min | 52.96 | 67.29 | 74.64 | 80.42 | 82.03 | 86.42 | 90.03 |
| 30 min | 37.50 | 44.58 | 47.15 | 48.71 | 49.08 | 49.93 | 50.48 |
| 1 h | 22.68 | 30.37 | 34.79 | 38.59 | 39.71 | 42.95 | 45.84 |
| 2 h | 13.18 | 17.19 | 19.60 | 21.76 | 22.41 | 24.33 | 26.11 |
| 6 h | 5.88 | 8.16 | 9.71 | 11.21 | 11.69 | 13.19 | 14.70 |
| 12 h | 3.13 | 4.41 | 5.53 | 6.86 | 7.35 | 8.49 | 9.18 |
| 24 h | 2.13 | 2.88 | 3.34 | 3.75 | 3.87 | 4.24 | 4.59 |

*Figure 2: Historical (1966 – 2017) IDF in Intensity Rates (mm/h) for Angers ID:7030170 (Simonovic et al., 2015)*

| T (years) | 2 | 5 | 10 | 20 | 25 | 50 | 100 |
|---|---|---|---|---|---|---|---|
| 5 min | 89.24 | 122.12 | 143.92 | 164.75 | 171.11 | 190.40 | 208.80 |
| 10 min | 68.13 | 92.00 | 106.94 | 120.42 | 124.57 | 136.67 | 147.93 |
| 15 min | 60.66 | 77.93 | 86.99 | 93.88 | 96.09 | 101.83 | 106.03 |
| 30 min | 42.80 | 51.60 | 54.97 | 56.86 | 57.42 | 58.79 | 59.73 |
| 1 h | 26.02 | 35.15 | 40.52 | 45.07 | 46.53 | 50.42 | 53.76 |
| 2 h | 15.12 | 19.90 | 22.83 | 25.38 | 26.19 | 28.47 | 30.49 |
| 6 h | 6.76 | 9.44 | 11.30 | 13.06 | 13.62 | 15.32 | 16.98 |
| 12 h | 3.58 | 5.11 | 6.41 | 7.93 | 8.44 | 9.79 | 10.70 |
| 24 h | 2.44 | 3.33 | 3.89 | 4.38 | 4.53 | 4.97 | 5.37 |

*Figure 3: Future Projection (RCP8.5 by 2100) IDF in Intensity Rates (mm/h) for Angers ID:7030170 (Simonovic et al., 2015)*

According to the projection data, the increase in annual precipitation would directly correspond with more intense rainfall, as the number of rainy days would not change. These figures should be interpreted with caution and serve only as an indicator of trends.

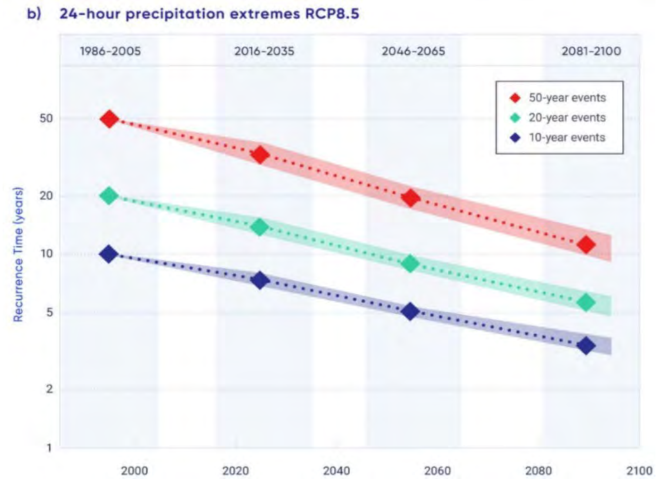


*Figure 4: Change in Precipitation Over Time According to the Pessimistic Scenario (Bush and Lemmen, 2020)*

As we can see in Figure 4 a rainfall of and intensity happening only every 50 years in the past will occur around every 10 years.

### 2.2.3 Flood Zones

As previously indicated, the study area is located 620 m from the Ottawa River on the most southern tip of the roadway. Poupart road on the southern portion of the study area is measured at an elevation of 64 m whereas the Ottawa River lies at an elevation of 43 m. In 2019, the City of Clarence-Rockland declared a state of emergency due to flooding reaching a historic peak in water levels and as a result led to the development of the flood Disaster Assistance Program, for businesses or residing within the identified zone of Figure 5 to follow (Government of Ontario, 2019). This program provides assistance for emergency expense and the costs to repair or replace essential property following a natural disaster that are not covered by insurance (applicable to primary residence and its basic contents, small business, farm or non-for-profit organization). The study area has been identified with a 'red star' within the figure to follow.

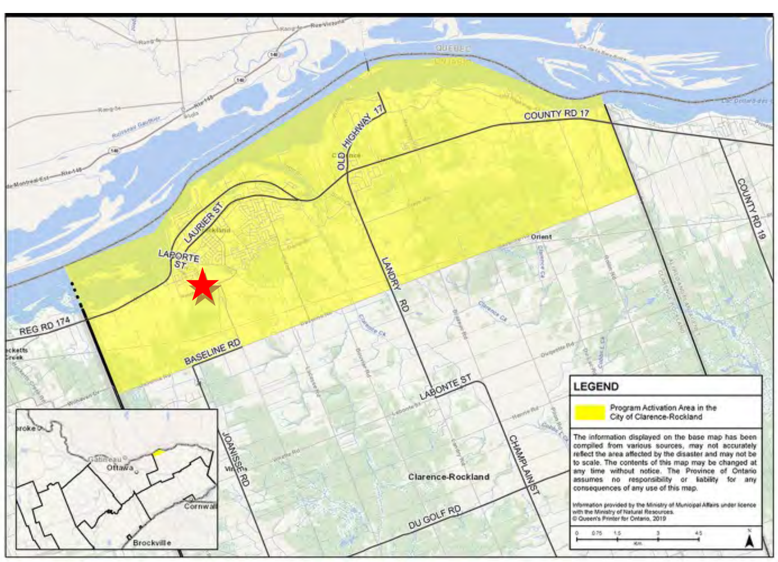


*Figure 5: Ottawa River Flood Activation Area, Clarence-Rockland (Government of Ontario, 2019)*

### 2.2.4 Drought

No long-term change is expected in the region's periodic droughts (Bush and Lemmen, 2020). Modelling droughts is very complex, given the extremely large number of variables occurring over long periods. In addition, there are many definitions of what constitutes a "drought." According to the latest studies, the first 10 cm of soil in southern Canada should be drier in the summer, but moisture at depth should not be affected by the end of the century based on the pessimistic scenario (RCP8.5) (Bush and Lemmen, 2020).

### 2.2.5 Freezing Rain

The number of freezing rainfalls during the winter may increase due to a greater frequency of near-freezing temperatures, but there should not be any increase in the number of annual events. According to the most recent studies, the degree of complexity and level of precision needed to assess the climate change impact of episodes of freezing rain is too great for existing models (Department of Health and Human Services, 2017). Therefore, the level of uncertainty for this climate hazard is very high and cannot be predicted.

### 2.2.6 Wind and Storms

There are few studies pertaining to projections of how climate change will affect wind speeds compared to such variables as temperature or precipitation (Bush and Lemmen, 2020). The smaller number of studies increase the uncertainty of this climate change variable. The complexity involved in modelling winds also applies to research related to storms and tropical cyclones. Worldwide research indicates an increase in the intensity of tropical cyclones, while the frequency of such events will be maintained or even reduced (Bush and Lemmen, 2020). The spatial resolution of the models is quickly increasing due to technological breakthroughs that should clarify the variation of this climate hazard over the next few years. This principle also applies to tornados. While climatic conditions conducive to their location may be forecast, where they touch down cannot be accurately predicted.

Utilizing the Intergovernmental Panel on Climate Change's (IPCC) WGI Interactive Atlas, as shown in Figure 6 to follow, through the analyses of Annual Surface Wind Change for the pessimistic RCP scenario within north-eastern North America, it is forecasted that within the years 2081-2100 that surface winds are projected to decrease over summer months, running from June to September, whereas winter surface winds are set to increase as shown in the dark green shading (IPCC, n.d.).

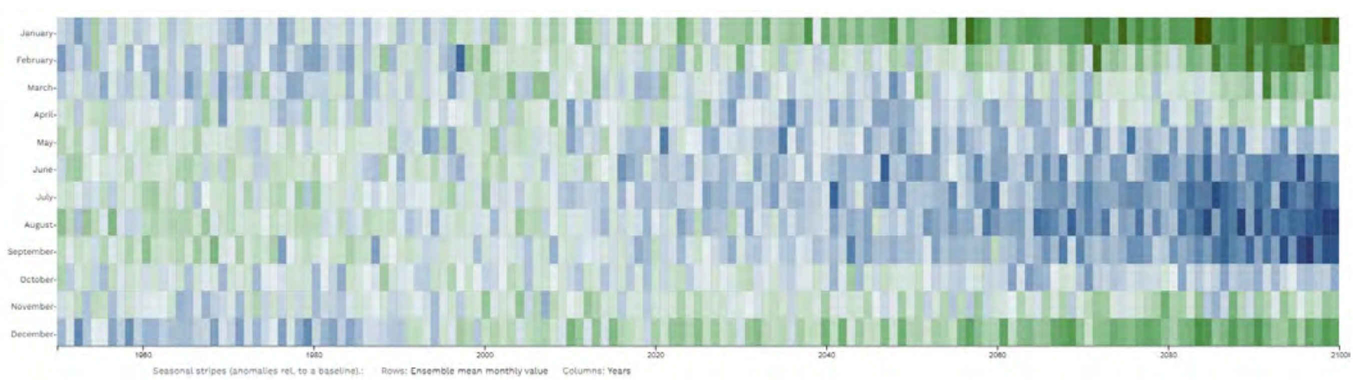


*Figure 6: CMIP6 - Annual Surface Wind Change for Pessimistic RCP 8.5 (IPCC, n.d.)*

This projection applies to average wind speed, while the projected increase in tropical storms could mean an increase in maximum wind speed.

### 2.2.7 Air Quality

Air quality has been enhanced as the result of the various air-quality improvement initiatives implemented over the years by the various levels of government. Climate change could exacerbate certain air quality parameters, such as increasing pollen production and the length of its season, along with the presence of ozone at ground level (Gough et al., 2016). However, ground-level ozone concentration and distribution are highly complex phenomena that depend on the presence of multiple meteorological, chemical and biological variables, and therefore, must be considered uncertain.

## 2.3 Identification and Quantification of Risks

To assess risk levels and identify significant measures for which modifications should be recommended, the classification method is based on the one specified in Appendix D (General Guidance) of *The Government of Canada Climate Lens* (Government of Canada, 2019).

Risk levels are determined by assessing the likelihood of occurrence and the gravity of consequences within a matrix. These variables are defined by the following tables:

*Table 4: Probability of Occurrence*

| | |
|---|---|
| Very high | Likely to occur once per year/Will probably become critical within a few years |
| High | Likely to occur at least once per decade/Will probably become critical within a decade |
| Average | Likely to occur once every 10 to 30 years/Will probably become critical within 10 to 30 years |
| Low | Likely to occur once every 30 to 50 years/Will probably become critical within 30 to 50 years |
| Very low | Not likely to occur during the period/Not likely to become critical during the period |

*Table 5: Scale of Gravity*

| | |
|---|---|
| Insignificant | Negligible change |
| Minor | Operations altered without permanent or major changes in functions |
| Moderate | Partial and temporary interruption of functions without threat to integrity |
| Major | Major losses or temporary interruption |
| Catastrophic | Destruction of infrastructure or permanent interruption |

*Table 6: Risk Classification Levels*

| Likelihood of occurrence | Gravity | | | | |
|---|---|---|---|---|---|
| | Insignificant | Minor | Moderate | Major | Catastrophic |
| Very high | Average | High | High | Extreme | Extreme |
| High | Low | Average | High | High | Extreme |
| Average | Low | Low | Average | High | High |
| Low | Negligible | Low | Low | Average | High* |
| Very low | Negligible | Negligible | Low | Low | Average* |

*Represents a category change from the Climate Lens guidance

Vulnerability analysis determines which systems and components may be affected by assessed climate hazards. The following table presents the results of this analysis for the road widening project in Rockland, ON. Components that are vulnerable will be assessed in the next section. All climate hazards below align with those outlined in Table 3 of Consideration of Climate Change in EA in Ontario (Government of Ontario, 2017).

*Table 7: Assessment of the Vulnerability of Components to Climate Hazards*

| Systems | Components | Climate Hazards | | | | |
|---|---|---|---|---|---|---|
| | | Extreme Temperatures | Freeze/thaw Cycles | Winter Precipitation | Intensity of Precipitation | Extreme Wind Gusts |
| Built Environment | Asphalt | Y | Y | Y | N | N |
| | Sidewalks | Y | Y | Y | Y | N |
| | Drainage | Y | Y | Y | Y | N |
| | Signage and lights | N | N | Y | Y | Y |
| | Fire Hydrants | N | N | N | N | N |
| | Structural Integrity | Y | Y | Y | Y | N |
| | Stormwater | N | Y | Y | Y | N |
| | Maintenance/ Reliability | Y | Y | Y | Y | N |
| Natural Environment | Biodiversity of the site | Y | Y | Y | Y | Y |
| | Landscaping | Y | Y | Y | Y | Y |
| Health & Safety | Occupational Personnel & Safety | Y | N | Y | Y | Y |
| | Users | N | Y | Y | N | N |

To follow, you will find a detailed outline of the risks that specified climate impacts hold on the roadways structure, and the reasoning behind the classification.

*Table 8: Classification of Risk and Climate Hazards*

| Climate Hazards* | Risks to Structure | Likelihood | Gravity of Consequences | Risk Level | Reasons |
|---|---|---|---|---|---|
| More frequent freeze-thaw cycles | • Accelerated deterioration/shearing of roadway/asphalt<br>• Expansion and contraction can cause ground movement and in turn producing cracking and swelling within the roadway<br>• Increased probability of potholes leading to road closures | Very High | Major | Extreme | • Increased frequency of freeze-thaw cycles is virtually certain.<br>• Repairs could be required, temporarily interrupting the use of segments of the roadway<br>• New road developments are less vulnerable because of the better quality of materials used and construction methods. |
| Increased snow water content and snow loads | • Increased load could result in ground movement or subsidence<br>• More maintenance and greater use of salt could accelerate deterioration of materials<br>• Increased snow loads can create power outages and impact to signalling and intersection infrastructure | Very High | Moderate | High | • The water load should increase with milder, rainier winters.<br>• Combined with the effect of more frequent freeze-thaw cycles. |
| Longer and more frequent heat waves/extreme heat events | • Extreme heat waves and temperatures can cause changes to asphalt composition, resulting in damage of roadways<br>• High temperatures can cause softening/potholes/rutting in particular on busy streets and intersections | Very High | Minor | High | • With a dark asphalt surface, this will absorb heat from the anticipated increase in temperatures and longer and more frequent heat waves |
| More frequent heavy precipitation events | • Heavy precipitation can result in flooding, weakening/washout of soil and culverts that support roads<br>• Heavy rainfall can leave debris on roadways and cause premature asphalt deterioration leading to temporary/permanent road closures | Very High | Major | Extreme | • More intense rainfall may result in flooding due to the roadway being located within a flood zone and near the Ottawa River |
| More extreme wind gusts | • Extreme wind gusts can decrease road safety due to decreased visibility and stability on the roadway<br>• Strong winds can damage intersection signals and other signage<br>• Extreme wind gusts can pose power outages to signalling and intersection infrastructure | Very High | Minor | High | • Wind gusts and speeds are anticipated to increase in coming years |

*Climate hazards taken from Table 3 of Consideration of Climate Change in EA in Ontario (Government of Ontario, 2017).

## 2.4 Adaptation Measures

Measures for adapting to climate change have been proposed for each climate hazard that presents an average, high or extreme level of risk. Application of some or all these measures can enhance the climate resilience of the road within the context of this study. Some of the following adaptive measures have been referenced from:

- Climate Risks & Adaption Practices – For the Canadian Transportation Sector 2016 (Woudsma et al., 2017)
- ONEIA Resilient Infrastructure, Economy, Future (ONEIA, 2022)
- SK Highway 6 and 39 Corridor Improvements – Climate Change Risk and Vulnerability Assessment (Stantec Consulting Ltd., 2019)
- Future of Stephen Avenue Climate Resilience Assessment (Stantec Consulting Ltd., 2022)

The following adaptive measures will reduce the building's risks and vulnerability with respect to the various previously identified significant climate hazards:

- **More frequent freeze-thaw cycles:**
  - Increase use of road de-icing materials (Woudsma et al., 2017)
- **Increased snow water content and snow loads:**
  - Consider applying anti-icing solution prior to events when freezing precipitation is forecasted (Stantec Consulting Ltd., 2019)
  - Install snow fencing to mitigate blowing snow (Stantec Consulting Ltd., 2019)
- **Longer and more frequent heatwaves/extreme heat events:**
  - Utilize more heat-resistant paving materials (Woudsma et al., 2017)
  - Integrate more roadside trees and other vegetation to increase shading (Stantec Consulting Ltd., 2022)
  - Operators and employees to follow ministry guidelines for safe operations for working in heat (Stantec Consulting Ltd., 2019)
  - Consider the use of a spray-on coating with a higher reflectivity of near infrared rays and lower reflectivity for the visible range (Stantec Consulting Ltd., 2022). This helps prevent glare and blinding drivers from a higher reflective road surface.
  - Check with asphalt provider if selected materials can support the near term heat projections and adjust the asphalt type for more heat tolerance if required (Stantec Consulting Ltd., 2022)
- **More frequent heavy precipitation events:**
  - Integrating forecasting of increased precipitation levels and volumes into roadway designs (Woudsma et al., 2017)
  - Improvements to stormwater management infrastructure and lower impact developments like vegetation (Woudsma et al., 2017)
  - Utilize permeable paving material for increased sub-surface drainage and infiltration (Stantec Consulting Ltd., 2022)
  - Increase ongoing maintenance and clearing of culverts and drainage systems (Woudsma et al., 2017)
  - Plan for detour roads in the instance of roadway flooding, this is to be a temporary mitigation measure (Stantec Consulting Ltd., 2019)
  - To lower the water table and protect the road materials, plant tree and bushes around the edge of the road (Stantec Consulting Ltd., 2022)

- **More extreme wind gusts:**
  - Integrate infrastructure with higher resilience to turbulent wind scenarios (Woudsma et al., 2017)
- **All climate hazards:**
  - Increase planned ongoing maintenance of roadway and signalling (Woudsma et al., 2017)
  - Allocate emergency operation budget for emergency response measures (Stantec Consulting Ltd., 2022)
  - Review emergency response procedures and resources (Stantec Consulting Ltd., 2019)

## 2.5 Climate Resiliency Conclusion and Recommendations

This study seeks to identify avenues for improving climate resiliency of the St-Jean Street – Poupart Road widening project. The recommended adaptation measures must be further evaluated to determine feasibility of implementation within the project's scope of work, budget as well as local regulations. Following this study of future climate conditions and the assessment of climate risks, our recommendations for adaptation measures to climate change can increase this project's overall climate resilience and long-term durability. This report is meant to inform the design team throughout the integrated design process to target and prioritize adaptation measures to be implemented in the project's overall design and construction.

# 3. Qualitative Greenhouse Gas Analysis

## 3.1 Procedure

Conducting a Qualitative GHG Inventory of the proposed roadway expansion, through secondary research (literature review) and industry best practices, Atrel Engineering Ltd will gain an understanding of the anticipated emissions during the project from varying scopes (1, 2 and 3) and sources (construction). Through an understanding of where the majority emissions are derived from during the construction of the roadway, this will allow Atrel Engineering to implement proposed mitigation measures into the lifecycle of the project, from material sourcing, to manufacturing, and finally construction.

This procedure is well aligned with the provincial guidelines associated with Considering Climate Change in the Environmental Assessment Process, and the MCEA Companion Guide.

The qualitative GHG analysis is based on the following three (3) objectives, gathered from the 'Considering Climate Change (CC) in the Environmental Assessment (EA) Process':

1. Consider what the project would be like if climate change mitigation was not a priority (business-as-usual);
2. Review the project as planned to identify any measures that could contribute to climate change mitigation (climate-focussed);
3. Document any measures that could reduce or avoid greenhouse gas emissions and enhance carbon storage when the project is implemented.

Per the Considering CC in the EA Process guide, the GHG Analysis of the St. Jean Street expansion project has considered those parameters outlined within the act and has provided responses to all questions posed to follow.

### 3.1.1 Site Boundary

A detailed background of the sites boundary and topography can be found within Section 1.3 of this report.

### 3.1.2 Reference Documents

This report has been prepared with the available data and statistical assumptions at the time of its preparation, mainly the following reference documents have been consulted within this inventory:

*Table 9: Sources of Information for the Qualitative GHG Inventory*

| Number | Sources |
|---|---|
| 1 | EL23-180801-3-0811-St-Jean Phase 2-Estimate |

## 3.2 Methodology

### 3.2.1 GHG Assessment Limits & Sources

The identification of GHG emissions for all sources considers the three (3) greenhouse gases emitted into the atmosphere: carbon dioxide ($CO_2$), nitrous oxide ($N_2O$) and methane ($CH_4$). When quantifying GHG emissions, they are provided in carbon dioxide equivalent ($CO_2e$) which is calculated using the amount of a GHG multiplied by its global warming potential (GWP) from the IPCC's Fifth Assessment Report (IPCC, 2014). The GWP over a 100-year horizon for each of the gases considered is shown in the table to follow.

*Table 10: Sources of Information for the Qualitative GHG Inventory*

| Gas | GWP (over 100 years) |
|---|---|
| $CO_2$ | 1 |
| $CH_4$ | 28 |
| $N_2O$ | 265 |

This qualitative GHG emissions study encompasses the roadway widening project in Rockland, ON, as previously stated in section 1.2. Only sources of significant GHG emissions will be considered in the assessment and overall emissions reduction strategies. In order to proceed with the study, all sources of emissions must be identified, and any exclusions must be justified. Table 11 presents the details on all the sources identified and considered for this project, and the analysis behind the decision making.

*Table 11: Emission Sources, Description and Consideration in Quantification*

| Source of emissions | Considered (Y/N) | Reasoning |
|---|---|---|
| Fossil fuel consumption by mobile and stationary machinery for site preparation and construction of the road | Y | Heavy machinery consumes significant amounts of fossil fuels. |
| Energy consumption during operation phase | N | The scope of the work does not include the operation and maintenance phase. |
| Consumption of fossil fuels for the transport of excavated material, embankments, and materials | Y | Transportation consumes a large amount of fossil fuels. The transportation sector is a major source of GHGs in Ontario (CER, 2022). |
| Decomposition of organic matter as a result of land-use change | Y | Under the Government of Canada's Draft Technical Guide Related to The Strategic Assessment of Climate Change released in August of 2021, all projects undergoing land-use change to infrastructure (i.e., road widening), must account for GHG emissions and impacts on carbon sinks (Government of Canada, 2021b). |
| Embodied carbon of the structural and aggregate materials, asphalt, concrete and PVC used for the construction of the road | Y | Embodied carbon usually accounts for a high proportion of emissions at the start of a project. |

| Source of emissions | Considered (Y/N) | Reasoning |
|---|---|---|
| Electricity consumption during construction | N | There will be no electricity consumption during construction, as the site is not connected to the local grid. The construction site will be run on a diesel-powered generator. |

Tree clearing of the area will be required prior to the road widening, primarily on the east portion running parallel to Poupart and St Jean Street, with construction of the road occurring in phases, from 2025-2026 and 2027-2029. The overall GHG emissions will be assessed in alignment with the Provincial Governments guidelines for 'Considering Climate Change Environmental Assessment Process'. GHG emissions from construction work include initial work and exclude future renovation, operation, maintenance, expansion, and demolition work. Embodied carbon emissions from asphalt and aggregate materials are assessed qualitatively within this report based on the lifecycle of a product (cradle to grave), consisting of five (5) stages, as outlined to follow:

1. Raw Material Extraction (A1);
2. Transport of raw material (A2);
3. Manufacturing (A3);
4. Transport of the product to the site (A4);
5. Construction and installation process (A5).

As identified within the cost estimate of this project, the main sources of Scope 1 emissions (related to the stationary and mobile equipment/machinery and transportation of materials) are as follows but are not limited to:

+ **Mobile/Stationary Equipment and Machinery (fossil-fuel combustion)**

*Table 12: Mobile/Stationary Equipment*

| Equipment Type | Fuel Consumption (L/hr) | Description | Source |
|---|---|---|---|
| Excavator | 19.1 | • Diesel Fuel<br>• Utilized for earth works | A |
| Loader | 60 | • Diesel Fuel<br>• Utilized for filling haulers and moving on site materials | B |
| Woodchipper<br>Brush cutter<br>Skid steer<br>Backhoe | 7 to 16 | • Diesel Fuel<br>• Utilized for onsite land clearing activities | C |
| Diesel generator | 14.4 | • Diesel Fuel<br>• Providing onsite power for equipment/other | D |
| Concrete pumper | 21.6 | • Diesel Fuel<br>• Utilized for roundabouts, sidewalks, etc. | E |

**A:** Cat 330D2[2] (HHP C7.1 ACERT) Caterpillar Performance Handbook 48, 2018
**B:** Cat AD60 Caterpillar Performance Handbook 48, 2018
**C**: Cat 239D[1], 416F2[1] 70 kW/94 hp Caterpillar Performance Handbook 48, 2018
**D**: Mobile Generator Set XQ125 Tier 4 Final Cat system, fuel efficiency provided from page 5 of the following manual in L for a fuel consumption of 50% Load, 60Hz – Prime 100 Power Rating, Cat XQ125 Rental Generator Set Specifications
**E:** Concrete pump can pump 24 $m^3$/hr; utilized the following information on the fuel consumption of a Concrete Pump Truck (0.9L/$m^3$) Fuel Consumption of Concrete Pump | Important to Save Cost (lutonmachinery.com)

+ **Transportation of Material Loads To and From Site (fossil-fuel combustion)**

*Table 13: Transportation Loads to and From Site*

| Equipment Type | Fuel Efficiency (L/100km) | Description | Source |
|---|---|---|---|
| Concrete Truck | 74.9 | • Concrete supplier truck | A |
| Material Supplier | 39.5 | • Truck (tri-axel)<br>• Supplying all materials for onsite use (i.e., asphalt, PVC, fencing, gravel etc.)<br>• Hauling all materials offsite from removals<br>• Hauling on site equipment onsite and offsite | B |
| Equipment Supplier | 39.5 | • Truck (tri-axel)<br>• Hauling equipment onsite and offsite | |
| Removals Hauler | 39.5 | • Truck (tri-axel)<br>• Hauling all materials offsite from removals and land clearing activities | |

**A:** 3.14 mpg converted to L/100km https://www.nrmca.org/wp-content/uploads/2019/07/UsingFleetBenchmarkingSurveySaveMoney.pdf

**B**: Natural Resources Canada, 2019

As previously indicated, Scope 3 emissions related to the project will include those emissions related to the following emissions sources and types but are not limited to:

+ **Land Use Change (carbon sinks, DOM)**
  - Forest Land to Infrastructure – deforestation and excavation of surrounding lands to allow for roadway development.
  - Removal of topsoil, peat land and clay layer of soil profile.

Note: the quantification of the removal of organic matter and natural assets can be quantified utilizing '*The Government of Canada's Draft Technical Guide Related to the Strategic Assessment of Climate Change, Annex B: Quantification of Direct GHG Emissions from Lane-Use Change*', with the methodology to be followed particularly for the removal of specified carbon sinks (i.e. in this case peat lands/wetlands) and the impacts and GHG emissions that such removals hold on the environment (Government of Canada, 2021b).

+ **Materials (embodied carbon)**

*Table 14: Materials (Embodied Carbon)*

| Material Type | $CO_2$ Factor ($kg\ CO_2$) | Units | Description | Source |
|---|---|---|---|---|
| Granular Reuse (type A & B) | N/A | MT | • Granular to be reused from previous roadway excavation – therefore no additional emissions | N/A |
| Granular Supply (type A & B) | 1.55 | MT | • 150mm-thick of granular 'A' = ~17,816 $m^2$ = ~2,672.4 $m^3$ = ~4,410 MT<br>• 600mm-thick of granular 'B' = ~23,965 $m^2$ = ~14,379 $m^3$ = ~38,104 MT | A |

| Material Type | $CO_2$ Factor ($kg\ CO_2$) | Units | Description | Source |
|---|---|---|---|---|
| PVC | ~2.7 | ft | • 300mm dia watermain PVC DR19 CLASS 150 = ~577.4 ft<br>• 400mm dia watermain PVC DR19 CLASS 150 = ~1,701.8 ft<br>• 200mm dia sanitary sewer PVC SDR 35 = ~524.9 ft<br>• 150mm dia sanitary sewer PVC SDR 35 = ~170.6 ft<br>• 300 – 450 mm dia sanitary sewer PVC SDR 35 for storm sewer installment = ~1,202.4 m | B |
| Concrete | 306.29 | $m^3$ | • Curbs, roundabouts and sidewalks = ~543 $m^3$ | C |
| Asphalt | 74.68 | MT | • 50mm thick HL3 pathway = ~6,634.1 MT | D |

*Note: the above is not an exhaustive listing of all materials utilized on site. These emissions factors have been sourced from environmental product declarations (EPDs) on said materials, either industry wide or localized to the project area, to be provided upon request.
**A**: Polaris Materials EPD - Gravel No. 7
**B**: Uni-Bell PVC Pipe Association NSF EPD - Table 26 – 8” PS 46 ASTM F794 Profile-Wall PVC Pipe
**C**: CRMCA EPD for Ready-Mixed Concrete #31-30 GU with air 25-34% SC
**D**: Peckham Industries #24 Bedford, BY Asphalt Plant Emerald Eco Label EPD

Within the GHG inventories for Project Accounting, it is typical of a projects GHG emissions ratio to be heavily sourced from firstly fossil fuel combustion related to mobile and stationary equipment use on site, followed by the release of carbon stocks and biogenic carbon from land-use change activities.

## 3.3 GHG Mitigation Measures

It is imperative to identify those aspects of the project that are high emissions sources for carbon, to provide insight into the areas of the projects construction that could hold impactful change through various mitigation measure strategies. To follow, you will find a listing of mitigation measures in alignment with the construction phases and processes for the roadway's development. These measures are categorized by impact (high, medium and low) with a description on how this categorization had been classified.

*Table 15: GHG Mitigation Measures Categorized by Impact*

| Mitigation Measure | GHG Reduction Potential | Description |
|---|---|---|
| Natural Asset/Environmental Restoration | High | The city and contractor will be developing a landscape plan with the surrounding subdivisions to incorporate one (1) tree per lot. This reforestation and planting of native species will compensate for the felling of trees from the roadway widening project.<br><br>It is recommended that the project account for the quantitative emissions associated to the land-use change activities on site, specifically with the disturbance of peat lands and wetlands. This methodology can be followed through the Government of Canada's Draft Technical Guide Related to the Strategic Assessment of Climate Change, Annex B (Government of Canada, 2021b).<br><br>Additional mitigation measures are recommended in reducing loss, remediating and restoring the natural assets: |

| Mitigation Measure | GHG Reduction Potential | Description |
|---|---|---|
| | | • Reducing the surface area of the disturbance zone (Natural Resources Canada, 2020);<br>• Reforestation of the temporary disturbance zone required for construction activities and surrounding area by planting native species;<br>• Introducing circular economy modelling by recycling the merchantable/harvested wood on the lumber market can reduce the GHG emissions associated to deforestation by immobilizing the carbon in structures made with lumber (St-Laurent and Hoberg, 2016). |
| Utilization of Grid Power (as an alternative to a diesel generator for power supply to site) | High | As outlined within Table 12, a typical diesel generator holds a diesel fuel consumption rate of 14.4 L/hr. Meaning, that if the project ran for a total of 2,310 hours, the generator would emit a total of ~89 tons of $CO_2e$. These emissions can certainly be avoided with utilizing local grid power for onsite operations and office trailers. It is recommended that the contractor seek out more information from its local utility provider (i.e. HydroOne). |
| Locally Supplied Materials | Medium | Transportation emissions are quite small when compared to other source categories for onsite construction emissions. It is however, still important to decrease these emissions by sourcing materials from local suppliers to decrease the fossil fuel emissions related to transportation to and from site.<br>It is important to note that concrete should be sourced as near to the site possible, with the fuel efficiency being 74.9 L/100km, almost double the emissions of a traditional hauler at 39.5 L/100km.<br>Reusing aggregate on site is the best way to reduce transportation distance. |
| Material Embodied Carbon | High | Materials and associated scope 3 emissions from embodied carbon usually holds the majority emissions when calculating a project's carbon footprint. It is apparent that for the roadway expansion, asphalt holds the largest impact on the sites scope 3 emissions, due to the amount of material required for paving the roadway and its pathways. Many studies show that by integrating recycled asphalt, biochar, or crumb rubber as alternative mixes can significantly reduce the 74.68 k2 $CO_2e$ per MT of asphalt (Yaro et al., 2023).<br>Secondly, concrete holds a very large amount of embodied carbon, in terms of kg $CO_2e$ per $m^3$ of concrete, to be utilized for curbs, sidewalks and roundabouts at 306.29 kg $CO_2e$. The impact of concrete on the overall sites emissions profile can be mitigated through the integration of higher amounts of supplementary cementitious materials (SCMs) like fly ash and slag or other alternatives.<br>Additionally, similarly to that of the granular being reused on site, it is recommended that recycled material be utilized within the building of the roadway, for fill, landscaping, erosion control, in order to integrate circular economy modelling and decrease the emissions pertaining to material supplies. It could also come from an adjacent construction project and the municipality could provide insight on construction sites in the vicinity. |

## 3.4 GHG Qualitative Analysis Conclusion and Recommendations

In conclusion, upon completing the qualitative analysis of the Poupart Street and St Jean Street roadway widening project's GHG inventory related to the construction phase, it is determined that the majority of emitting GHGs are associated with Scope 3 emissions linked to the embodied carbon within the material utilized for the construction of the roadway. Through the integration of those mitigation measures identified in Section 3.3, specifically for those reductions categories as "H" or high impact reductions, the contractor and developer will be able to create impactful and positive change within the overall GHG emissions profile of the project, in alignment with the government's Considering Climate Change (CC) in the Environmental Assessment (EA) Process.

The considerations of a project's impacts on climate change taken from section 3 of the provincial government's 'Consideration of Climate Change in EA in Ontario' guidelines have been addressed in the table to follow.

*Table 16: Considerations for a Project's Impacts on Climate Change (Government of Ontario, 2017)*

| Consideration |
|---|
| **1. How might the project/alternatives generate greenhouse gas emissions or affect carbon storage or the removal of carbon dioxide from the atmosphere?** |
| The natural assets surrounding the Poupart St and St Jean Street roadway will undergo land use change through the removal of such lands through the widening of the roadway. Currently, the roadway is surrounded by many acres of agricultural lands and roadside deciduous trees and forested lands. The emission related to the land-use change of natural assets and forest land to infrastructure, from the release of carbon sinks, land conversion and dead organic matter (DOM) required during the excavation for the construction of the roadway are all categorized as scope three (3) emissions. Through recent studies, it is noted that emissions related to land-use change to infrastructure hold majority GHG emissions related to a project, however, are categorized as 100% biogenic sources. Biogenic sources are those that are derived from natural sources like living organisms or biological processes that eventually circle back into the atmosphere. Biogenic sources typically emit the following GHG gases: $CO_2$, $CH_4$ and $N_2O$. The gases from biogenic sources would eventually make their way back into the earth's natural cycle through carbon sequestration of flora and fauna. Therefore, with these emissions originating from a natural cycle, they are not adding to our global GHG emissions, like fossil fuels. |
| **2. To what extent have the project/alternatives already taken into account impacts on climate change in project planning?** |
| Atrel Engineering Ltd will have the opportunity to analyze different options to integrate adaptation measures as outlined in the previous section within the design and construction of the roadway. This study will provide the developer with the background of climate hazards to be considered and the potential and likelihood of occurrence within this region. Options in managing the risks and vulnerabilities to the roadway can then be evaluated through the integration of resiliency measures within the overall design. |
| **3. Are there alternative methods to implement the project that would reduce any adverse contributions to a changing climate?** |
| Please refer to section 3.3 Mitigation Measures related to GHG Emissions of our report. |
| **4. How might the project/alternatives give rise to climate change impacts, positive or negative, on Indigenous people and/or communities?** |
| Rockland, Ontario is located on the ancestral treaties of the Anishinabewaki and Omamiwininiwag (Algonquin) territories and lands. Certainly, the climate change impacts and hazards being felt and to be amplified within this region due to our changing climate for future scenarios will impact these lands and their people negatively, through increased heat waves leading to droughts, to longer more intense precipitation events in turn leading to an increased potential of flooding of the local lands as a result of the Ottawa River and active flood zone of which the project is situated within. Addressing these climate impacts and incorporating mitigation measures within the community's infrastructure, in addition to conducting a thorough EA is the first step in striving for positive change and impacts within the local communities, peoples and ecosystems. |
| **5. What commitments can be made to reduce the impacts on climate change from the project over time, i.e. when the project is implemented?** |
| Please refer to section 3.3 Mitigation Measures related to GHG Emissions of our report. |

# 4. References Cited or Viewed


Bush, E. and Lemmen, D.S., editors. 2019. *Canada's Changing Climate Report*. Government of Canada. Ottawa. Ontario. 446 pp.

Canada Energy Regulator. 2022. *Provincial and Territorial Energy Profiles – Ontario*. Retrieved 2022-09-07. Online: https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-ontario.html#:~:text=The%20largest%20emitting%20sectors%20in,7.2%20MT%20CO2e.

Cannon A. J., Jeong I. D., Zhang X., Zwiers F. W. et al., 2020. *Climate-resilient buildings and core public infrastructure: an assessment of the impact of climate change on climatic design data in Canada*. Government of Canada. 122 pp.

Caterpillar. (2018). Caterpillar Performance Handbook 48. Retrieved March 1, 2023, from https://wheelercat.com/company/resources/cat-performance-handbook/

City of Ottawa and National Capital Commission. 2020. *Climate projections for the National Capital Region – Volume 1: Results and interpretation for Key Climate Indices*. CBCL Limited. 134 pp.

Department of Human Health and Services. 2017. *Changements climatiques - Vulnérabilité et adaptation des immeubles - Répertoire des guides de planification immobilière*. Government of Quebec. Expertise and norms division. 241 pp.

Environment and Climate Change Canada. 2021. *Climate Data for a Resilient Canada*. Government of Canada. Viewed 08-06-2021. Online: https://climatedata.ca/

Environment and Climate Change Canada. 2022. *National Inventory Report 1990-2020: Greenhouse Gas Sources and Sinks in Canada*. Government of Canada.

Gough W., Anderson V. and Herod K. 2016. *Ontario climate change and health modelling study*. University of Toronto. Ministry of health and Long-term Care. Toronto, ON. 30 pp.

Government of Canada. 2019. *Climate Lens - General Guidance.* Viewed 07-06-2021. Online: https://www.infrastructure.gc.ca/pub/other-autre/cl-occ-eng.html#annexG

Government of Canada. 2021a. *Climate Atlas, version 2*. Environment and Climate Change Canada. Online: https://climateatlas.ca/

Government of Canada. 2021b. *Draft Technical Guide Related to The Strategic Assessment of Climate Change: Guidance on quantification of net GHG emissions, impact on carbon sinks, mitigation measures, net-zero plan and upstream GHG assessment.* In Government of Canada. Retrieved March 31, 2023, from https://www.canada.ca/en/environment-climate-change/corporate/transparency/consultations/draft-technical-guide-strategic-assessment-climate-change.html

Government of Ontario. (2017, December 14). *Guide: Consideration of Climate Change in Environmental Assessment in Ontario | Environmental Registry of Ontario*. Environmental Registry of Ontario. Retrieved May 30, 2023, from https://www.ontario.ca/page/considering-climate-change-environmental-assessment-process

Government of Ontario. (2019, May 7). *Ontario Government Activates Disaster Recovery Assistance to Support Residents in the Ottawa River Area*. Retrieved June 8, 2023, from https://news.ontario.ca/en/bulletin/52112/ontario-government-activates-disaster-recovery-assistance-to-support-residents-in-the-ottawa-river-area

IPCC AR6-WGI Atlas. (n.d.). https://interactive-atlas.ipcc.ch/regional-information#eyJ0eXBlIjoiQVRMQVMiLCJjb21tb25zIjp7ImxhdCI6Mzk0NjAxOCwibG5nIjotNjU2MDk1OSwiem9vbSI6MywicHJvaiI6IkVQU0c6NTQwMzAiLCJtb2RlIjoiY29tcGxldGVfYXRsYXMifSwicHJpbWFyeSI6eyJzY2VuYXJpbyI6InNzcDU4NSIsInBlcmlvZCI6ImZhciIsInNlYXNvbiI6InllYXIiLCJkYXRhc2V0IjoiQ01JUDYiLCJ2YXJpYWJsZSI6InN mY1dpbmQiLCJ2YWx1ZVR5cGUiOiJSRUxBVElWRV9BTk9NQUxZIiwiaGF0Y2hpbmciOiJTSU1QTEUiLCJyZWdpb25TZXQiOiJhcjYiLCJiYXNlbGluZSI6IldNTzIiLCJyZWdpb25zU2VsZWN0ZWQiOlsyXX0sInBsb3QiOnsiYWN0aXZlVGFiIjoic2Vhc29uYWwtc3RyaXBlcyIsInNob3dpbmciOnRydWUsIm1hc2siOiJub25lIiwic2NhdHRlclNYWciOiJSRUxBVElWRV9BTk9NQUxZIiwic2NhdHRlclWYXIiOiJzZmNXaW5kIn19

Intergovernmental Panel on Climate Change. (2014). *AR5 Synthesis Report: Climate Change 2014.* IPCC. https://www.ipcc.ch/report/ar5/syr/

Municipal Engineers Association. (2018). *Companion Guide for Municipal Class EA Manual*. In MCEA. Retrieved May 30, 2023, from http://www.municipalclassea.ca/files/Companion%20Guide%20rev%2002%20December%20%202018.pdf

Natural Resources Canada. 2019. *Fuel Efficiency Benchmarking in Canada's Trucking Industry*. Government of Canada. Retrieved 2022-07-07. Online: https://www.nrcan.gc.ca/energy/efficiency/transportation/commercial-vehicles/reports/7607

Natural Resources Canada. (2020, December 23). *Mitigation involving forests*. https://natural-resources.canada.ca/climate-change-adapting-impacts-and-reducing-emissions/climate-change-impacts-forests/mitigation/13097

Ontario Environment Industry Association. (2022). *Resilient infrastructure. Resilient economy. Resilient future*. In ONEIA. Retrieved June 7, 2023, from https://www.oneia.ca/resources/Documents/ONEIA%20climate%20resilient%20infrastructure%20opportunities%20FINAL%20Jan%202022.pdf

Peterson St-Laurent, G., & Hoberg, G. (2016). Climate Change Mitigation Options in British Columbia's Forests: A Primer. Retrieved June 20, 2023, from https://carbon.sites.olt.ubc.ca/files/2012/01/Primer_Climate-Change-Mitigation-Options-in-BC_.pdf

Stantec Consulting Ltd. (2019). *Saskatchewan Highway 6 and Highway 39 Corridor Improvements – Climate Change Risk and Vulnerability Assessment*. In PIEVC Program. Retrieved June 11, 2023, from https://pievc.ca/2019/03/08/saskatchewan-highway-6-and-highway-39-corridor-improvements-climate-change-risk-and-vulnerability-assessment/

Stantec Consulting Ltd. (2022). Future of Stephen Avenue Climate Resilience Assessment. In PIEVC Program. Retrieved June 10, 2023, from https://pievc.ca/2023/03/05/future-of-stephen-avenue-climate-resilience-assessment/

University of Regina. 2021. *Ontario Climate Change Data Portal*. University of Regina. Viewed 08-06-2021. Online: http://www.ontarioccdp.ca/

Woudsma, C., and Towns, W. (2017). Ontario. In K. Palko and D.S. Lemmen (Eds.), *Climate risks and adaptation practices for the Canadian transportation sector 2016* (pp. 139-179). Ottawa, ON: Government of Canada.

Yaro, N.S.A.; Sutanto, M.H.; Baloo, L.; Habib, N.Z.; Usman, A.; Yousafzai, A.K.; Ahmad, A.; Birniwa, A.H.; Jagaba, A.H.; Noor, A. *A Comprehensive Overview of the Utilization of Recycled Waste Materials and Technologies in Asphalt Pavements: Towards Environmental and Sustainable Low-Carbon Roads*. *Processes* **2023**, *11*, 2095. https://doi.org/10.3390/pr11072095

# APPENDIX "N"

## Fisheries Technical Report, CIMA+: February, 2023

## &

## Response from Fisheries & Oceans Canada: June 23, 2023

# Stewart Village Subdivision Services and St. Jean Street Widening

## Fisheries Technical Report

St Jean Street, Rockland, Ontario

CIMA+ file number: A001262 / A001263
February 22, 2023

# Stewart Village Subdivision Services and St. Jean Street Widening

## Fisheries Technical Report

St Jean Street, Rockland, Ontario


Prepared by: Sophie Lafrance
Sophie Lafrance, Biologist

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CIMA+ file number: A001262 / A001263
February 22, 2023

## Confidentiality and ownership

## Table of involved resources

In addition to the signatories of this report, the following individuals have also been involved in the study and writing of the report as technical experts within the project team:

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| Amal Siddiqui | Biologist, Environment |
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| **Review No.** | **Reviewed by** | **Date** | **Description of the change or submission** |
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## LIST OF ACRONYMS AND DEFINITIONS

| | |
|---|---|
| DFO | Department of Fisheries and Oceans Canada |
| ESA | Endangered Species Act |
| FIA | Fisheries Impact Assessment |
| UTM | Universal Transverse Mercator |
| LIO | Land Information Ontario |
| MECP | Ministry of Environment, Conservation and Parks |
| MNRF | Ministry of Natural Resources and Forestry |
| MTO | Ministry of Transportation of Ontario |
| NASAR | National Aquatic Species at Risk |
| NHIC | Natural Heritage Information Centre |
| SAR | Species at Risk (provincial and federal listed endangered and threatened species) |
| SARA | Species at Risk Act (Federal) |
| SARO | Species at Risk in Ontario |
| SNC | South Nation Conservation |

### SRANK DEFINITIONS

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

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

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

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

S5: Secure; Common, widespread, and abundant in the nation or state/province.

?: Inexact Numeric Rank—Denotes inexact numeric rank.

SNA: Not Applicable, A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

### SARA STATUS DEFINITIONS

END Endangered: a wildlife species facing imminent extirpation or extinction.

THR Threatened: a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

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

**SARO STATUS DEFINITIONS**

END Endangered: A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA.

THR Threatened: A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.

SC Special concern: A species with characteristics that make it sensitive to human activities or natural events

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# 1. Introduction

## 1.1 Background

The following report has been prepared by CIMA+ to support a request for review application submitted on behalf of the two clients, the Town of Rockland and 11034936 Canada Inc. These two clients have separate projects that are occurring at the same location. These are:

1. Town of Rockland – St. Jean Street Widening
2. 11034936 Canada Inc. – Servicing for their Residential Subdivision

While the works associated with these two projects are the responsibility of two separate proponents, the initial works will be completed by 11034936 Canada Inc. on behalf of the Town.

Note that in addition to habitat visits in 2022 completed by CIMA+, this report uses data collected by Bowfin Environmental Consulting (Bowfin). Bowfin has collected data on this system for both projects and related works since 2008 (Bowfin 2008-2021) and merged its services with CIMA+ in 2022.

### 1.1.1 Town of Rockland

St. Jean Street is undergoing a Municipal Class Environmental Assessment (MCEA). It is anticipated that the elevation of the road will rise significantly, resulting in a much wider road allowance. As such, this request for review is being submitted on behalf of the Town of Rockland for the impacts to the wetland and to the channel. Their works include the replacement of the existing culvert with a longer one designed to accommodate the wider road allowance. The MCEA process has not begun; however, to prevent delays in the servicing for the residential subdivision, the engineering team has calculated the amount of widening required (worse-case). The 11034936 Canada Inc. proponent would complete the wetland removal, infill and culvert replacement at the same time as the installation of their services. The servicing design is such that they would travel over the new culvert.

The road widening will include the dredging and infilling of 5045m$^2$ of wetland habitat and the realignment of 268m$^2$ of the channel (not including the habitat through the existing culvert). The wetland is predominantly indirect fish habitat while the channel is direct, year-round, fish habitat. The majority (all of the wetland (5045m$^2$) and 242m$^2$ of the channel habitat) will be disturbed on the downstream (west) side of St. Jean Street with the remaining channel habitat (26m$^2$) being on the upstream side (east). The length of the channel (including the culverts) will be reduced from the current 126m to 86.5m (length of the twin box culverts). The existing 1500mm CSP culvert would be replaced with twin 79.5 m long 2400 wide box culverts (1800mm tall), countersunk by 0.30m and backfilled with native material. Options to create a low-flow passage in one of the two culverts is currently being investigated. Erosion protection will be installed at the entrance and exit of the new culverts. A pool (minimum 0.5m deep and the width of the two culverts) will be created downstream/upstream of the erosion protection. The existing culvert's 1:2 year peak velocity is 2.76 m/s, while the new culvert's will be 0.82m/s (JFSA, 2022).

#### 1.1.2 Residential Servicing

11034936 Canada Inc. is constructing a residential subdivision north of Poupart Road, on the south side of Lafontaine Creek. Bowfin completed the Environmental Impact Statement (EIS) for that subdivision (Bowfin 2013-2019). Originally, all works, including the servicing, were to be completed outside of a 30m setback from the high-water mark for fish habitat and/or edge of the wetland (whichever was greater). In 2017, the location of the stormwater management (SWM) facility was adjusted to be within this setback but remained outside of the high-water mark. This met the DFO guidance at the time which specifically noted:

> "Stormwater management facilities/basins
> - Construction of new land-based stormwater management facilities, settling ponds and storage basins
>   - No work occurring below the High Water Mark of a nearby waterbody" (DFO website accessed September 7, 2017)

The location of the SWM facility has not changed; however, the location of the last (eastern) leg of the services will follow the new road allowance. It is CIMA+'s understanding, based on communications with Atrel Engineering, that the location of the services is dictated by the works associated with the road allowance. As such, there are no additional impacts (indirect or direct) to fish or fish habitat.

## 1.2 PROJECT LOCATION

The residential subdivision is situated on the top of the valley between Lafontaine Creek Marsh and St Jean Street in the Town of Rockland, Ontario (Figure 1 and Figure 2). It is part of Lots 27 and 28, Concession 1, and Lot D, Concession 8, in the Geographical Township of Clarence (UTM 18T 477278 m E; 5042563 m N and Latitude 45.536246; Longitude -75.291051). The road allowance widening, culvert replacement, and servicing that will occur in or within 30m of fish habitat is along the portion of St. Jean Street that runs north-south (a stretch of roughly 60m) (Figure 3).The surrounding lands include the treed valley (south), and commercial and residential lands (east of St. Jean Street).

## 1.3 LEGISLATIVE CONTEXT

The scope of this report is solely the review of the proposed works through the lens of the *Fisheries Act* and, as applicable to fish, the *Species at Risk Act*.

#### 1.3.1 Fisheries Act

The *Fisheries Act,* last amended August 28, 2019, is administered by the Department of Fisheries and Oceans Canada (DFO) and is intended to provide a framework for the management of threats to fish and fish habitat, including the prevention of pollution, regardless of their attachment to a fishery. The most relevant sections to works, undertakings and activities are:

+ Prohibition of the Death of Fish (Section 34.4 (1));
+ Prohibition of the Harmful alteration, disruption, or destruction of Fish Habitat (Section 35 (1)); and
+ The provisional Ministerial powers to ensure the free passage of fish or the protection of fish or fish habitat with respect to existing obstructions (Section 34.3).

Under the updated FA, certain types of waterbodies remain that do not require DFO review. Generally, these are for projects that will occur on a waterbody that is not connected to fish habitat and does not contain fish at any time of year. As will be discussed herein, Lafontaine Creek is direct, permanent, fish habitat, and most of its adjacent wetland in this area of impact, is indirect (not flooded during spring).

### 1.3.2 Species at Risk Act

DFO also reviews projects in the context of the *Species at Risk Act* (SARA) as it pertains to fish[1] (as defined by the *Fisheries Act* see footnote). The relevant sections are:

+ Prohibition against the killing, harming, harassment, capturing or taking of “fish” listed as extirpated, endangered, or threatened (Subsection 32 (1))
+ Prohibition against possessing, collecting, buying, selling or trading of a “fish” listed as extirpated, endangered or threatened (Subsection 32(2))
+ Prohibition against the damaging or destruction of the residence of a “fish” species listed as endangered or threatened or those extirpated species for which a recovery strategy has recommended the reintroduction of the species into the wild in Canada (Section 33)
+ Prohibition against the destruction of any part of critical habitat of a “fish” species listed as endangered or threatened or those extirpated species for which a recovery strategy has recommended the reintroduction of the species into the wild in Canada (Subsection 58(1))

[1] Summary of the FA definition of fish: parts of fish, shellfish, crustaceans, marine animals, and any parts of these, and eggs, sperm, spawn, larvae and juvenile stages of the above list.

**Figure 1: General Location of the Residential Subdivision**


Figure by : A. Quinsey
Verified by : M. Lavictoire

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**Figure 2: Location of Proposed Works, Undertakings and Activities in Relation to Fish Habitat**

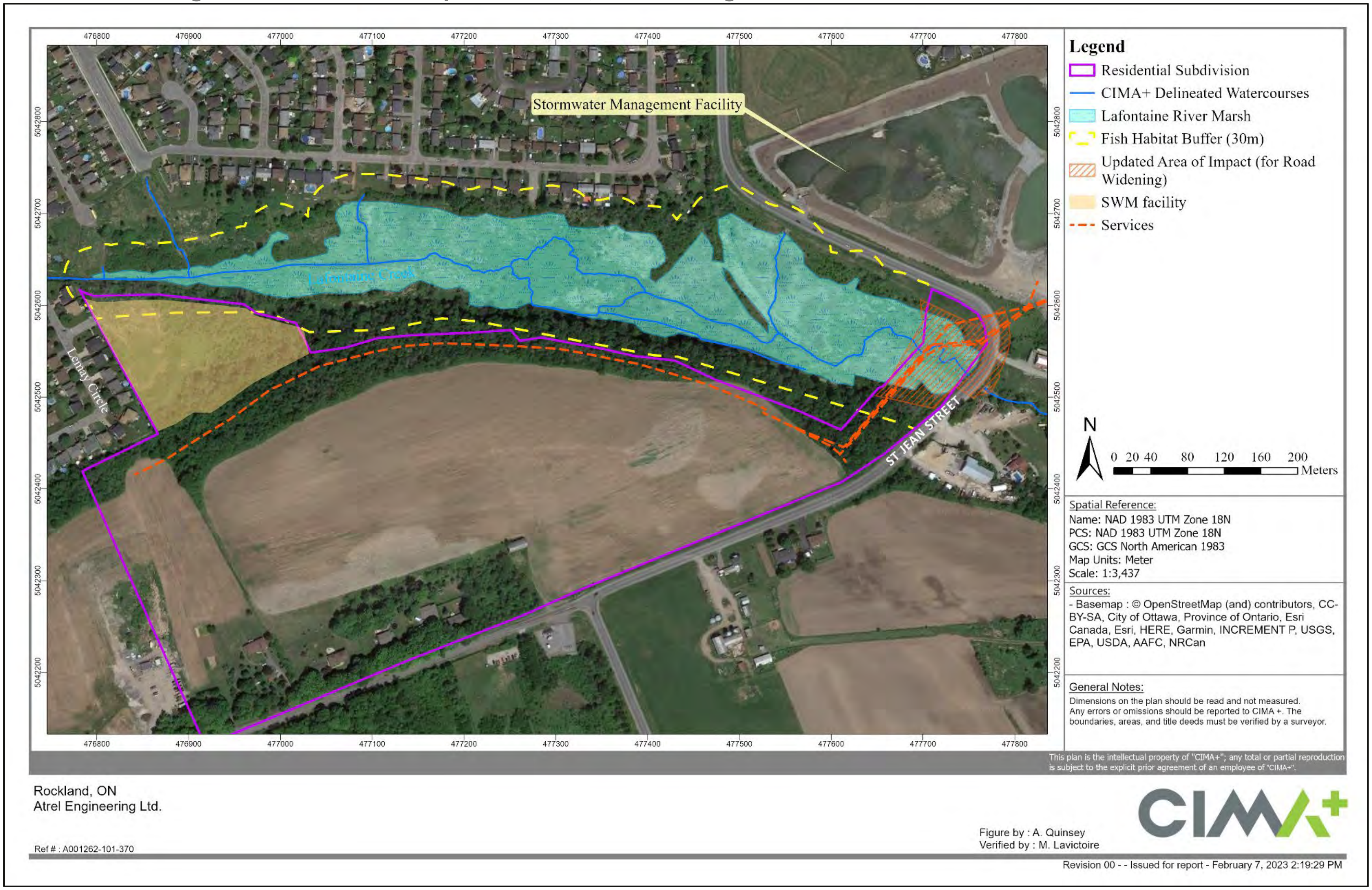
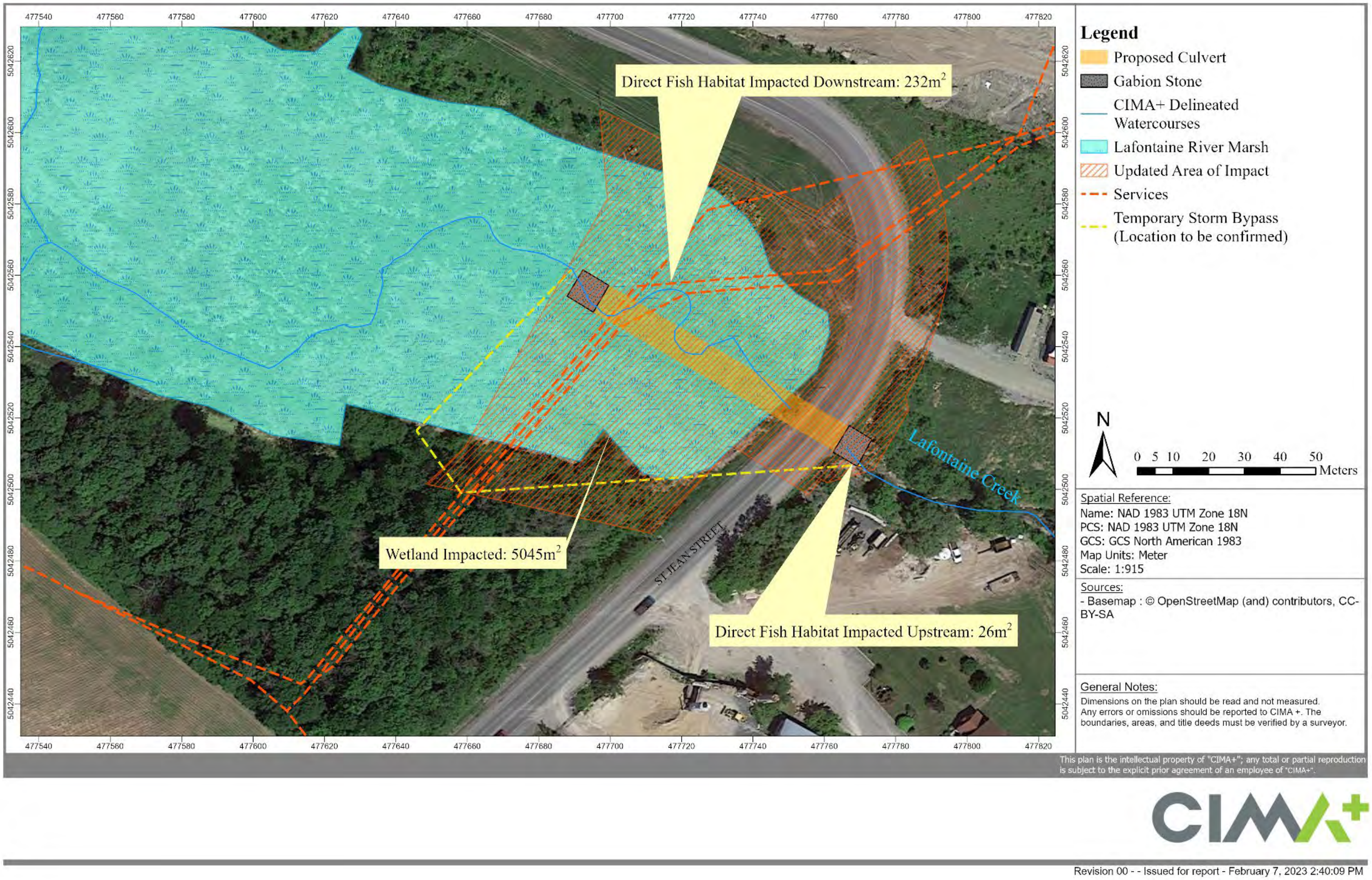


**Figure 3: Location of Works within the Channel and Wetland**



# 2. Methodology

## 2.1 Background Review

A search through available records and consulting reports was made to gather existing information on the fish habitat and community within the project area. The following web sources were used during the background review: Land Information Ontario (LIO), Natural Heritage Information Centre (NHIC), Species at Risk (limited to fish species protected under provincial or federal legislation), DFO National Aquatic Species at Risk (NASAR) (on-line) and review of other available consulting reports. Citizen science database iNaturalist was also consulted.

## 2.2 Field Studies

### 2.2.1 Fish Habitat Description

As noted above, the fish habitat and community data was collected by Bowfin between 2008 and 2019. However, CIMA+ delineated the edge of the active channels in 2022 using a hand-held GPS unit and these watercourse lines are shown on all figures herein.

To assess the potential impacts to fish habitat, fish communities or fish species at risk (SAR) the aquatic habitats within the study area were assessed based on the point observation technique used by *Ontario Stream Assessment Protocol* (Stanfield, 2013) and the Ministry of Transportation of Ontario (MTO)'s *Environmental Guide for Fish and Fish Habitat October 2006* (MTO, 2006). The channel morphology was described using evenly spaced transects upon which data was recorded from evenly spaced observation points. The data collected included: channel width, wetted width, bankfull depth, water depth, substrate size, morphological units, and in-stream cover.

### 2.2.2 Fish Community Sampling

Fish community sampling was performed to document the use of the site by fish between 2008 and 2019 by Bowfin. The most recent data was from the spring and summer 2019. The community was sampled using hoop nets, and backpack electrofishing. Minnow traps and Windemere traps were also used in 2008. The fish were identified, counted, measured [fork length (FL)/total length (TL) as appropriate], and released. The transect length, approximate width, volts, current and effort were also recorded.

# 3. Available Background Information on Fish and Fish Habitat

The proposed services will be built near Lafontaine Creek, which did not have fisheries information available outside of the Bowfin surveys. The full list of species is included in the table below for Lafontaine Creek between Lemay Circle and in its headwaters. Bowfin's data from sampling stations within this report's area of focus is included in Section 5. Of the fish captured, one sport fish (northern pike) and two pan fish (pumpkinseed and yellow perch) were identified. It is noted that young-of-the-year (YOY) northern pike have been captured between Lemay Circle and St. Jean Street, and further upstream (Figure 4).

As this project is within 730m of the Ottawa River, Lac Dollard-des-Ormeaux reach, the list from Land Information Ontario (LIO) is also provided in the table below. LIO provided a list of 75 warm to cold water fish species in the river, near the site (Table 1). Of these, twelve sport fish were identified: longnose gar, channel catfish, cisco, brown trout, northern pike, muskellunge, burbot, smallmouth bass, largemouth bass, sauger, and walleye. In addition, six pan fish were identified: rock bass, pumpkinseed, bluegill, white crappie, black crappie, and yellow perch.

The provincial background databases identified three species at risk (SAR) protected by the provincial *Endangered Species Act*; the endangered species American eel, and the threatened species lake sturgeon and cutlip minnow. All three are identified for the Ottawa River. These have not been documented on Lafontaine Creek.

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

### Figure 4: Catch Summary on Lafontaine Creek and its Tributaries

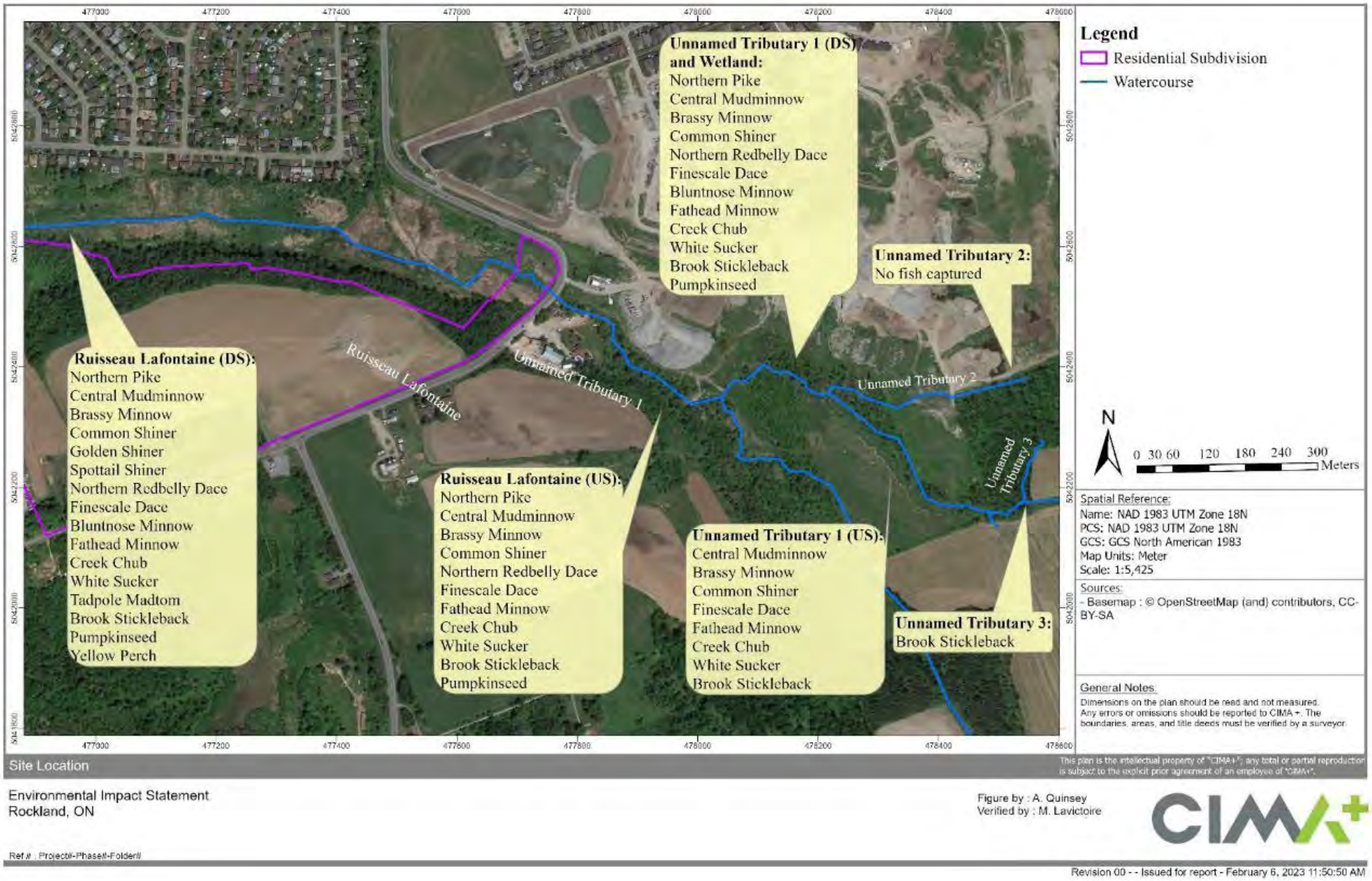


Table 1: List of Fish Identified in Background Information as Occurring in Lafontaine Creek and the Ottawa River, in the Lac Dollard-des-Ormeaux Reach

| Species Name | Scientific Name | Trophic Class | Thermal Regime | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Lafontaine Creek and its Tributaries | Ottawa River (Lac Dollard-des-Ormeaux Reach) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Northern Brook Lamprey** | *Ichthyomyzon fossor* | nonfeeding | cool | SNR | SC | SC | | Y | LIO 2019 |
| **Silver Lamprey** | *Ichthyomyzon unicuspis* | herbivore/ detrivore | cool | S3 | SC | SC | | Y | LIO 2019 |
| **American Brook Lamprey** | *Lethenteron appendix* | herbivore | cold | S3 | No Status | No Status | | Y | LIO 2019 |
| **Lake Sturgeon** | *Acipenser fulvescens* | invertivore/ herbivore | cool | S2 | THR | No Status | | Y | LIO 2019 |
| **Longnose Gar** | *Lepisosteus osseus* | carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **American Eel** | *Anguilla rostrata* | invertivore/ carnivore | cool | S1? | END | No Status | | Y | LIO 2019 |
| **Alewife** | *Alosa pseudoharengus* | planktivore | cold | SNA | No Status | No Status | | Y | LIO 2019 |
| **American Shad** | *Alosa sapidissima* | planktivore | cool | S1 | No Status | No Status | | Y | LIO 2019 |
| **Mooneye** | *Hiodon tergisus* | invertivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Brown Trout** | *Salmo trutta* | invertivore/ carnivore | cold/cool | SNA | No Status | No Status | | Y | LIO 2019 |
| **Cisco** | *Coregonus artedii* | planktivore/ invertivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **Rainbow Smelt** | *Osmerus mordax* | invertivore/ carnivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **Northern Pike** | *Esox lucius* | carnivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Muskellunge** | *Esox masquinongy* | carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |

| Species Name | Scientific Name | Trophic Class | Thermal Regime | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Lafontaine Creek and its Tributaries | Ottawa River (Lac Dollard-des-Ormeaux Reach) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Central Mudminnow** | *Umbra limi* | invertivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Spotfin Shiner** | *Cyprinella spiloptera* | invertivore/ herbivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Common Carp** | *Cyprinus carpio* | invertivore/ detritivore | warm | SNA | No Status | No Status | | Y | LIO 2019 |
| **Cutlip Minnow** | *Exoglossum maxillingua* | invertivore | warm | S1S2 | THR | SC | | Y | LIO 2019 |
| **Brassy Minnow** | *Hybognathus hankinsoni* | planktivore/ detritivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Eastern Silvery Minnow** | *Hybognathus regius* | herbivore/ detritivore | warm | S2 | No Status | No Status | | Y | LIO 2019 |
| **Common Shiner** | *Luxilus cornutus* | invertivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Northern Pearl Dace** | *Margariscus nachtriebi* | invertivore/ carnivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Golden Shiner** | *Notemigonus crysoleucas* | invertivore/ herbivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, LIO 2019 |
| **Emerald Shiner** | *Notropis atherinoides* | planktivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Blackchin Shiner** | *Notropis heterodon* | invertivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Spottail Shiner** | *Notropis hudsonius* | invertivore/ planktivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, LIO 2019 |
| **Rosyface Shiner** | *Notropis rubellus* | invertivore/ detritivore/ herbivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |

| Species Name | Scientific Name | Trophic Class | Thermal Regime | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Lafontaine Creek and its Tributaries | Ottawa River (Lac Dollard-des-Ormeaux Reach) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Sand Shiner** | *Notropis stramineus* | invertivore/ detritivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Mimic Shiner** | *Notropis volucellus* | invertivore/ herbivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Northern Redbelly Dace** | *Chrosomus eos* | invertivore/ planktivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Finescale Dace** | *Chrosomus neogaeus* | invertivore/ planktivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Bluntnose Minnow** | *Pimephales notatus* | detritivore | warm | S5 | No Status | No Status | Y | Y | Bowfin 2008, LIO 2019 |
| **Fathead Minnow** | *Pimephales promelas* | detritivore/ invertivore | warm | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Western Blacknose Dace** | *Rhinichthys obtusus* | invertivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Longnose Dace** | *Rhinichthys cataractae* | invertivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Creek Chub** | *Semotilus atromaculatus* | invertivore/ carnivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Fallfish** | *Semotilus corporalis* | invertivore/ carnivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Longnose Sucker** | *Catostomus catostomus* | invertivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **White Sucker** | *Catostomus commersonii* | invertivore/ detritivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |

| Species Name | Scientific Name | Trophic Class | Thermal Regime | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Lafontaine Creek and its Tributaries | Ottawa River (Lac Dollard-des-Ormeaux Reach) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Quillback** | *Carpiodes cyprinus* | invertivore/ detritivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Silver Redhorse** | *Moxostoma anisurum* | invertivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **River Redhorse** | *Moxostoma carinatum* | invertivore | cool | S2 | SC | SC | | Y | LIO 2019 |
| **Shorthead Redhorse** | *Moxostoma macrolepidotum* | invertivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Greater Redhorse** | *Moxostoma valenciennesi* | invertivore | warm | S3 | No Status | No Status | | Y | LIO 2019 |
| **Yellow Bullhead** | *Ameiurus natalis* | invertivore/ carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Brown Bullhead** | *Ameiurus nebulosus* | invertivore/ herbivore/ carnivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Channel Catfish** | *Ictalurus punctatus* | invertivore/ carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Stonecat** | *Noturus flavus* | invertivore/ carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Tadpole Madtom** | *Noturus gyrinus* | invertivore/ planktivore | warm | S4 | No Status | No Status | Y | Y | Bowfin 2008, LIO 2019 |
| **Margined Madtom** | *Noturus insignis* | invertivore | warm | SU | No Status | No Status | | Y | LIO 2019 |
| **Trout-Perch** | *Percopsis omiscomaycus* | invertivore/ carnivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **Burbot** | *Lota lota* | invertivore/ carnivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **Banded Killifish** | *Fundulus diaphanus* | invertivore/ planktivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Brook Silverside** | *Labidesthes sicculus* | planktivore/ invertivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |

| Species Name | Scientific Name | Trophic Class | Thermal Regime | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Lafontaine Creek and its Tributaries | Ottawa River (Lac Dollard-des-Ormeaux Reach) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Brook Stickleback** | *Culaea inconstans* | planktivore/ invertivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Ninespine Stickleback** | *Pungitius pungitus* | planktivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Mottled Sculpin** | *Cottus bairdii* | invertivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Slimy Sculpin** | *Cottus cognatus* | invertivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **Rock Bass** | *Ambloplites rupestris* | invertivore/carnivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Pumpkinseed** | *Lepomis gibbosus* | invertivore/ carnivore | warm | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Bluegill** | *Lepomis macrochirus* | invertivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Northern Sunfish** | *Lepomis peltastes* | invertivore | warm | S3 | SC | SC | | Y | LIO 2019 |
| **Smallmouth Bass** | *Micropterus dolomieu* | invertivore/ carnivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Largemouth Bass** | *Micropterus salmoides* | invertivore/ carnivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **White Crappie** | *Pomoxis annularis* | invertivore/ carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Black Crappie** | *Pomoxis nigromaculatus* | invertivore/ carnivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Iowa Darter** | *Etheostoma exile* | invertivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Fantail Darter** | *Etheostoma flabellare* | invertivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Johnny Darter** | *Etheostoma nigrum* | invertivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Tessellated Darter** | *Etheostoma olmstedi* | invertivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |

| Species Name | Scientific Name | Trophic Class | Thermal Regime | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Lafontaine Creek and its Tributaries | Ottawa River (Lac Dollard-des-Ormeaux Reach) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Yellow Perch** | *Perca flavescens* | invertivore/ carnivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, LIO 2019 |
| **Logperch** | *Percina caprodes* | invertivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Sauger** | *Sander canadensis* | invertivore/ carnivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Walleye** | *Sander vitreus* | invertivore/ carnivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Freshwater Drum** | *Aplodinotus grunniens* | invertivore/ carnivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Shows Presence/Absence** | Y | | | | | | | | |

(Bowfin 2008, Bowfin 2019, Coker et al. 2001, MTO 2006, Page et al. 2013, LIO 2019, OMNRF 2013)
Updated: December, 2022

**SRANK DEFINITIONS**

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

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

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

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

S5 Secure, Common, widespread, and abundant in the nation or state/province.

SNR Unranked, Nation or state/province conservation status not yet assessed.

SU Unrankable, Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

SNA Not Applicable, A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

S#S# Range Rank, A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

? Inexact Numeric Rank—Denotes inexact numeric rank

SARO STATUS DEFINITIONS

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

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

# 4. Site Investigations Results

## 4.1 Survey Dates and Conditions

Bowfin Environmental Consulting completed several fisheries related visits to the site in 2008 and 2019. These visits included fish sampling and fish habitat surveys for Lafontaine Creek. CIMA+ did not complete any fish sampling surveys in 2022.

**Table 2: Summary of Dates, Times, Conditions and Purpose of Site Investigations**

| Date | Time (h) | Staff | Air Temperature (Min-Max) °C* | Cloud Cover (%) Beaufort Wind Scale [Descriptor (scale)] | Total Rainfall (mm) 7 days prior to visit* | Water Level Conditions** | Purpose |
|---|---|---|---|---|---|---|---|
| **April 10, 2008** | n/a | M. Lavictoire S. St. Pierre | 5.0 (2.0-6.9) | 25% cloud cover Wind : gentle breeze (3) to moderate breeze (4) | 7.8 | n/a | -Pike spawning visual survey |
| **April 24, 2008** | n/a | M. Lavictoire S. St. Pierre | 15.0 (5.7-20.1) | 25% cloud cover Wind : light breeze (2) | 1.8 | n/a | -Fish Community Sampling |
| **April 25, 2008** | n/a | M. Lavictoire S. St. Pierre | 18.0 (6.5-21.7) | 75% cloud cover Wind : light breeze (2) | 1.8 | n/a | -Fish Community Sampling |
| **April 29, 2008** | n/a | M. Lavictoire S. St. Pierre | 7.0 (-0.2-8.9) | 50% cloud cover Wind : gentle breeze (3) | 27.0 | n/a | -Fish Community Sampling |
| **April 30, 2008** | n/a | M. Lavictoire S. St. Pierre | 8.0 (-1.1-8.2) | 50% cloud cover Wind : light breeze (2) | 27.0 | n/a | -Fish Community Sampling |
| **May 8, 2008** | n/a | M. Lavictoire S. St. Pierre | 11.0 (7.9-15.5) | 75% cloud cover Wind : gentle breeze (3) | 10.0 (and 0.4 the day of) | n/a | -Pike spawning visual survey |
| **July 22, 2008** | n/a | M. Lavictoire S. St. Pierre | 20.0 (15.7-23.8) | 75% cloud cover Wind : light breeze (2) | 26.4 | n/a | -Fish Community Sampling |

| Date | Time (h) | Staff | Air Temperature (Min-Max) °C* | Cloud Cover (%) Beaufort Wind Scale [Descriptor (scale)] | Total Rainfall (mm) 7 days prior to visit* | Water Level Conditions** | Purpose |
|---|---|---|---|---|---|---|---|
| | | | | | | | -Fish Habitat Assessment |
| **April 17, 2019** | 1230-1445 | C. Fontaine<br>M. Brochu | 12.0-14.0<br>(-2.1-14.5) | 0% cloud cover<br>Wind: light air (1) to light breeze (2) | 32.8 | Flood Outlook Statement | -Fish Community Sampling |
| **April 18, 2019** | 0930-1030 | M. Lavictoire<br>C. Fontaine<br>M. Brochu<br>E. Theberge | 5.0-6.0<br>(3.6-18.0) | 90% cloud cover changing to 80% cloud cover<br>Wind: light (2) to gentle breeze (3) | 32.8 | Flood Outlook Statement | -Fish Community Sampling |
| **May 12, 2019** | 0930-01300 | M. Lavictoire<br>A. Yates | 9.0<br>(5.6-16.7) | 100% cloud cover,<br>Wind: light air (1) | 28.8 | Flood Warning | -Fish Community Sampling |
| **July 22, 2019** | 0715-1315<br>0715-0915 | M. Lavictoire<br>M. Brochu<br>E. Theberge<br>A. Yates | 16.0-22.0<br>(13.5-23.7) | 100% cloud cover<br>Wind: light air (1) | 1.8 | Water Safety Statement | -Fish Community Sampling |
| **July 23, 2019** | 0815-0930 | C. Fontaine<br>M. Brochu | 16.0-20.0<br>(11.2-26.6) | 0% cloud cover<br>Wind: calm (0) | 1.8 | Water Safety Statement | -Fish Community Sampling<br>-Fish Habitat Assessment |
| **April 6, 2022** | 0800-0915 | M. Lavictoire | 8.0<br>(2.8-15.2) | 25% cloud cover<br>Wind: gentle breeze (3) | 3.3 | Water Safety Statement | -Fish Habitat |
| **May 9, 2022** | 1100-1300 | M. Lavictoire | 20.0<br>(3.0-22.9) | 0% cloud cover<br>Wind: calm (0) to light breeze (2) | 8.9 | Water Safety Statement | -Watercourse Delineation<br>-Fish Habitat |
| **May 10, 2022** | 1100-1245 | A. Quinsey | 20.0<br>(5.9-25.4) | 0% cloud cover<br>Wind: light breeze (2) | 8.1 | Water Safety Statement | -Watercourse Delineation |

M. Lavictoire – Michelle (Nunas) Lavictoire – B. Sc. Wildlife Resources and M.Sc. Natural Resources

C. Fontaine - Cody Fontaine - Fisheries and Wildlife Technologist
M. Brochu – Melissa Brochu – M. Sc. Environmental and Life Sciences and Fisheries and Wildlife Technician
E. Theberge – Elysabeth Theberge —B.Sc., M.Sc. Biology
A. Yates – Abby Yates – B.Sc. Env. Ecology
A. Quinsey – Al Quinsey – B.Sc. Environnemental Biology
S. St-Pierre – Shaun St. Pierre – B. Sc Biology / Fisheries and Wildlife Technologist

*Min-Max Temp Taken From: Environment Canada. National Climate Data and Information Archive. Ottawa International Airport. Available http://climate.weatheroffice.gc.ca/ [December 12, 2022]
**Water Level Conditions taken from South Nation Conservation (SNC) https://www.nation.on.ca/

**Water Level Definitions**
Water Safety Statement: High flows, unsafe banks, melting ice or other factors that could be dangerous for recreational users such as anglers, canoeists, hikers, children, pets, etc. are present. Flooding is not expected.
Flood Outlook Statement: Early notice of the potential for flooding based on weather forecasts calling for heavy rain, snow melt, high wind or other conditions that could lead to high runoff, cause ice jams, lakeshore flooding or erosion
Flood Watch: Flooding is possible in specific watercourses or municipalities. Municipalities, emergency services and individual landowners in flood-prone areas should prepare.

## 4.2 Fish Habitat and Communities

As noted, information collected by Bowfin from 2008 to 2019 and from CIMA+ in 2022 has been used for this section. The data from 2008 was used to describe the downstream section of Lafontaine Creek (Station 1) and consisted of habitat description and fish community sampling through the use of traps. The two stations centred around St. Jean Street (Stations 2 and 3) were surveyed in 2019 using hoop nets and backpack electrofishing.

## Figure 5 : Fish Station for Lafontaine Creek


Rockland, ON
Atrel Engineering Ltd.

Ref # : A001262-101-370

Figure by : A. Quinsey
Verified by : M. Lavictoire

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### 4.2.1 Lafontaine Creek

Lafontaine Creek, a tributary to the Ottawa River (Lac Dollars-des-Ormeaux reach), is approximately 5.3 km in length. The lands uses surrounding Lafontaine Creek (in and outside of this Site's study area) vary from agricultural fields, meadows, forests to wetlands. The residential subdivision is situated roughly 630 m and the works associated with St. Jean Street roughly 1020m upstream from the confluence with the Ottawa River.  The portion of the channel within this area of focus, downstream of St. Jean Street, travels within the Lafontaine River Marsh.

The channel upstream of St. Jean Street is defined within a narrow valley. There, the floodplain floods periodically, but not for long periods (see Photo 1). From here, the water travels through a 1500mm diameter CSP culvert into the Lafontaine River Marsh. Monitoring of this channel over the years has found that there is little fish habitat within the wetland itself as the flow is typically confined to the channel (Photo 2). The extent of the wetland habitat that becomes flooded, is ephemeral in nature and is depicted in Photo 3. This is the portion that would be impacted by the wetland infill and the increased culvert length. The downstream edge of these works is shown by the stake in Photo 4. In addition to the main channel through the wetland, there is ponding at the base of the steep south valley wall. The portions of this ponding that are accessible to fish for at least a period of the year are depicted as fish habitat on the figures herein (Photo 5 and Photo 6). Additional flow, originating from a stormwater management facility north of St. Jean Street, reaches the main channel about 215m downstream of the culvert (Figure 5). The channel then splits into two at another 160m downstream of this influx of flow. For the next 500m, the fish habitat is no longer confined to the two channels but includes smaller secondary channels in the marsh (Photo 8 and Photo 9). Outside of this smaller channels, the marsh habitat itself remains dry despite the presence of a beaver dam observed in the same location since surveys began in 2008 (Photo 10). The final length of Lafontaine Creek investigated and depicted on the figures herein, consists of a confined single channel (Photo 11).


Photo 1 : Looking upstream from St. Jean Street (May 9, 2022)


Photo 2 : Looking downstream from St. Jean Street (May 9, 2022)


**Photo 3 : Showing the extent of the overtopping of the banks on the downstream side St Jean Street (April 17, 2019)**


**Photo 4: Looking at the downstream edge of area of impact (noted with the stake) (May 9, 2022)**

**Photo 5: Further downstream, outside of the area of impact where channel approaches the valley banks (May 9, 2022)**

**Photo 6: Further downstream, outside of the area of impact where channel approaches the valley banks (May 9, 2022)**


**Photo 7: Looking at the cattail marsh portion of the wetland, near the input from the stormwater management facility, little water (May 10, 2022)**


**Photo 8: Further downstream looking out towards the wetland, just upstream of the beaver dam in the next photograph, wetland is not inundated (May 9, 2022)**


**Photo 9: Portion of wetland flooded by beaver dam in next photo (May 9, 2022)**


**Photo 10: Downstream beaver dam (noted during visits since 2008) (April 6, 2022)**


**Photo 11 : Looking downstream from near the downstream end of Lafontaine River Marsh (towards Lemay Circle) (April 8, 2022)**

#### 4.2.1.1 Station 1

Station 1 was situated near the downstream of the site and was 280 m in length. On July 29, 2008, the wetted width was 4.8 m with an average water depth of 69 cm (range: 13-111 cm). The habitat was a glide.

The substrate consisted exclusively of fines. In-water cover consisted of aquatic vegetation (yellow water lily, lesser duckweed, frog bite, Canada waterweed, slender pondweed, floating burreed, coontail, flowering rush and algae), overhanging vegetation (purple loosestrife, reed canary grass, tufted vetch, common burdock, sedges and goldenrod), and large woody debris. This station was poorly shaded.

The tops of the banks were fully vegetated with mostly herbaceous and some woody species. The most common species were purple loosestrife, reed canary grass, tufted vetch, common burdock, sedges, goldenrod, and staghorn sumac. No canopy cover was present.

The fish community was sampled in the spring with minnow and Windemere traps set overnight on April 24, 2008 and April 29, 2008, respectively. No fish were captured using the minnow traps. A total of 41 fish representing 10 species were captured with the Windermere traps (Table 3). In the summer, only Windemere traps were set on July 22, 2008, as they provided the highest efficiency during spring sampling. A total of 295 fish representing 8 species were captured.

**Table 3: Station 1 - Spring and Summer Catch (2008)**

| Species Name | Scientific Name | Station 1 No. of fish (size range, mm) | |
|---|---|---|---|
| | | April 29, 2008 (Windemere Traps) | July 22, 2008 (Windemere Traps) |
| Northern Pike | *Esox lucius* | | 4 (104-172) |
| Central Mudminnow | *Umbra limi* | 8 (59-174) | 0 |
| Brassy Minnow | *Hybognathus hankinsoni* | 1 (69) | 0 |
| Common Shiner | *Luxilus cornutus* | 2 (75-92) | 115 (75-141) |
| Golden Shiner | *Notermigonus crysoleucas* | 0 | 1 (78) |
| Spottail Shiner | *Notropis hudsonius* | 6 (61-74) | 0 |
| Northern Redbelly Dace/Finescale Dace | *Phoxinus eos/ P. neogaeus* | 2 (57-60) | 0 |
| Bluntnose Minnow | *Pimephales notatus* | 0 | 1 (55) |
| Fathead Minnow | *Pimephales promelas* | 3 (49-60) | 0 |
| Creek Chub | *Semotilus atromaculatus* | 1 (125) | 87 (53-195) |
| White Sucker | *Catostomus commersonii* | 2 (118-136) | 54 (110-229) |
| Tadpole Madtom | *Noturus gyrinus* | 5 (64-73) | 0 |
| Brook Stickleback | *Culaea inconstans* | 11 (36-53) | 0 |
| Pumpkinseed | *Lepomis gibbosus* | 0 | 22 (55-117) |
| Yellow Perch | *Perca flavescents* | 0 | 11 (54-153) |
| **Effort** | | **5 Traps** | **5 Traps** |
| **Total No. Species** | | **10** | **8** |
| **No. Individuals** | | **41** | **295** |

**Photo 12 : Looking upstream from downstream at Station 1 (July 29, 2008)**

**Photo 13 : Looking downstream from upstream at Station 1 (July 29, 2008)**

#### 4.2.1.2 Station 2

Station 2 was situated just downstream of St Jean Street on its north side, and was 60 m in length. The average channel width was 2.3 m and the average bankfull height was 37 cm. On April 17, 2019, the wetted width was 3.3 m with an average water depth of 43 cm (range: 25-77 cm). The May 12 wetted width and water depth were 1.5 m and 34 cm (range: 22-64 cm), respectively. By July 22, the wetted width was 1.8 m with an average water depth of 20 cm (range: 0-53 cm). The habitat consisted of a mix of pools and glides.

The substrate consisted mostly of fines with some gravel. In-water cover consisted of overhanging vegetation (reed canary grass), undercut banks, and pools. Deeper pools were located near the St Jean culvert, but more shallow pools were located throughout (55-60 cm in the spring). Portions of this station were shaded by the tall overhanding herbaceous vegetation in the summer.

The tops of the banks were fully vegetated with herbaceous vegetation species. The most common species were reed canary grass, field bindweed, jewelweed, bittersweet nightshade and hog peanut. No canopy cover was present.

The fish community was sampled three times: once during the early spring to look for upstream migrating northern pike (overnight set of a single hoop net), again later in the spring (backpack electrofishing), and a third time in the summer (one hoop net and backpack electrofishing). The hoop net, set on April 17, 2019 did not capture any adult pike but did catch 5 fish representing 4 species: common shiner, creek chub, brook stickleback and white suckers (Table 4).

The spring electrofishing on May 12, 2019 took place over an area of approximately 90 $m^2$ for 648 seconds. A total of 9 fish representing 3 species were captured: brassy minnow, creek chub, and white sucker (Table 4).

Summer sampling (July 22-23, 2019) captured 8 species between the two sampling methods. The hoop net captured a total of 31 fish representing 6 species: central mudminnow, common shiner, fathead minnow, creek chub and white sucker. The electrofishing which sampled approximately 108 $m^2$ for 386 seconds captured 15 fish representing 4 species: northern pike, common shiner, creek chub, and pumpkinseed (Table 4). The northern pike was a young-of-the-year (YOY).

**Table 4: Station 2 - Spring and Summer Catches (2019)**

| Species Name | Scientific Name | Station 2 No. of fish (size range, mm) | | | |
|---|---|---|---|---|---|
| | | April 17, 2019 (Hoop Net) | May 12, 2019 (Electrofishing) | July 22, 2019 (Hoop Net) | July 22, 2019 (Electrofishing) |
| Northern Pike | *Esox lucius* | 0 | 0 | 0 | 1 (95) |
| Central Mudminnow | *Umbra limi* | 0 | 0 | 3 (94-100) | 0 |
| Brassy Minnow | *Hybognathus hankinsoni* | 0 | 2 (70-75) | 0 | 0 |
| Common Shiner | *Luxilus cornutus* | 1 (145) | 0 | 6 (56-99) | 2 (88-91) |
| Fathead Minnow | *Pimephales promelas* | 0 | 0 | 3 (55-62) | 0 |
| Creek Chub | *Semotilus atromaculatus* | 1 (65) | 6 (55-176) | 1 (129) | 9 (66-115) |
| White Sucker | *Catostomus commersonii* | 2 (108-194) | 1 (100) | 3 (97-100) | 0 |
| Brook Stickleback | *Culaea inconstans* | 1 (50) | 0 | 0 | 0 |
| Pumpkinseed | *Lepomis gibbosus* | 0 | 0 | 15 (50-87) | 3 (50-60) |
| **Effort** | | **1 Hoop Net** | **7s/m$^2$** | **1 Hoop Net** | **4s/m$^2$** |
| **Total No. Species** | | **4** | **9** | **6** | **4** |
| **No. Individuals** | | **5** | **3** | **31** | **15** |


**Photo 14 : Looking downstream at Station 2 (April 16, 2019)**


**Photo 15 : Station 2 looking upstream from the downstream end (May 25, 2022)**

#### 4.2.1.3 Station 3

Station 3 was situated just upstream of the culvert on the west side of St Jean Street, and was 67 m in length. The average channel width was 2.9 m and the average bankfull height was 34 cm. On April 17, 2019, the wetted width was 2.0 m with an average water depth of 54 cm (range:42-78 cm). The May 12 wetted width and water depth were 2.6 m and 17 cm (range: 8-45 cm), respectively. By July 22, the wetted width was 2.0 m with an average water depth of 15 cm (range: 0-49 cm). The habitat consisted of a mix of pools, glides, and glides runs.

The substrate consisted mostly of gravel, with a few areas of bedrock and fines. The in-water cover consisted of overhanging vegetation (reed canary grass, Manitoba maple), with few areas of terrestrial vegetation (tree roots), rock, woody debris and undercut banks. Few areas of deep pools (range: 50 cm deep in summer) were noted in the summer visit. The water colour was opaque during the summer and some erosion was noted along the banks.

The tops of the banks were partially to fully vegetated with herbaceous vegetation and woody species. The most common species were reed canary grass, cattails, field bindweed, staghorn sumac, dogwood species, Japanese knotweed, willow species and Manitoba maple. The canopy cover ranged from none to full canopy cover.

The fish community was sampled three times: once during the early spring in an attempt to capture upstream migrating northern pike (overnight set of a single hoop net), again later in the spring (backpack electrofishing), and a third time in the summer (one hoop net and backpack electrofishing). The hoop net, set on April 17, 2019, did not capture any adult pike but did catch 4 fish representing 3 species: central mudminnow, brassy minnow, and creek chub (Table 5).

The spring electrofishing on May 12, 2019 took place over an area of approximately 174 $m^2$ for 392 seconds. A total of 6 fish representing 2 species were captured: creek chub, and white sucker (Table 5)

Summer sampling (July 22-23, 2019) captured 5 species between the two sampling methods. The hoop net captured a total of 3 fish representing 2 species: pumpkinseed and northern pike. The pike was another YOY. The electrofishing, which sampled approximately 134 $m^2$ for 345 seconds, captured 27 fish representing 5 species: northern pike, common shiner, creek chub, white sucker, and pumpkinseed (Table 5). All pike were YOY.

**Table 5: Station 3 - Spring and Summer Catches (2019)**

| Species Name | Scientific Name | Station 3 No. of fish (size range, mm) April 17, 2019 (Hoop net) | May 12, 2019 (Electrofishing) | July 22, 2019 (Hoop Net) | July 22, 2019 (Electrofishing) |
|---|---|---|---|---|---|
| Northern Pike | *Esox lucius* | 0 | 0 | 2 (96-110) | 2 (105-110) |
| Central Mudminnow | *Umbra limi* | 1 (80) | 0 | 0 | 0 |
| Brassy Minnow | *Hybognathus hankinsoni* | 2 (65-73) | 0 | 0 | 0 |
| Common Shiner | *Luxilus cornutus* | 0 | 0 | 0 | 8 (66-91) |
| Creek Chub | *Semotilus atromaculatus* | 1 (66) | 5 (50-68) | 0 | 12 (70-133) |
| White Sucker | *Catostomus commersonii* | 0 | 1 (150) | 0 | 3 (85-127) |
| Pumpkinseed | *Lepomis gibbosus* | 0 | 0 | 1 (55) | 2 (49-56) |
| **Effort** | | **1 Hoop Net** | **$2/m^2$** | **1 Hoop Net** | **$3s/m^2$** |
| **Total No. Species** | | **3** | **2** | **2** | **5** |
| **Total No. Individuals** | | **4** | **6** | **3** | **27** |


**Photo 16 : Hoop net set in Station 2 (April 17, 2019)**


**Photo 17 : Station 2 looking upstream from the downstream end (April 17, 2019)**


**Photo 18 : Station 2 looking upstream from the downstream end (July 22, 2019)**

# 5. EVALUATION AND ASSESSMENT

Under the updated FA there remain certain types of waterbodies where DFO review is not required. Generally, these are for projects that will occur on a waterbody that is **not** connected to fish habitat and does not contain fish at any time of year. It also includes specific activities for which guidelines have been prepared by DFO; if these can be met, then no review is required. The guidelines consist of Standard, Code of Practice or Mitigation Measures for the Protection of Fish and Fish Habitat[2]. The site investigations determined that the channel provided direct fish habitat while most of the wetland provided indirect habitat, or was only wet ephemerally (i.e., did not provide spawning habitat). The proposed works, activities and undertakings (WUAs) associated with this submission do not fall under Standards, CoPs or activities for which the Mitigation Measures for the Protection of Fish and Fish Habitat apply. There are, however, two CoPs that cover portions of the WUAs:

1. End-of-pipe fish protection screens for small water intakes in freshwater
2. Temporary cofferdams and diversion channels

Both the infilling of the wetland and changes to the watercourse for the culvert replacement need to be reviewed by DFO.

## 5.1 Project Summary and Construction Sequencing

### 5.1.1 Changes to Existing Fish Habitat

The only portion of the services that are below the high water mark or in the wetland are those situated along the north-south stretch of St. Jean Street. As noted in the introduction, this street is being altered and will be going through the MCEA process. The location and distance into the wetland that these services are being placed reflect the predicted infilling required for the new road allowance. This includes the infilling of 5045m$^2$ of wetland habitat and 290m$^2$ of channel habitat. The majority (5045m$^2$ of the wetland and 242m$^2$ of the channel habitat) will be disturbed on the downstream (west) side of St. Jean Street with the remaining direct fish habitat (26m$^2$) on the upstream side (east). The final area for the channel is within the existing culvert (22.5m$^2$). The channel provides direct fish habitat. Other than a few small portions that flood very briefly (see Section 4.2.1 – Photo 3), the wetland is indirect fish habitat.

The existing 1500mm CSP culvert would be replaced with twin 79.5 m long 2400 wide box culverts (1800mm tall), countersunk by 0.30m and backfilled with native material. The existing culvert's 1:2 year peak velocity is 2.76m/s while the new culvert's will be 0.82m/s (JFSA, 2022). A review of the DFO SPOT (an online fish passage tool) using northern pike with a maturity length of 385 mm found that 50% of the fish could navigate through the new longer culverts at velocities of 0.41 m/s and that it is unlikely that any fish could navigate at the predicted velocities of 0.82 m/s. SPOT calculates the distance that 50% of the fish can travel at velocities of 0.82 m/s to be 19 m.

[2] Activities covered by the Measures to protect fish and fish habitat are: bridge maintenance, on-land mineral exploration activities, and decking repairs for docks, pirs, wharves and bridges.

The potential of these velocities to delay northern pike spawning further upstream was reviewed by analysing the duration of the flows that create the higher than the targeted 0.4m/s. This was completed by JFSA (JFSA, 2022), who predicted that the duration of the velocity above the target of 0.4m/s is 14% (duration of 1:2 year event is anticipated to be 41.10 hours), and the target would be met for 35.18 hours. This means that fish passage could be delayed for 5.92 hours per event. It is also noted that under the current conditions, the 1500mm diameter pipe is 15m long and has a predicted velocity of 2.76m/s during the same event. Despite the much shorter culvert, SPOT would predict that northern pike would not be able to pass through the existing culvert during peak flows. Given that YOY northern pike have been captured by Bowfin at several locations upstream (Figure 4), this delay has not prevented spawning. As a result, the new culverts would provide improved conditions with a shorter delay. The ability to pass fish through the culvert during low-flow is being reviewed.

The proposed works will include the following activities:

+ Clearing of terrestrial vegetation within 30 m of features;
+ Excavation in terrestrial habitat
+ Dredging within the wetland and watercourse;
+ Installation of two longer and wider culverts;
+ Installation of rip rap on the upstream and downstream sides of the culverts for erosion protection;
+ Grading and backfilling;
+ Stabilization of banks

### 5.1.2 Construction Sequencing

1. Plan work for July 1 to March 14, inclusive.
2. Check weather forecast and plan work for a period of dry weather;
3. Installation of erosion and sediment control measures.
4. Removal of wetland material to the till and infill with blasted rock. The excavation will be infilled as it progresses to minimize the size of area with bare soil. If wetland is inundated, then fish salvage to be completed by a qualified professional (i.e., aquatic biologist or fish technician).
5. Isolate the in-water work area for the culvert.
6. Bypass pumping of flow to ensure that water levels on upstream and downstream remain unaffected by work area. The bypass will consist of a 900mm diameter pipe connected upstream and downstream of the cofferdams (Figure 3). This bypass will be for the passage of flow (not fish) and will discharge into a newly constructed drain in the wetland. The drain will be left open at the end of the work, creating seasonal fish habitat.
7. Dewater and complete a fish salvage of the isolated work area (fish biologist or fish technician). Water removed to be treated as needed to ensure water quality in the fish habitat or in the wetland to remain is not impacted.
    a. Follow DFO Code of Practice for End-of-pipe and for temporary cofferdam and diversion channels

8. Install culvert, create pool and install in-water erosion control in the dry.
9. Backfill culvert and re-water slowly
10. Decommission the bypass pipe.
11. Remove erosion and sediment control measures once the disturbed areas have <20% bare soil.

## 5.2 Evaluation of Potential to Impact Fish and Fish Habitat

The significance of the potential impacts is measured using four criteria:

1. Area affected may be:
    a. local in extent signifying that the impacts will be localized within the project area;
    b. regional signifying that the impacts may extend beyond the immediate project area.

2. Nature of Impact:
    a. negative or positive;
    b. direct or indirect.

3. Duration of the impact may be rated as:
    a. short term (1 year);
    b. medium term (up to 4 years);
    c. long term (>4 years);
    d. permanent.

4. Magnitude of the impact may be:
    a. negligible signifying that the impact is not noticeable;
    b. minor signifying that the project's impacts are perceivable and require mitigation;
    c. moderate signifying that the project's impacts are perceivable and require mitigation as well as monitoring and/or compensation;
    d. major signifying that the project's impacts would destroy the environmental component within the project area.

The *Fisheries Act* indicated that the following factors are to be considered during the review:

1. Contribution to the productivity of relevant fisheries by the fish or fish habitat that is likely to be affected;
2. Fisheries management objectives;
3. Whether there are measures and standards to avoid, mitigate or offset death or HADD of fish habitat;
4. Cumulative effects of the work, undertaking, or activity (WUA) in combination with other WUA that have been or are being carried on, on fish and fish habitat;
5. Any Fish Habitat Banks, that may be affected;

6. Whether any measures and standards to offset the HADD prioritize restoration of degraded fish habitat.

Note that the Minister will also consider additional considerations including information provided by Indigenous peoples or factors the Minister considers relevant.

Factors 1-4 are discussed in the next sections. No Fish Banks are present and, should, any offsets be required, these would be described in a separate report.

### 5.2.1 Contribution to the productivity of relevant fisheries by the fish or fish habitat that is likely to be affected

The background information, including DFO's NASAR mapping, did not show any occurrences of fish SAR or fish special concern species in Lafontaine Creek.

Sampling found that the channel provided fish habitat to 16 species of common warm to cool water fish species including 1 sport fish (northern pike) and 2 pan fish (pumpkinseed and yellow perch). No invasive species have been captured. Of note was the presence of YOY northern pike both in the immediate work area and upstream. The review of the habitat over the years noted that the wetland habitat being directly impacted is rarely accessible to fish and never for long periods (dry by May minimizing value for spawning habitat).

### 5.2.2 Fisheries Objectives

There are no stated fisheries management objectives for this system. However, of the species captured, northern pike, yellow perch, and pumpkinseed are species that are often targeted by the Ministry of Natural Resources and Forestry (MNRF) for management. Further, there is access from St. Jean Street to the pools at the culvert which would allow bait fish harvesting.

### 5.2.3 Whether there are measures and standards to avoid, mitigate or offset death of fish or HADD of Fish Habitat

To explore how best to mitigate the impacts, further understanding of the potential impacts provided through a summary of the work categories and pathways of effect is provided.

#### 5.2.3.1 Work Categories

+ Aquatic Vegetation Removal;
+ Culverts (twin box culverts at St. Jean Street);
+ Dewatering/pumping;
+ Dredging/Excavation;
+ Riparian vegetation removal;
+ Shoreline protection;
+ Temporary structures;

- Watercourse alignment.

#### 5.2.3.2 Pathways of Effects

The proposed project has the potential to trigger the following Pathways of Effects (PoE):

- (Addition) or Removal of aquatic vegetation:
  - There is little aquatic vegetation within the channel to be impacted, but the floodplain on the upstream side and the wetland in the adjacent lands will be removed. At this location the removal of vegetation will have little impact on the direct habitat of fish (most vegetation is outside of the active fish habitat or only wet ephemerally). The herbaceous vegetation being removed from the wetland does provide shading in the summer, but this is a warm-water system, and the channel will be shaded by the longer culvert. There will remain a large amount of similar habitat contributing nutrients to the systems both upstream and downstream of the site. However, the nature of the work will see a risk of resuspension and entrainment of sediments that will need to be managed through appropriately implemented erosion and sediment control plan.

- Change in timing, duration, and frequency of flow (Temporary cofferdams):
  - It is anticipated that the work in the portion of the wetland that is dry will consist of removal of wetland substrate and infilling with blasted rock as they proceed. To minimize the amount of bare soil.
  - The removal of the wetland and terrestrial vegetation is also to occur during the normal in-water period, when these areas are dry thereby minimizing the area to be isolated and dewatered to that required for the installation of the culvert.
  - Any water pumped from the site (i.e., dewatering) will be discharged in a manner that prevents erosion or suspension of sediments;
  - A fish salvage will take place within the isolated areas;
  - Bypass flow will be provided to downstream habitat, sufficient to ensure that habitat upstream and downstream is not impacted during the course of the construction (i.e., mimic the normal flow for that time of year and ensure that outlet does not cause erosion or suspension of the sediments). The bypass may result in the construction of new fish habitat in the wetland (portion of wetland that is not fish habitat). This will be to facilitate the direction of water to the channel. If completed, the resulting drain could be left to become seasonal fish habitat once work is completed.

- Dredging:
  - Required as part of the wetland removal and preparation for culvert installation (upstream side of culvert had some aquatic vegetation below the high water mark);
  - Work will take place in isolation to minimize suspension of sediments;
  - Potential impacts due to erosion and sediment concerns will be mitigated.

+ Excavation :
  - The excavation works are associated with the removal of terrestrial habitat;
  - Potential impacts due to the exposure of soils along the banks and near the watercourse and the removal of top soil will be mitigated through installation of erosion and sediment control measures and the isolation of fish habitat.

+ Fish passage (Temporary: prevented by cofferdams; Permanent: culvert passage):
  - Minimize the period of time that the channel needs to be isolated (i.e., the bulk of the wetland removal to occur separately);
  - Work will take place during normal in-water period;
  - Any water pumped from the site will be discharged in a manner that prevents erosion or suspension of sediments;
  - A fish salvage will take place within the isolated area.
  - Fish passage during high flows will be temporarily delayed (by hours) but will be improvement from current conditions.
  - Fish passage during low flows is being designed.

+ Grading:
  - Grading of the Site will be completed in such a way as to ensure that a similar volume of water reaches the wetland (pre- to match post- flows in terms of quantity and quality);
  - Potential impacts due to the exposure of soils and bank stability will be mitigated through isolated work areas, erosion and sediment control measures and stabilizing banks once completed.

+ Placement of material or structures in water (Temporary – cofferdams to isolate work area. Permanent – rip rap) :
  - Cofferdams would be installed during in-water timing window and would block off the entire channel temporarily to allow for fish salvages and removal of water from habitat prior to installation of new culvert;
  - Flow bypass will be required to maintain normal (for the time of year) levels upstream and downstream of the work area;
  - Any bypass flow will be released in such a way as to prevent erosion or the transportation of suspended sediments downstream. DFO's end of pipe standard code of practice will be followed for the intake of any pumps in active fish habitat;
  - Anticipate that cofferdams would consist of sheet piles or large metre bags. In the case of bags, they will be filled with clean stone, washed and free of fines;
  - Any rip rap installed for erosion protection is to be installed in a manner that does not cause erosion or fish passage issues during all flow conditions. The rip rap elevation should match the streambed upstream and downstream of its placement. It is to be free of fines. Rock placed below the high-water mark will consist of riverstone or angular rock (without voids) designed not to create a fish trap.

+ Use of industrial equipment :
  - Potential impacts with bank stability, erosion and sediment issues will be mitigated (see mitigation measures below);
  - Potential impacts with accidents and malfunctions will be mitigated (see mitigation measures below).

+ Vegetation Clearing
  - There will be no use of herbicides for the removal of vegetation during construction.
  - There is little woody vegetation to be removed
  - Where feasible, woody vegetation in the way of the work will be trimmed to allow people and equipment access.
  - Potential impacts with erosion and sediment issues will be mitigated (see measures below).

+ Wastewater management (dewatering)
  - Any dewatered water from isolated work areas will be treated prior to releasing it back into the features (see mitigation measures).
  - Warm-water system – no anticipated thermal changes.

Based on the above, these works, and activities have the potential to cause impacts to fish or fish habitat through:

+ Increased erosion potential of slopes;
+ Sedimentation and/or suspension of fines within watercourse;
+ Change in food supply;
+ Change in direct in-water habitat due to the longer culvert and rip rap;
+ Changes in timing duration, or frequency of flow because of construction of cofferdams during in-water period is not anticipated to be an issue since it will be completed during the normal in-water period and is anticipated to be completed within 2-3 months;
+ Displacement or stranding of fish during isolation for construction;
+ Contamination of water (i.e., accidents or malfunctions of equipment in or near water, impacts to water quality from turbidity).
+ Anticipated that spring movements will be improved and that a design can be developed for low-flow conditions.

The characteristics of the channel and the proposed work activities are such that this proposal could result in negative direct or indirect impacts to a local area. These would be short term (temporary work area during construction) to permanent (new longer culvert, loss of indirect habitat). Without mitigation, these impacts would be moderate. The magnitude of the negative impacts is anticipated to be moderate for the following reasons:

+ Duration of work is short – most work would be completed immediately prior to commissioning or decommissioning the segment.;
+ Type of work is well understood, and best management practices exist;

- The work can be completed during normal in-water timing window;
- No indication of endangered or threatened aquatic species is noted for this watercourse;
- All in-water works can be constructed in isolation and in the dry, and fish salvaged to minimize fish mortality;
- Habitat being impacted is headwaters, and common to the area. It is more easily recreated and improved upon than natural systems;
- Velocities through the culverts in the 1:2 year will be faster than desired but significantly slower than the current conditions. Design for the low-flow channel is pending.

#### 5.2.3.3 Avoidance

When possible, changes in design can be implemented to avoid impacts to fish. The following changes were made:

- With respect to the residential subdivision, the location of the servicing was restricted to the terrestrial habitat for all but the final portion of the alignment. There, the location is dictated by the future changes to the street.
- Timing of the work in fish habitat (commissioning of new and decommissioning of existing) would take place during the normal in-water timing window (July 1 to March 14, inclusive).
- Design considerations are on-going for the culvert to improve fish passage during all conditions.

#### 5.2.3.4 Mitigation Measures

**Planning**

- Follow the DFO guidelines in their Code of Practice for temporary cofferdams and end-of-pipe (https://www.dfo-mpo.gc.ca/pnw-ppe/practice-practique-eng.html);
- Minimize clearing of vegetation within 30 m from the normal high-water mark. Unless required avoid stripping lands and simply drive over vegetation during construction;
- Minimize size of the isolated area and the amount of in-water work;
- Site instruction will be provided to contractor to highlight that the channel provides permanent fish habitat;
- Clearly demarcate work areas within the riparian habitat in the field;
- All in-water works to occur during the in-water work window (July 1 to March 14, inclusive);
- Erosion and sediment control measures will be installed prior to the clearing of vegetation within 30 m of a watercourse;
- Plan the majority of the wetland removal and infilling to occur in isolation of the work in-water and for the backfilling to proceed at the same time as the removal of the wetland soils. This is to minimize the potential for erosion and sediment issues and to reduce the duration of the isolation of the channel;

- The work in the fish habitats is to be completed once the site is fully isolated and the fish out has been completed. Removal of the cofferdam when water inside isolated area is stable and the banks are stabilized;
- Suspend activities that cause muddy environments during periods of heavy rains;
- Minimize clearing of woody vegetation (few woody individuals are present). Where possible, cut trees leaving behind a 60 cm stump or more and cut shrubs down (instead of grubbing).
- Design the culverts to provide passage during the spring and baseflow conditions to mimic or improve upon existing conditions.

**Erosion and Sediment Control**

- An erosion and sediment control plan will be developed by contractor and implemented prior to any work within 30 m of the watercourse:
  - Provide regular maintenance to the erosion and sediment control measures during construction. Contractor shall be responsible for ensuring that the erosion and sediment control measures are maintained and will monitor the water clarity downstream of the work site throughout the day and during rain events. Water quality is to meet the *Canadian Water Quality Guidelines for the Protection of Aquatic Life*. Monitoring for visible plumes outside of the work area is to be undertaken;
  - At a minimum, the erosion and sediment control plan will include the installation of sediment fencing along the top of banks where vegetation clearing and/or soil disturbance will occur within 30 m of any channel prior to the removal of vegetation. And the installation of a turbidity curtain downstream;
  - Additional materials (i.e., rip rap, filter cloth and silt fencing) will be readily available in case they are needed promptly for erosion and/or sediment control.
- Construction and removal of cofferdam dams can create a plume. As such, appropriate measures should be put in place such as placing rock for the cofferdam within a turbidity curtain that isolates just the area where the cofferdam is being built. Where possible, consider using steel plate for the cofferdam;
- Note that if meter bags are used, they can often split when being removed as such it is preferred that gravel (washed and free of fines) be used for the metre bags;
- Any stockpiles of soil or fill material will be stored as far as possible from the channel and protected by silt fencing (minimum 30 m);
- The sediment fencing will not be removed until the bank is stabilized (meaning <20% bare soil);
- Where the channel is to remain, any disturbed banks will be returned to pre-construction conditions and contours;
- The work within the channels will be completed in the dry;
- Water from dewatering will be treated prior to returning it to the system (i.e., straw bale settling ponds covered by geotextiles or sediment sock on the end of hose and situated on top of well vegetated slopes);
- Water from bypass will be released in such a way as to prevent erosion or the transportation of suspended sediments downstream;

- Where banks/riparian area (area within 30 m of channel) have been stabilized by seeding and/or planting, monitor the revegetation to ensure that the vegetation becomes fully established;
- Any riprap will consist of clean rock free of fines;
- Where possible, limit clearing of vegetation to trimming and leave the stump and lower 60 cm of the tree trunk in place (for shoreline stabilization).

### Fish and Fish Habitat Protection

- The construction of the cofferdams will be undertaken in the wet. Sheet piles are preferred. If large meter bags, methods to minimize fish within the work area should be considered (i.e., seine nets could be used by the biologist to minimize the number of fish in the immediate area. Seine nets will not provide any mitigation for suspended sediments);
- Fish (and other aquatic fauna) will be salvaged from the isolated channel or any portion of the wetland that is flooded at the time of construction, by a qualified aquatic biologist/technician. The salvage will need to be repeated if the work area becomes flooded;
- Dewatering of water in areas that may contain fish will be completed from hoses placed in fish baskets or covered with clean wash rock or other such method to prevent fish impingement and entrainment. Note that the screens that come on the hoses are not enough to prevent fish from harm. Contractor should refer to DFO's Standard Code of Practice for End-of-Pipe;
- Monitor the end of pump frequently for ensure that all fish protection measures are functioning;
- Minimize the size of temporary in-water work areas;
- Bypass flow is required. The amount of flow bypass must be sufficient to maintain the habitats downstream of the site (i.e., similar to what would be present, at that time of year, if work was not occurring. A new drain from the end of the bypass pipe to the existing channel is being considered. Details pending but will be assessed by a fisheries biologist to ensure that this does not result in fish kills (or erosion concerns);
- When pumping is used, the DFO Standard Code of Practice for End-of-Pipe should be followed to ensure that fish do not become impinged or entrained;
- Any disturbed bank, along the section to remain, will be returned to pre-construction conditions, including revegetation, as necessary, with native vegetation appropriate for site conditions;
- Placement of any erosion control blankets is to avoid the area that will be wet (i.e., will be placed above the high-water level) as the mesh of the blankets can trap fish.
- All material introduced for the temporary measures will be fully removed from the water at the completion of the work;

### Contaminant and Spill Management

- All equipment working in or near the water should be well maintained, clean and free of leaks. Maintenance on construction equipment such as refueling, oil changes or lubrication would only be permitted in designated area located at a minimum of 30 m from the shoreline 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;

+ If concrete pours in-situ are required, then it is noted that concrete particles and pours can affect the pH and temperature of any water that comes into contact with the material. All water outside of work area is to meet the minimum requirements established by CCME for the protection of aquatic life. Monitoring is to be completed by the contractor and records provided to the Owner.
    - The pH outside of the temporary work area is to be keep with the CCME guidelines (between 6.5-9.0 pH units).
+ Emergency spill kits will be located on site. The crew will be fully trained on the use of clean-up materials to minimize impacts of any accidental spills. The area would be monitored for leakage and in the unlikely event of a minor spillage the project manager would halt the activity and corrective measures would be implemented;
+ If a spill occurs:
    - Stop all work;
    - Spills are to be immediately reported to the MECP Spills Action Centre (1800 268-6060). Note that under the *Fisheries Act* deleterious substance includes sediments;
    - Clean-up measures are to be appropriate and are not to result in further harm to fish/fish habitat;
    - Sediment-laden water will be removed and disposed of appropriately.
+ No construction debris will be allowed to enter the watercourse;
+ Following the completion of construction, all construction materials will be removed from site.

### 5.2.4 Cumulative effects of the work, undertaking, or activity (WUA) in combination with other WUA that have been or are being carried on, on fish and fish habitat.

As noted in the introduction, the placement of the servicing for the residential subdivision will not result in additional or cumulative impacts to fish or fish habitat in terms of footprint.

Further, development upstream of this site, for a different developer, will need to consider the overall impacts to fish habitat through the system.

## 5.3 Calculation of Areas to be Impacted

Information on the footprints, temporary and permanent (as applicable), to fish habitat are provided in the bullets bellow. The total footprint is 5535m$^2$, mostly to indirect robust emergent wetland habitat.

Permanent, Wetland:

+ 5045m$^2$ – mostly indirect fish habitat of the wetland removal and infill. Loss of some ephemeral habitat.

Permanent, Channel:

+ 290m$^2$ – realignment of direct permanent fish habitat into the twin culverts. This would represent a loss of channel length of 39.5 m but an overall increase in area or an overall increase in habitat to 399m$^2$ because of the wider channel width within the culverts.
  - Existing
    - Downstream Channel Habitat 241.5m$^2$
    - Culvert Habitat 22.5m$^2$
    - Upstream Channel Habitat 26.1m$^2$
  - Proposed
    - Downstream Channel Habitat 10.4m$^2$
    - Culvert Habitat 381.6m$^2$
    - Upstream Channel Habitat 7.3m$^2$

+ Design details are forthcoming, it is anticipated that two pools will be constructed downstream of the erosion protection (see next bullet). Each pool would be 4.8m wide (span the two culverts) and minimum depth of 0.5m. Within one of the two culverts, a low-flow channel is being designed that would be 1.0m wide.
+ 120m$^2$ – Alteration of existing fine substrate to rock (river stone below the high-water mark) for erosion protection on each side of the culvert (roughly 60m$^2$ upstream and downstream)
+ There is also the potential to create new seasonal channel in the wetland. This would be to accommodate passage of flow during construction but details are pending.

Temporary, Channel:

+ 80m$^2$ – temporary loss of direct fish habitat during construction. Isolation and installation of cofferdams on the upstream and downstream sides of the culvert. Impact to the channel.

## 5.4 Residual Impacts

The impacts to the existing habitat are the result of the road widening and are primarily restricted to the wetland, indirect fish habitat (5045m$^2$). The remainder would result in a shortening of the existing channel from 126m to 86.5m (of which 79.5m is through the culvert). The twin culverts will represent improvements to the velocities during the spring, as compared to the single, narrower existing culvert. This could reduce the existing delay of northern pike migrations. Provided that baseflow conditions are similar or deeper, through the culvert, then fish passage would be improved overall. While there is an overall increase in the amount of habitat (from 290 to 399m$^2$, the majority of the gain is in the twin culverts which are wider and longer. The main change of direct fish habitat would be restricted to the natural channel that is now within the new longer culvert 250m$^2$.

# 6. CONCLUSION

The proposed WUA will result in impacts to indirect and direct fish habitat, below the high-water mark and is to be submitted to DFO for a Request for Review and advice on culverts.

I trust that this report will meet your requirements. Should you have any questions or comments, please contact Michelle Lavictoire.

# 7. References

Bowfin Environmental Consulting (2008). Laviolette – *Proposed Subdivision, Fish Habitat and Community Assessment*. 51pp.

Bowfin Environmental Consulting (2017). Fish Habitat and Community Assessment for the Rockland Subdivision. 17pp

Bowfin Environmental Consulting (2017). Tree Conservation and Planting Plan and Species at Risk Assessment. 40pp + appendix

Bowfin Environmental Consulting (2019). *Morris Village Subdivision, Fisheries Assessment*. 30pp.

Bowfin Environmental Consulting and Muncaster Environmental Consulting (2018). *Rural Residential Development: 2727 Carp Road, Headwaters Report*. 26pp.

Coker, G.A., Portt, C.B., & Minns, C.K. (2001). Morphological and Ecological Characteristics of Canadian Freshwater Fishes. *Canadian Manuscript Report of Fisheries and Aquatic Sciences 2554*. 89pp.

Eakins, R.J. (2018). Ontario Freshwater fishes' life history database. Retrieved September 26, 2018 from: http://www.ontariofishes.ca

iNaturalist. (2019). iNaturalist Research-grade Observations. Occurrence dataset. Accessed online February 6, 2023 from: www.inaturalist.org.

J.F. Sabourin and Associates Inc. (JFSA) (2022). Hydraulic Assessment: Lafontaine Creek Culvert Sizing Summary, Rockland, Ontario. 6pp + figures and attachments

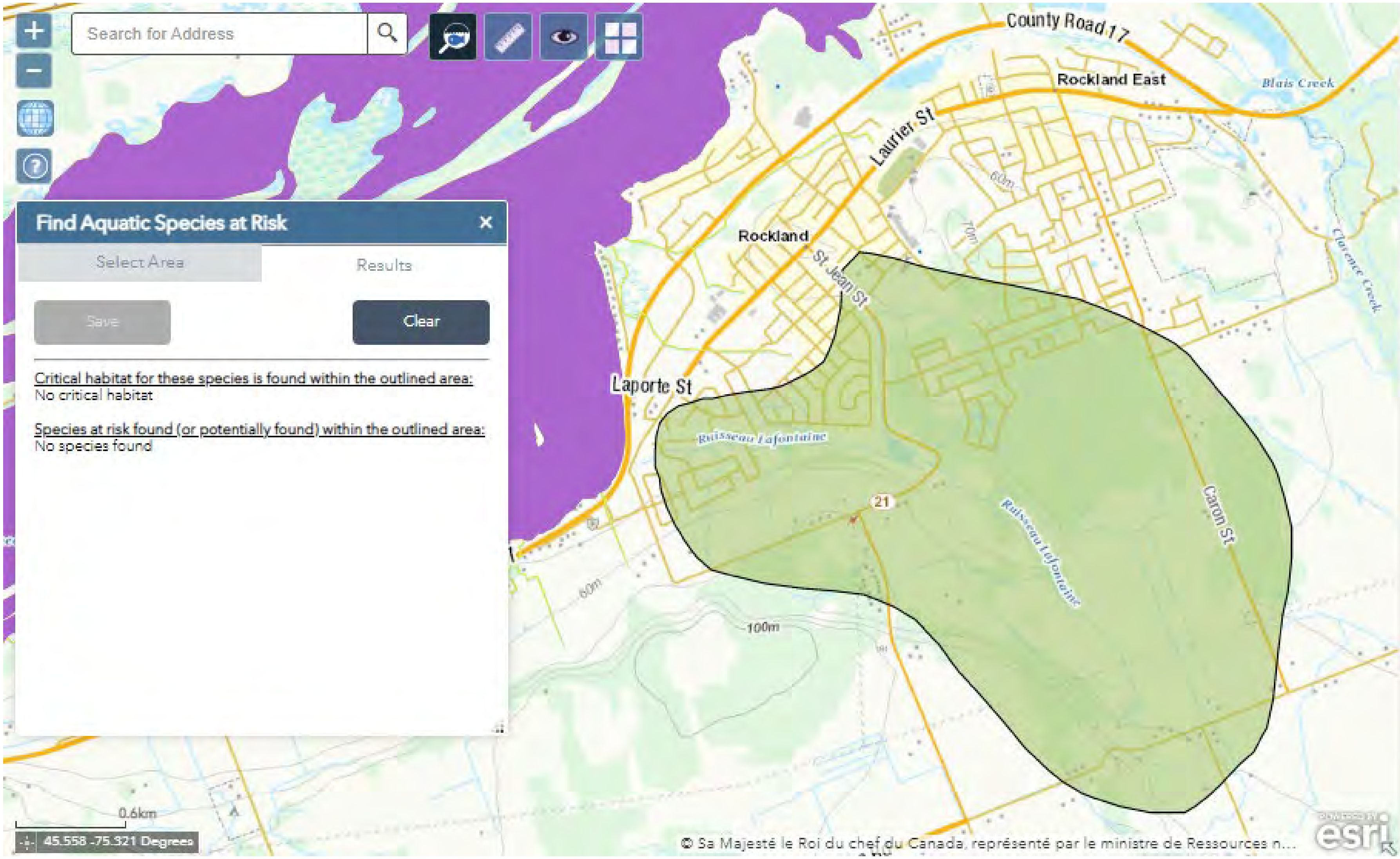
MTO (2006). Environmental Guide for Fish and Fish Habitat, Section 5: Sensitivity of Fish and Fish Habitat. Ministry of Transportation Ontario.

Ontario Ministry of Natural Resources. (2019). Land Information Ontario.

Page, L.M, Espinosa-Pérez, H., Findley, L.T., Gilbert, C.R., Lea, R.N., Mandrak, N.E., Mayden, R.L., & Nelson, J.S. (2013). *Common and Scientific Names of Fishes from the United States, Canada, and Mexico*, 7th edition. American Fisheries Society. Special Publications 34.

# A

## Appendix A
## DFO Species at Risk Mapping for Lafontaine Creek




*NASAR Accessed February 6, 2023*

Fisheries and Oceans Canada
Pêches et Océans Canada

Ontario and Prairie Region
Fish and Fish Habitat Protection Program
650 – 2010 12th Avenue
Regina, SK S4P 0M3

Région de l'Ontario et des Prairies
Programme de protection du poisson et de son habitat
650 – 2010 12e Avenue
Regina, SK S4P 0M3

June 23, 2023

*Your file – Votre référence*
St. Jean Street Widening and Culvert Replacement

*Our file – Notre référence*
23-HCAA-00379

City of Clarence-Rockland
Attention: Jonathan Samson
1560 Laurier Street
Rockland, Ontario K4K 1P7

**Subject: Road Widening and Culvert Replacement, Lafontaine Creek, Rockland – Implementation of Measures to Avoid and Mitigate the Potential for Prohibited Effects to Fish and Fish Habitat**

Dear Jonathan Samson:

The Fish and Fish Habitat Protection Program (the Program) of Fisheries and Oceans Canada (DFO) received your proposal on February 23, 2023. The Program understands that you propose to widen St. Jean Street and replace the existing culvert associated with Lafontaine Creek in Rockland, Ontario. The proposed works, undertakings, and activities are expected to commence in summer/fall 2023, require roughly six months to complete, and include:

- the replacement of the existing 1,500 mm diameter, 15 m long CSP culvert with twin box culverts that measure 2,400 mm x 1,800 mm x 79.5 m;
- the twin box culverts being countersunk by 0.3 m and one of the culverts accommodating a low-flow channel;
- the infilling of the existing channel and associated wetland resulting in the destruction of approximately 268 $m^2$ of fish habitat;
- the installation of riprap armouring at both ends of the new culvert resulting in the alteration of approximately 120 $m^2$ of fish habitat; and
- an isolated work area and diversion channel/bypass pumping to allow for work to proceed under dry conditions while maintaining downstream flows.

The Program understands that there are no aquatic species listed under the *Species at Risk Act* that may occur in the vicinity of where your proposed works, undertakings, and activities are to be located.

Our review considered the following information:

- Request for Review and additional supporting documents dated February 23, 2023;
- Email correspondence between DFO (Carsten Slama) and CIMA+ (Michelle Lavictoire) on April 17 and 20, May 17 and 31, and June 7, 2023; and
- Teleconference call on May 24, 2023 between DFO (Carsten Slama), CIMA+ (Michelle Lavictoire), Atrel Engineering Ltd. (Jean Decoeur), and JFSA (Bryan Willcott).

Your proposal has been reviewed to determine whether it is likely to result in:

- the death of fish by means other than fishing and the harmful alteration, disruption, or destruction of fish habitat which are prohibited under subsections 34.4(1) and 35(1) of the *Fisheries Act*; and
- effects to listed aquatic species at risk, any part of their critical habitat, or the residences of their individuals in a manner which is prohibited under sections 32, 33, and subsection 58(1) of the *Species at Risk Act*.

The aforementioned outcomes are prohibited unless authorized under their respective legislation and regulations.

To avoid and mitigate the potential for prohibited effects to fish and fish habitat (as listed above), we recommend implementing the measures outlined in your plan, including but not limited to those listed below:

- Plan in-water works, undertakings, and activities to respect timing windows to protect fish and fish habitat.
  - The restricted activity timing window for this watercourse is March 15 to June 30.
- Limit the duration of in-water works, undertakings, and activities so as to not diminish the ability of fish to carry out one or more of their life processes (e.g., spawning, rearing, feeding, migrating).
- Use temporary cofferdams to isolate a section of the watercourse in order to conduct works, undertakings, and activities in the dry while maintaining the natural downstream flow.
  - Follow the DFO Interim code of practice: Temporary cofferdams and diversion channels, when using temporary cofferdams.
- Screen intake pipes to prevent entrainment or impingement of fish.
  - Follow the DFO Interim code of practice: End of pipe fish protection screens for small water intakes in freshwater, when using pumps.
- Capture any fish trapped within an isolated work area and safely relocate them to an appropriate location in the same watercourse.
  - Dewater gradually to reduce the potential for stranding fish.
  - Relocate any fish as per applicable permits for capturing and relocating fish.
  - Fish handling, relocation, and monitoring activities shall be undertaken by or under the direct supervision of a biologist qualified to identify aquatic species.
- Limit impacts on riparian vegetation to those approved for the works, undertakings, and activities.

- Operate machinery in a manner that minimizes disturbance to the watercourse bed and banks.
- Avoid disturbing or removing aquatic vegetation, natural wood debris, rocks, sand, or other materials from the banks, shoreline, or the bed of the watercourse outside of the project area.
- Maintain natural stream geomorphology with a smooth tie-in to the existing channel.
- Install effective erosion and sediment control measures prior to beginning works, undertakings, and activities and ensure those measures are functioning properly. Regularly monitor the watercourse for signs of sedimentation during all phases of the works, undertakings, and activities and take corrective action when needed.
- Use only clean materials (e.g., rock, coarse gravel, wood, steel) for works, undertakings, and activities.
- Install rock riprap that is sized appropriately and ensure its placement will not prevent fish passage under low-flow conditions.
- Maintain all machinery onsite in a clean condition and free of fluid leaks.
- Wash, refuel, and service machinery and store fuel in a manner that prevents deleterious substances and equipment fluids from entering a watercourse or water body.
- Develop and immediately implement a spill response plan to prevent deleterious substances from entering a watercourse or water body and ensure containment kits are available.
- Aquatic invasive species are introduced and spread through transporting sands and sediments and using contaminated construction equipment. To prevent the introduction and/or spread of aquatic invasive species during construction in aquatic environments:
  - Clean, drain, and dry any equipment used in the water, and
  - Never move organisms or water from one body of water to another.

Provided that you incorporate the appropriate measures into your plans, the Program is of the opinion that your proposal is not likely to result in the contravention of the above mentioned prohibitions and requirements.

Should your plans change or if you have omitted some information in your proposal, further review by the Program may be required. Consult our website (http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html) or consult with a qualified environmental consultant to determine if further review may be necessary. It remains your responsibility to be in compliance with the *Fisheries Act*, the *Species at Risk Act,* and the *Aquatic Invasive Species Regulations.*

It is also your *Duty to Notify* DFO if you have caused, or are about to cause, the death of fish by means other than fishing and/or the harmful alteration, disruption, or destruction of fish habitat. Such notifications should be directed to FisheriesProtection@dfo-mpo.gc.ca.

**Please notify this office at least 10 days before starting any in-water works**. Send your notification to the assessor (contact information below) and the DFO 10 notification mailbox: DFO.OP.10DayNotification-Notification10Jours.OP.MPO@dfo-mpo.gc.ca. We recommend that a copy of this letter be kept on site while the work is in progress. It remains your responsibility to meet all other federal, territorial, provincial, and municipal requirements that apply to your proposal.

Please note that the advice provided in this letter will remain valid for a period of one year from the date of issuance. If you plan to execute your proposal after the expiry of this letter, we recommend that you contact the Program to ensure that the advice remains up-to-date and accurate. Furthermore, the validity of the advice is also subject to there being no change in the relevant aquatic environment, including any legal protection orders or designations, during the one-year period.

If you have any questions regarding the content of this letter, please contact Carsten Slama by phone (306.201.9349) or email at carsten.slama@dfo-mpo.gc.ca. Please refer to the file number referenced above when corresponding with the Program.

Yours sincerely,

Amanda Conway

Amanda Conway
A/Senior Biologist, Linear Development
Fish and Fish Habitat Protection Program

cc: Michelle Lavictoire (CIMA+)
Carsten Slama (DFO)

# APPENDIX “O”

## Natural Heritage Technical Report,

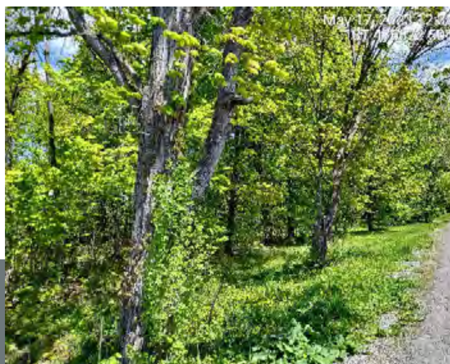
**CIMA+ September, 6, 2023**

# St. Jean Street Widening – Municipal Class EA

## Natural Heritage Technical Report

Atrel Engineering Ltd.

CIMA+ file number: A001263A





CIMA+ file number: A001263A
September 6, 2023 – Review 001

# St. Jean Street Widening – Municipal Class EA

## Natural Heritage Technical Report

Atrel Engineering Ltd.

CIMA+ file number: A001263A

Prepared by:

Al Quinsey, Environmental Professional

Prepared and Verified by:

Michelle Lavictoire Associate Partner,
Senior Project Manager/Senior Biologist

Suite 600, 1400 Blair Road Towers, Ottawa, ON
Canada K1J 9B8

CIMA+ file number: A001263A
September 6, 2023 – Review 0011

## Confidentiality and ownership

## Table of involved resources

In addition to the signatories of this report, the following individuals have also been involved in the study and writing of the report as technical experts within the project team:

| Name | Discipline |
|---|---|
| Michelle Lavictoire | Senior Project Manager |
| Al Quinsey | Environmental Professional |
| Amal Siddiqui | Environmental Professional |
| Sophie Lafrance | Environmental Professional |

| Review and submission register | | | |
|---|---|---|---|
| **Review No.** | **Reviewed by** | **Date** | **Description of the change or submission** |
| 001 | AQ/AS/ML | 2023/08/25 | Updated following completion of field work |
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# List of Acronyms and Definitions

| | |
|---|---|
| ANSI | Area of Natural and Scientific Interest |
| BAG | Butternut Assessment Guidelines |
| BHA | Butternut Health Assessment |
| BHE | Butternut Health Expert |
| CC | Coefficient of Conservation |
| COSEWIC | Committee on the Status of Endangered Wildlife in Canada |
| COSSARO | Committee on the Status of Species at Risk in Ontario |
| DBH | Diameter-at-breast Height |
| DFO | Department of Fisheries and Oceans Canada |
| EAA | Environmental Assessment Act |
| ELC | Ecological Land Classification |
| ESA | *Endangered Species Act, 2007*(Provincial) |
| FA | *Fisheries Act* |
| FWCA | *Fish and Wildlife Conservation Act, 1997* (Provincial) |
| GPS | Global Positioning System |
| NAD 83 | North American Datum 1983 |
| UTM | Universal Transverse Mercator |
| LIO | Land Information Ontario |
| NHA | Natural Heritage Assessment |
| NHIC | Natural Heritage Information Centre |
| MBCA | *Migratory Bird Convention Act, 1994* |
| MCEA | Municipal Class Environmental Assessment |
| MEA | Municipal Engineers Association |
| MECP | Ministry of Environment, Conservation and Parks |
| MNRF | Ministry of Natural Resources and Forestry |
| OMNR/MNRF/MNDMNRF | Ontario Ministry of Natural Resources (old name)<br>Ministry of Natural Resources and Forestry (old name)<br>Ministry of Northern Development, Mines, Natural Resources and Forestry |
| OBBA | Ontario Breeding Bird Atlas |
| NASAR | National Aquatic Species at Risk |
| OP | Official Plan |
| ORAA | Ontario Reptile and Amphibian Atlas |
| OSAP | Ontario Stream Assessment Protocol |
| OWES | Ontario Wetland Evaluation System |
| PSW | Provincially Significant Wetlands |
| ROW | Right of Way |
| SAR | Species at Risk (in this report they refer to species that are provincially or federally listed as endangered or threatened and receive protection under ESA or SARA) |
| SARA | *Species at Risk Act* |

| | |
|---|---|
| SARO | Species at Risk in Ontario |
| SNC | South Nation Conservation |

**SRANK Definitions**

| | |
|---|---|
| S1 | Critically Imperiled in the nation or state/province because of extreme rarity (often 5 or fewer occurrences) or because of some factor(s) such as very steep declines making it especially vulnerable to extirpation from the state/province. |
| S2 | Imperiled in the nation or state/province because of rarity due to very restricted range, very few populations (often 20 or fewer), steep declines, or other factors making it very vulnerable to extirpation from the nation or state/province. |
| S3 | Vulnerable in the nation or state/province due to a restricted range, relatively few populations (often 80 or fewer), recent and widespread declines, or other factors making it vulnerable to extirpation. |
| S4 | Apparently Secure; uncommon but not rare; some cause for long-term concern due to declines or other factors. |
| S5 | Secure; Common, widespread, and abundant in the nation or state/province. |
| ? | Inexact Numeric Rank—Denotes inexact numeric rank |
| SNA | Not Applicable – A conservation status rank is not applicable because the species is not a suitable target for conservation activities. |
| S#B | Breeding |
| S#N | Non-Breeding |

**SARA Status Definitions**

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

**SARO Status Definitions**

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

**Coefficient of Conservatism Ranking Criteria**

| | |
|---|---|
| 0 | Obligate to ruderal areas. |
| 1 | Occurs more frequently in ruderal areas than natural areas. |
| 2 | Facultative to ruderal and natural areas. |
| 3 | Occurs less frequent in ruderal areas than natural areas. |
| 4 | Occurs much more frequently in natural areas than ruderal areas. |
| 5 | Obligate to natural areas (quality of area is low). |

| | |
|---|---|
| 6 | Weak affinities to high-quality natural areas. |
| 7 | Moderate affinity to high-quality natural areas. |
| 8 | High affinity to high-quality natural areas. |
| 9 | Very high affinity to high-quality natural areas. |
| 10 | Obligate to high-quality natural areas |

# 1. INTRODUCTION

CIMA+ Canada Inc. (CIMA+) was retained by Atrel Engineering Ltd., hereafter referred to as the proponent, to provide technical memos with respect to the natural environment in support of a Municipal Class Environmental Assessment (MCEA) Schedule C for the St. Jean Street widening Section G-J (Figure 1 and Figure 2). It is CIMA+'s understanding that the proposed options include widening the existing right-of-way (RoW) from the roughly 10 m to 30 m. The street's alignment will not change from the existing alignment, as the widening will be restricted to the lands that are 15 m from the existing centre line, for all but the portion along Lafontaine Creek where a wider area of impact is required to meet the road design. The options being investigated include those with and without a divided lane, and round abouts or signalized options. It includes the installation of a new culvert on Lafontaine Creek, which has already been reviewed by Fisheries and Oceans Canada (DFO). Based on comments provided to CIMA+, the following terms of reference apply to the natural heritage aspect and are the scope for this Natural Heritage Technical Report:

+ Terrestrial
+ Species at Risk
+ Incidental Wildlife Observations
+ Aquatic Environment

## 1.1 Site Location and History

The Site consists of 1.6 km of St, Jean Street and Poupart Road, the 15 m on either side of the center line (4.8 ha), and up to 35 m on the north side of the culvert crossing and 50 m on the south side at Lafontaine Creek (0.14 ha) (Figure 2). It is in parts of Lot 28-31, Concession 1, Old Survey and Lot C-D Concession 8-9 in the Geographic Township of Clarence, City of Clarence-Rockland (UTM 18T 4991020 m E; 534023 m N, and Latitude 45.07181 Longitude -74.56791) (Figure 1 and Figure 2). The lands are bordered by undeveloped and agricultural lands to the south and a mix of cleared lands, agricultural lands, wetlands, and single lot developments to the north, east, and west.

## 1.2 Purpose

The purpose of this technical memo is to provide information on the methodology and the findings from background review and site investigations with respect to the presence/absence of natural heritage features. When present, their boundaries, attributes, connectivity, and functions are evaluated and the potential to impact these features assessed. Recommendations for avoidance and mitigation measures are provided based on the current understanding of scope and area of impact as described in Section 3.1 (study area).

## Figure 1: General Location of Site


Spatial Reference:

Name: NAD 1983 CSRS Ontario MNR Lambert
PCS: NAD 1983 CSRS Ontario MNR Lambert
GCS: GCS North American 1983 CSRS
Map Units: Meter
Scale: 1:186,933

Sources:

- Basemap : ESRI OpenStreetMap contributors, HERE, Garmin, FAO, USGS, EPA, NPS, AAFC, NRCan

General Notes:

Dimensions on the plan should be read and not measured. Any errors or omissions should be reported to CIMA+. The boundaries, areas, and title deeds must be verified by a surveyor.

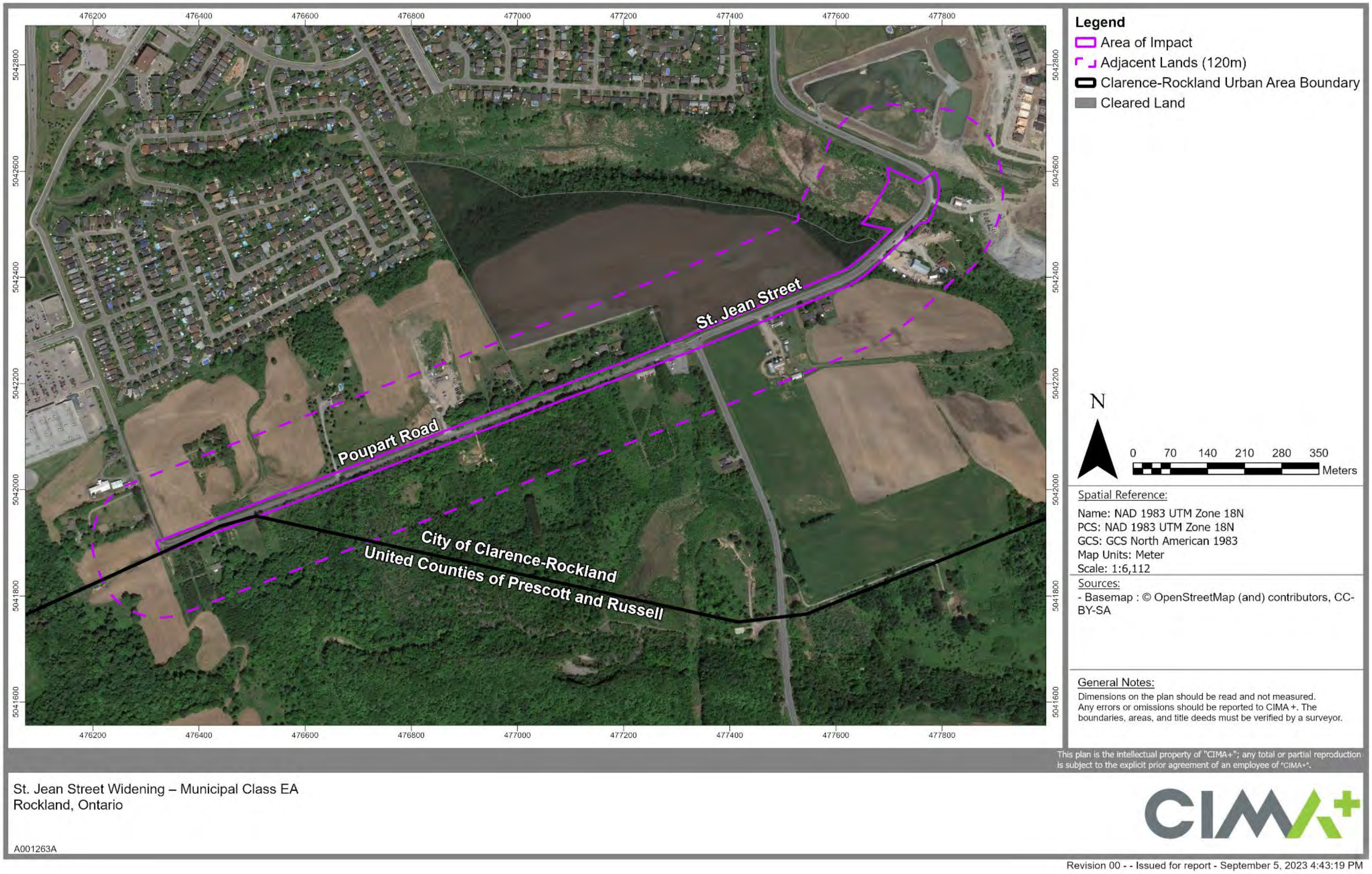


St. Jean Street Widening – Municipal Class EA
Rockland, Ontario

A001263A

Revision 00 - - Issued for report - June 8, 2023 10:32:28 AM

## Figure 2: Site and the Adjacent Lands



# 2. LEGISLATIVE CONTEXT

This section includes a summary of the relevant regional, provincial, and federal acts, regulations and policies that apply to the proposed road widening in respects to the natural heritage features. A review of the impacts to the natural heritage features is typically triggered by one primary Act. It is anticipated that this project will fall solely under the *Environmental Assessment Act* (EAA). The federal *Impact Assessment Act, 2019* is not anticipated to be triggered. The project must still conform to the norms of other provincial and federal legislations. These are briefly described below beginning with the primary process.

## 2.1 Provincial - Primary

### 2.1.1 Environmental Assessment Act

The *Environmental Assessment Act, 1990* (EAA) is triggered when the proponent is a provincial ministry, municipality, or public body (i.e., conservation authorities) for specific types of projects including infrastructure, such as public road widenings. The Act sets out the guidelines for the evaluation of the potential environmental effects and the steps to be taken with respect to notifications, consultation, and submissions. The assessments can be individual or scoped / streamlined. The streamlined EA is a self-assessment processes that follow a specific standard. The Municipal Class Environmental Assessment (MCEA) created by the Municipal Engineers Association (MEA) applies to various projects carried out by municipalities including road widening. Under this process, the project is first categorized into one of three types:

+ Schedule A - Normal or emergency operations and maintenance activities with minimal environmental effects which are pre-approved.
+ Schedule B – Improvements and minor expansions to existing facilities with some potential effects that require screening level assessment.
+ Schedule C – New facilities and major expansions which are required to follow the environmental assessment planning process described in the Class Environmental Assessment. (MEA, https://municipalclassea.ca/manual)

A Schedule C project will include the preparation of a MCEA based on approved terms of reference. The MCEA guidelines includes the need to consider provincial guidelines including the Provincial Policy Statement.

### 2.1.1 Provincial Policy Statement and Official Plans

While the Provincial Policy Statement (PPS) is a tool under the *Planning Act, 1990* which is not triggered by the proposed road widening, the MCEA recommends that the PPS and policies listed in the Official Plan (OP) of the City of Clarence-Rockland be considered when assessing the significance of a natural environmental feature for a municipal project.

The City of Clarence-Rockland's website indicates that the OP of the Urban Area of the City of Clarence-Rockland is applicable to all future development in this area since its adoption in February 2021 as well as the Official Plan of the United Counties of Prescott and Russell (UCPR) as applicable. The road widening works are within the Urban Area, but the adjacent lands to the south include some that is within the Rural Policy Area, where only the Official Plan for the UCPR applies. The OPs follows the guidelines set out in the 2020 Provincial Policy Statement (PPS) in which there are several natural features and areas identified as needing protection. These are described in Table 1. As outlined in the OPs, the locations of most known significant features along with other locally significant features (identified as part of the regions' Natural Heritage System) are identified on Schedule A. The habitat of endangered and threatened species is not depicted on any schedules to protect the species.

The OP of UCPR identifies natural heritage features that are significant on Schedule B for all but significant wetlands, which are on Schedule A (Wetlands Policy Area). The Wetland Policy Area includes wetlands deemed as significant by either the province or UCPR. These are described in Table 1. The habitat of endangered and threatened species is not depicted on any schedules to protect the species.

Since the *Planning Act* is not triggered, Environmental Impact Studies (EIS) under the Planning Act are also not required. Instead, the same intent, which is to evaluate potential environmental effects, is completed through the MCEA process and is the purpose of this technical report.

**Table 1: Summary of Natural Heritage Features**

| Natural Heritage Feature | Reference for City of Clarence-Rockland and United Counties of Prescott and Russell |
|---|---|
| **Habitat of Endangered and Threatened Species (SAR)** | OP refers to the province for the application of the *Endangered Species Act*.<br><br>Habitat of endangered and threatened species are not depicted on any UCPR OP schedules. OP Section 5.5.2 states that no development shall be permitted within significant portions of the habitat of endangered or threatened species, except in accordance with provincial regulations and requirements. |
| **Significant wetlands** | The City OP Section 5.7 indicates that protected wetlands are those designated as "Wetland" on Land Use Schedule A, Province's Mapping (boundary may need to be fine-tuned in field); adjacent lands are those within 120 m of the Wetland boundary.<br><br>UCPR OP Section 5.5.1 notes that no development is permitted in PSWs (they have noted that there are no locally significant wetlands). Item (c) notes that Conservation Authorities may request determination of whether unevaluated wetlands display characteristics of a PSW. |

| Natural Heritage Feature | Reference for City of Clarence-Rockland and United Counties of Prescott and Russell |
|---|---|
| **Significant valleylands** | As per City OP Section 4.13, significant valleylands are depicted as a development Constraint on Schedule A<br><br>Significant valleylands are not depicted on any UCPR OP schedules and shall be identified and assessed based on the *Natural Heritage Reference Manual (*NHRM). |
| **Significant woodlands** | The City OP does not identify any significant woodlands.<br><br>UCPR OP Section 5.5.6 notes that woodlands are depicted on Schedule B2 but that their boundaries require confirmation on site using the NHRM. |
| **Significant wildlife habitat** | As per City section 4.13, any significant wildlife habitat would be depicted as a development constraint on Schedule A<br><br>UCPR OP Section 5.5.4 notes that the only SWH is that on Schedule B2 and consists of deer wintering area or wildlife travel corridor. Section 5.5.4 (2) that no additional SWH will be considered within settlement areas. Additional wildlife habitat would be considered on a site-by-site basis and when needed, this evaluation is to be completed through the use of the *Significant wildlife Habitat Technical Guide and Addendum* (OMNR, 2000) |
| **Significant Areas of Natural and Scientific Interest** | OP refers to the province for the identification of Areas of Natural and Scientific Interest. |
| **Fish Habitat** | OP refers to the federal *Fisheries Act* (see sections further below).<br><br>Fish habitat is depicted on UCPR OP Schedule B2. OP Section 5.5.7 identifies fish habitat as defined by the *Fisheries Act*. Fish Habitat is also protected under the federal *Fisheries Act*. |

## 2.2 Provincial - Other

### 2.2.1 Endangered Species Act

The *Endangered Species Act, 2007* (ESA) prohibits killing or damaging the habitat of species that are listed on the SAR in Ontario list as endangered or threatened. It applies to all private and provincially owned lands in Ontario, and can also be triggered on federal lands. Under ESA, endangered (END) indicates that the species lives in the wild in Ontario but is facing imminent extinction or extirpation and threatened (THR) indicates the species lives in the wild in Ontario, is not endangered, but is likely to become endangered if steps are not taken to address the factors threatening it. Note that species listed as special concern are not afforded protection under the Act.

The ESA is applicable on private and provincial lands. It can also sometimes be applicable to federal lands. The relevant sections to the project are:

- Prohibition on killing or harming of END or THR individuals (Section 9)
- Prohibition on damage to END or THR habitat (Section 10)

### 2.2.2 Conservation Act

This site is under the jurisdiction of the South Nation Conservation Authority (SNC). Note: O. Reg. 170/06 Development, Interference with Wetlands and Alterations to Shorelines and Watercourses under the *Conservation Authorities Act* – South Nation Conservation Authority (SNC).

### 2.2.3 Fish and Wildlife Conservation Act

In addition to the protections offered by the statutes and policies noted above, the *Fish and Wildlife Conservation Act, 1997*, administered by the Ministry of Natural Resources and Forestry (MNRF), needs to be considered. This Act imposes restrictions on the hunting, trapping, and fishing of wildlife, as well as the possession of animals (live or dead). These restrictions include the capturing or harassing of specially protected wildlife or any wild bird species (not a game bird and not listed as an exception) regardless of its live stage (egg, adult) (Part II 5 (1)). It also protects nests or eggs of wild bird species (other than American crow, brown-headed cowbird, common grackle, house sparrow, red-winged blackbird, or starling) (Part II 7(1)). In case of conflicting provisions with the Endangered Species Act, the Act providing greater protection for the animal, invertebrate, or fish in question will prevail.

## 2.3 Federal

### 2.3.1 Fisheries Act

The *Fisheries Act,* last amended on August 28, 2019, is administered by Fisheries and Oceans Canada (DFO) and is intended to provide a framework for the management of threats to fish and fish habitat, including the prevention of pollution, regardless of their attachment to a fishery. The most relevant sections to works, undertakings and activities are:

- Prohibition of the Death of Fish (Section 34.4 (1));
- Prohibition of the Harmful alteration, disruption, or destruction of Fish Habitat (Section 35 (1)); and
- The provisional Ministerial powers to ensure the free passage of fish or the protection of fish or fish habitat with respect to existing obstructions (Section 34.3).

### 2.3.2 Migratory Birds Convention Act

The *Migratory Birds Convention Act, 1994* (MBCA) regulates the protection and conservation of migratory birds as populations and individuals. It also offers protection for nests containing a live bird or viable eggs for most migratory bird species. Schedule 1 under the Migratory Bird Regulations (2022) lists 18 species that may reuse nests and whose nests are protected year-round regardless of occupation, unless the nest has been reported and deemed abandoned after a waiting period. Species listed under Schedule 1 that occur in Ontario include great egret, great blue heron, cattle egret, green heron, snowy egret, black-crowned night heron, and pileated woodpecker. The Migratory Bird Regulations (2022) prohibits the disturbance, damage, or destruction of migratory bird nests or eggs. These prohibitions and regulations apply to any areas where migratory birds and their nests are found in Canada.

### 2.3.3 Species at Risk Act

Federally protected species are listed in ‘Schedule 1’ of the *Species at Risk Act* (SARA). The application of SARA varies depending on the species and the level of government with jurisdiction over the land. In general, the relevant sections are:

+ Prohibition of killing, harming, harassment, capturing or taking of an individual listed as extirpated, endangered, or threatened (Section 32(1))
+ Prohibition of possessing, collecting, buying, selling, or trading an individual listed as extirpated, endangered, or threatened (Section 32(2))
+ Prohibition against the damaging or destruction of residences of species listed as endangered or threatened. For extirpated species, the recovery strategy must also recommend the reintroduction of the species into the wild in Canada (Section 33)

However, on lands that are not federal, Sections 32 and 33 do not apply except for aquatic species (those listed as “fish” under the *Fisheries Act* or a migratory bird as per the *Migratory Birds Convention Act, 1994* (MBCA)), unless a federal order has been created.

# 3. METHODOLOGY

The natural heritage features along the proposed road widening were examined and analyzed by the review of available information through desktop research and on-site ecological surveys. The following report provides information available from the background review and surveys completed in 2022 and 2023.

The terms of reference provided to CIMA+ for the natural heritage technical memo are the following items in **bold** script. CIMA+ division of the natural heritage features into each component is noted in the sub bullets. As such, the report focuses on these four items.

+ **Terrestrial**
  - Vegetation Communities
  - Wetlands
  - Woodlands
+ **Aquatic Environment**
  - Fish and Fish Habitat
+ **Species at Risk**
+ **Incidental Wildlife Observations**

## 3.1 Study Area

The Site refers to the roadway and the direct area of impact (15 m on either side of the existing centre line, plus the area of impact within the wetland). It is assumed that all clearing, excavations, backfilling and grading along paving will be restricted to this width. Since this is under provincial review, the adjacent lands herein are based on provincial guidance (i.e., those identified under the Provincial Policy Statement (*Planning Act*), those defined by the province for natural heritage assessments for renewable energy projects) which is 120 m. However, this area is widened when analyzing the potential for species at risk (SAR) as their protected habitats vary with the species being considered. Note that CIMA+ and Bowfin Environmental Consulting (Bowfin), now merged with CIMA+, have undertaken several studies for this road widening or for both related and unrelated projects proponents in this general area. This included a Fisheries Technical Report for the proposed culvert replacement and impacts to the wetland habitat that was circulated to DFO as part of DFO's review process. Where permitted, relevant data collected for other proponents, is either included as part of the background review or embedded in the main body of the report.

## 3.2 Background Review

When completing desktop reviews, a larger area (~5 km) to obtain a better understanding for the local characteristics and occurrences of species at risk. The data was then reviewed and analyzed for applicable site-specific information. Information from government websites, other consultants' reports, and personal knowledge has also been included as appropriate. Data sources included:

- Aerial/Satellite Imagery (ESRI, 2021)
- Available consultant's reports
- Atlas of the Mammals of Ontario (Dobbyn, 1994)
- Fisheries and Oceans (DFO) National Aquatic Species at Risk Mapping (DFO, 2022)
- Geographic information from Land Information Ontario (LIO, 2021)
- iNaturalist (2022)
- Ministry of Natural Resources and Forestry's (MNRF) Natural Heritage Information Center (NHIC) Make A Map for square #18VR7742 and the surrounding 5km
- Official Plan of the City of Clarence-Rockland (2021)
- Official Plan of the United Counties of Prescott and Russell (2021)
- Ontario Breeding Bird Atlas squares #18VR74, #18VR84, #18VR73, and #18VR83 (Atlas 2- 2001 - 2005)
- Ontario Reptile and Amphibian Atlas
- South Nation Conservation Authority website (SNC, 2023)

## 3.3 Field Studies

### 3.3.1 Vegetation Descriptions and Flora Observations

Vegetation communities were mapped using satellite imagery and verified during field visits. Field studies will supplement these findings. Field investigations included a botanical inventory. The vegetation was characterized based on the appropriate methodologies: Ontario Wetland Evaluation System, Southern Manual (OWES) (MNRF, 2022) for wetland habitats and the Ecological Land Classification for Southern Ontario (ELC) (Lee et al. 1998) for upland habitats. The MNRF's ELC and OWES definition of wetlands do not match one another; since wetlands are to be evaluated following OWES, the determination of the presence/absence of wetland habitat was solely based on the OWES definition of wetland habitat:

> *"Lands that are seasonally or permanently flooded by shallow water as well as lands where the water table is close to the surface; in either case the presence of abundant water has caused the formation of hydric soils and has favored the dominance of either hydrophytic or water tolerant plants".* (MNRF, 2014)

Furthermore, OWES protocol notes that the presence of large numbers of obligate upland species requires an upland classification. As per OWES, the outer boundaries of the wetlands within the Site were mapped using the "50% wetland vegetation rule" which estimates the relative abundance of wetland and upland species in each layer. Our OWES qualified professional walked the outer limits of the wetland, using a hand-held GPS, to create a boundary line. As per OWES, the minimum community size to be delineated is 0.5 ha and the minimum wetland size to be assessed is 2 ha unless special functions or ecological importance is identified. In that case smaller wetland communities or wetlands may be delineated.

The upland vegetation communities were characterized using ELC by mapping ecological communities to the community class or lower. The ecological community boundaries were generally defined through a review of satellite imagery and then further refined during field investigations. Like OWES, the ELC protocol recommends that a vegetation community be at least 0.5 hectares (ha) in size before it is defined. Based on the composition of vegetation communities within the Site, patches of vegetation less than 0.5 ha were described as inclusions (if required). The information was documented and classified according to species and locational data was gathered using a hand-held GPS.

Plants that could not be identified in the field were collected for a more detailed examination in the laboratory. Nomenclature used in this report follows the Southern Ontario Plant List (Bradley, 2010) for both common and scientific names which are based on Newmaster et al. (1998). Authorities for scientific names are given in Newmaster et al. (1998).

### 3.3.2 Blanding's Turtle Monitoring

Basking surveys were conducted in the wetland along Lafontaine Creek in 2022. The methodology follows the provincial Survey Protocol for Blanding's Turtle (*Emydoidea blandingii*) in Ontario (OMNRF, 2015) and assesses the presence/absence of Blanding's turtles (BLTU) with reasonable confidence in an area with appropriate effort.

- Minimum of five basking surveys in suitable habitat if BLTU has not been observed at the site in the past.
- The survey period began following ice-melt (typically late March – early April) and ended before June 15th.
- The spacing of surveys should be such that a minimum period of 3 weeks is covered.
- Basking surveys were completed between 8 am and 5 pm during sunny periods and when air temperature was at least 5°C (partially cloudy or overcast is accepted if air temperature is above 15°C and is warmer than the water temperature). Surveys should not be conducted when temperatures are above 25°C (except early in the morning 8-10 am)
- When possible, surveys should target days immediately following inclement weather, when turtles would be more prone to basking.
- Search time varied based on site size and level of vegetation. Generally, search time was 2-4 person hours per hectare in heavily vegetated areas (less effort if the site can be easily scanned from the shoreline).
- Checked vegetated area in close proximity to the wetland (up to 1 m away from shores)
- Where vegetated, waded through the wetland (in 10 m transects)

### 3.3.3 Bird Surveys including SAR Birds

Information on bird use of the area was collected through a raptor nest survey, as well as daytime and nighttime breeding bird surveys. This information serves primarily to determine the presence/absence of species at risk (endangered/threatened) but also serves to meet the requirements of other functions as applicable to the OP policies for the land and project (i.e., MBCA regulations, functions of woodlands and wetlands, significant wildlife habitat).

***Raptor and pileated nest survey (2023).*** The raptor and pileated nest survey consisted of searching for individuals or evidence of nesting (such as stick and cavity nests, food caches, whitewashing of branches and foliage, accumulation of feathers/fur, or prey remains on the ground or in shrubs as per the Significant Wildlife Habitat Technical Guide (SWHTG) Appendix O).

***Least Bittern Survey (2022).*** The Least Bittern surveys followed the protocols described in the *National Least Bittern Survey Protocol* (Jobin et al. 2010) and required three visits. The visits took place within the Lafontaine River Marsh between early May and mid-July and were spaced at least 10 days apart as per the protocol. Since this species decreases calling after nesting, it is recommended that the first visit be in early May in this part of Ontario. The surveys began no earlier than 30 minutes before dawn and were completed by 10 am. They took place on days with suitable weather, avoiding days with rain, extreme heat (>30°C) or winds exceeding 19 km/h (3 on the Beaufort wind scale). The station was surveyed for 13 minutes as follows: 5 minutes passive, 5 minutes active (playing call response broadcast), and 3 minutes passive.

***Marsh bird survey (2022).*** The breeding bird survey methods were based on the Marsh Monitoring Program, and are summarized below:

+ Consisted of two visits spaced a minimum of 7 days apart.
+ All visits were completed between May 20 and July 5.
+ Visits began no earlier than 30 minutes after dawn and completed by 10 00hr.
+ Surveys were conducted on days with no rain, little to no wind and good visibility.
+ Surveys included point counts spaced roughly 250 m apart.
+ Point counts consisted of listening and observing for birds over a 15-min period.
+ A broadcast tape was used to elicit calling for more secretive marsh species.
+ Information recorded: number heard/seen, their sex, location, and behaviour.
+ Birds were identified by sight and sound.
+ Additional information on bird activity was collected while walking between survey points.

***Grassland breeding bird survey (2022 and 2023).*** The provincial grassland breeding bird survey protocol was used for grassland habitats and followed as described below:

+ Three visits completed between June 1st and first week in July.
+ Began no earlier than 30 minutes after dawn and completed by 0900 hours;
+ Conducted on a day with no rain, little to no wind and good visibility;
+ Included linear transects spaced 250 m apart with point counts every 250 m;

  - Point counts consisted of listening and observing for SAR species over a 10 min period recording the number heard/seen, their sex, location, behaviour and interactions with other birds (any species);
- While walking between points, any additional SAR observations was recorded; and
- A list of all birds observed was also compiled within the different habitats.
- Birds were identified by sound and/or sight.

***Daytime breeding bird survey (2022 and 2023).*** The daytime survey for breeding birds followed the *Ontario Breeding Bird Atlas Guide for Participants* (Environment Canada, 2001) which consisted of:

- Minimum of two visits were completed for forested areas.
- Surveys began no earlier than 30 minutes before sunrise and were completed by five hours past sunrise (adjusted as needed in response to reduced calling).
- Visits were conducted on days with no rain, little to no wind (≤3 on the Beaufort scale), and good visibility.
- The survey type was point counts:
  - 5-minute point count stations were generally spaced 300 m apart (or as near as 100 m if information from all habitat types was needed).
  - Point counts consisted of listening and observing over a specified time period and recording the number of birds heard/seen, their sex, location, behavior and interactions with others.
  - While walking between points, any additional observations were recorded.
- Birds were identified by sound and/or sight.

***Eastern whip-poor-will survey (2022).*** Eastern whip-poor-will surveys were conducted in 2022 and followed the current survey protocol for this species (*Draft Survey Protocol for Eastern Whip-poor-will (Caprimulgus vociferus) in Ontario* (OMNRF, 2014b)):

- Three surveys between May 18 and June 30 (late May and first week of June are preferred if conditions permit).
- Two of the three visits may be completed on consecutive nights.
- Weather targeted the following conditions: over 10°C, no precipitation, low noise levels, calm winds (up to 3 on the Beaufort scale), 50% or more visible moon face illuminated & moon over the horizon, with little to no cloud cover.
- Surveys targeted two moon phases.
- Surveys were at night and began no earlier than 30 minutes after sunset and ended at least 15 minutes before sunrise (but are typically to end earlier if the moon descends below the horizon).
- Survey points were established no further than 500 m apart within appropriate habitats.
- Surveys consisted of a 5-min listening period at each point. Where whip-poor-wills were heard, the surveyor recorded the following: number of whip-poor-wills, their behavior (i.e., calling, perched, flushed), movement, and noted whether the same bird has been heard at another point and approximate direction and distance.

- If a whip-poor-will was heard calling, the surveyors were to walk apart until a distance of 50-60 m was established between the two surveyors. The call(s) were then noted from these new locations. The purpose of this step is to help triangulate nests and/or defended area.
- Additional notes on any whip-poor-wills were recorded in-between points.
- Breeding evidence ranking of probable is attributed to results where birds are heard calling from the same general location on at least two nights (in appropriate habitat). When the birds only call during one visit, this is an indication of presence but not of habitat use.

#### 3.3.4 Species at Risk Plants, including Butternut Inventory

Specific attention was paid to locating species at risk (SAR) or species of conservation value listed as potentially occurring within the study area. If these species were observed, individuals would be photographed, and their coordinates recorded on a hand-held GPS using NAD83. Plants that could not be identified in the field were collected for a more detailed examination in the laboratory.

The recently updated Butternut Assessment Guidelines (BAG) were followed (MECP, 2021). These protocols indicate the following:

- Surveys were completed by a Butternut Health Expert
- Acceptable survey period was during the leaf-on season, which is considered to be between May 15-August 31, environmental conditions permitting.
- A tree's health assessed outside of this period is only accepted as valid if the assigned canker widths are at least 40% (i.e., Category 1). The assessment of Categories 2 or 3 is not accepted outside of the leaf-on period.
- Each individual tree was assigned a number and identified (i.e., paint, preference for white) or flagged.
- The classification of the health into Categories 1, 2 or 3 was completed as per the Butternut Data Collection Form.
- Butternut Health Export Report Template was used when submitting data to the province.

For this survey, the inventory included the forested area along the road and the 50 m surrounding area. Where the 50 m extended into neighbouring lands, inventory was assessed "over the fence". Any individuals noted will be marked with white spray paint and/or flagging tape and numbered sequentially. Their UTMs, using a GPS unit set at NAD83, were recorded. The individuals were assessed according to the BAG (MECP, 2021).

#### 3.3.1 Amphibian Surveys

The UCPR can require evaluation of Significant Wildlife Habitat (SWH) including Amphibian Surveys. Since the adjacent lands fall within the UCPR jurisdiction Amphibian breeding surveys were completed based on the methods outlined in the *Marsh Monitoring Program Participant's Handbook for Surveying Amphibians* (Bird Studies Canada, 2009). Three (3) surveys are usually conducted between April and June to document both early season and 'optimal' season breeders. Due to the timing of award of this contract, the April evening survey period was missed. This was addressed by completing a daytime egg mass search early May 2023. The evening May and June survey periods were completed as per protocol in 2023. Specifically, surveys were completed at three (3) point count stations generally conducted one half hour after sunset and ending before midnight to establish quantitative estimates of abundance in suitable habitat types within the site. Where evidence of breeding behaviour was observed at any station, it was recorded to measure the intensity and number of individuals calling using the Call Level Code and Abundance Counts.

### 3.3.1 Fish Habitat Description

The fish habitat and community data were collected by Bowfin between 2008 and 2019. CIMA+ delineated the edge of the active channels in 2022 associated with Lafontaine Creek and confirmed the lack of additional fish habitat along the alignment in 2023. Delineation was completed using a hand-held GPS unit and the watercourses are shown on all figures herein. The aquatic habitats within the study area were assessed based on the point observation technique used by *Ontario Stream Assessment Protocol* (Stanfield, 2013) and the Ministry of Transportation of Ontario (MTO)'s *Environmental Guide for Fisheries* (MTO, 2020). The channel morphology was described using evenly spaced transects upon which data was recorded from evenly spaced observation points. The data collected included: channel width, wetted width, bankfull depth, water depth, substrate size, morphological units, and in-stream cover.

### 3.3.2 Fish Community Sampling

Fish community sampling was performed to document the use of the Lafontaine Creek between 2008 and 2019 by Bowfin. The most recent data was from the spring and summer 2019. The community was sampled using hoop nets, and backpack electrofishing. Minnow traps and Windemere traps were also used in 2008. The fish were identified, counted, measured [fork length (FL)/total length (TL) as appropriate], and released. The transect length, approximate width, volts, current and effort were also recorded.

### 3.3.3 Incidental Fauna Observations

During all visits, any wildlife observations were recorded. Incidental observations included observations of an individual, its tracks, burrows, feces and/or kill sights.

## 3.4 Evaluation of Natural Heritage Features

The natural heritage features identified as present or as candidate features based on the background review and site investigations are brought forward for evaluation as per the applicable provincial and/or federal guidelines for that feature or species at risk (SAR). This step is completed following the site investigations.

## Figure 3: Amphibian and Breeding Bird Survey Points




St. Jean Street Widening – Municipal Class EA
Rockland, Ontario

A001263A

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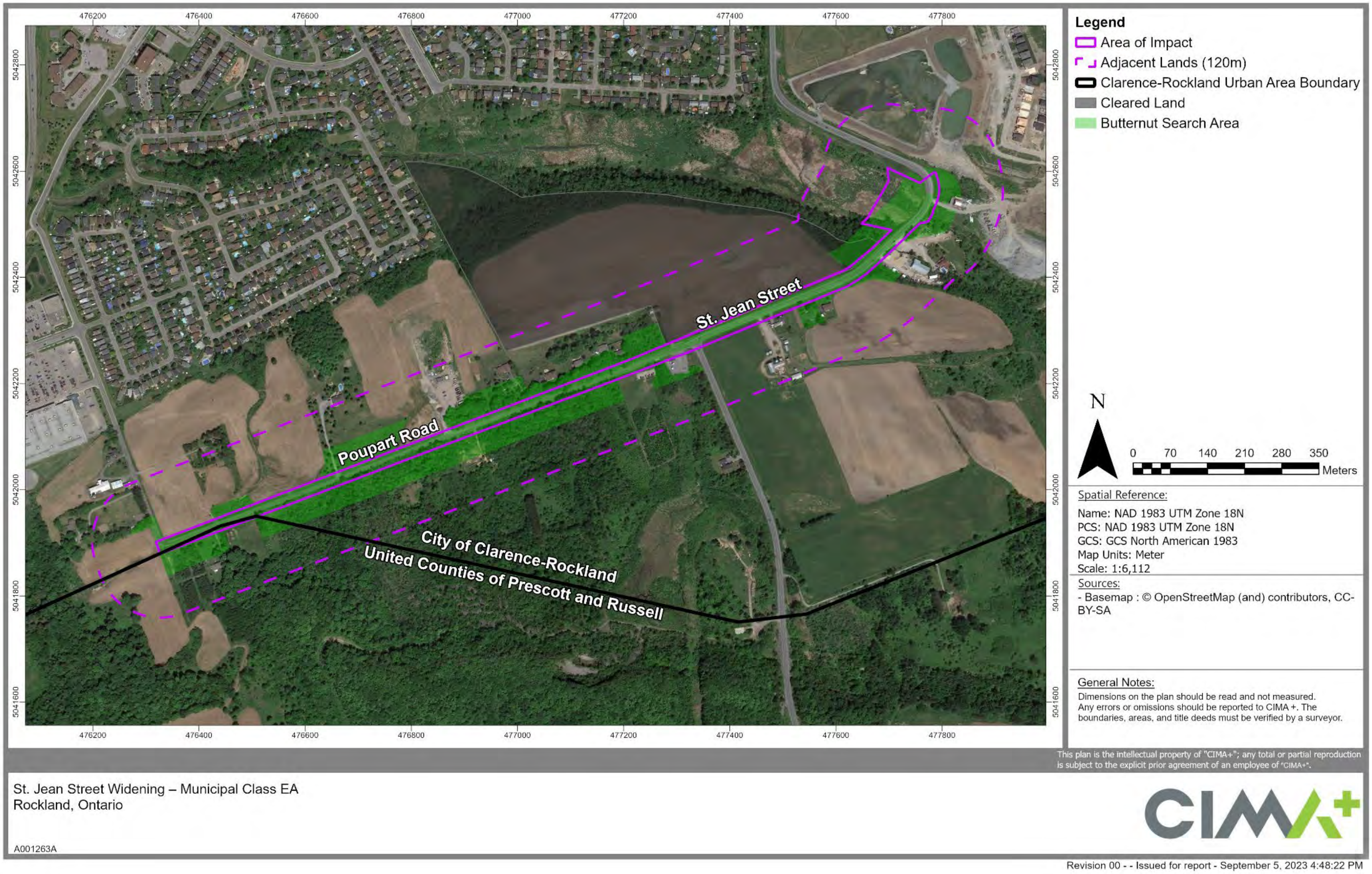
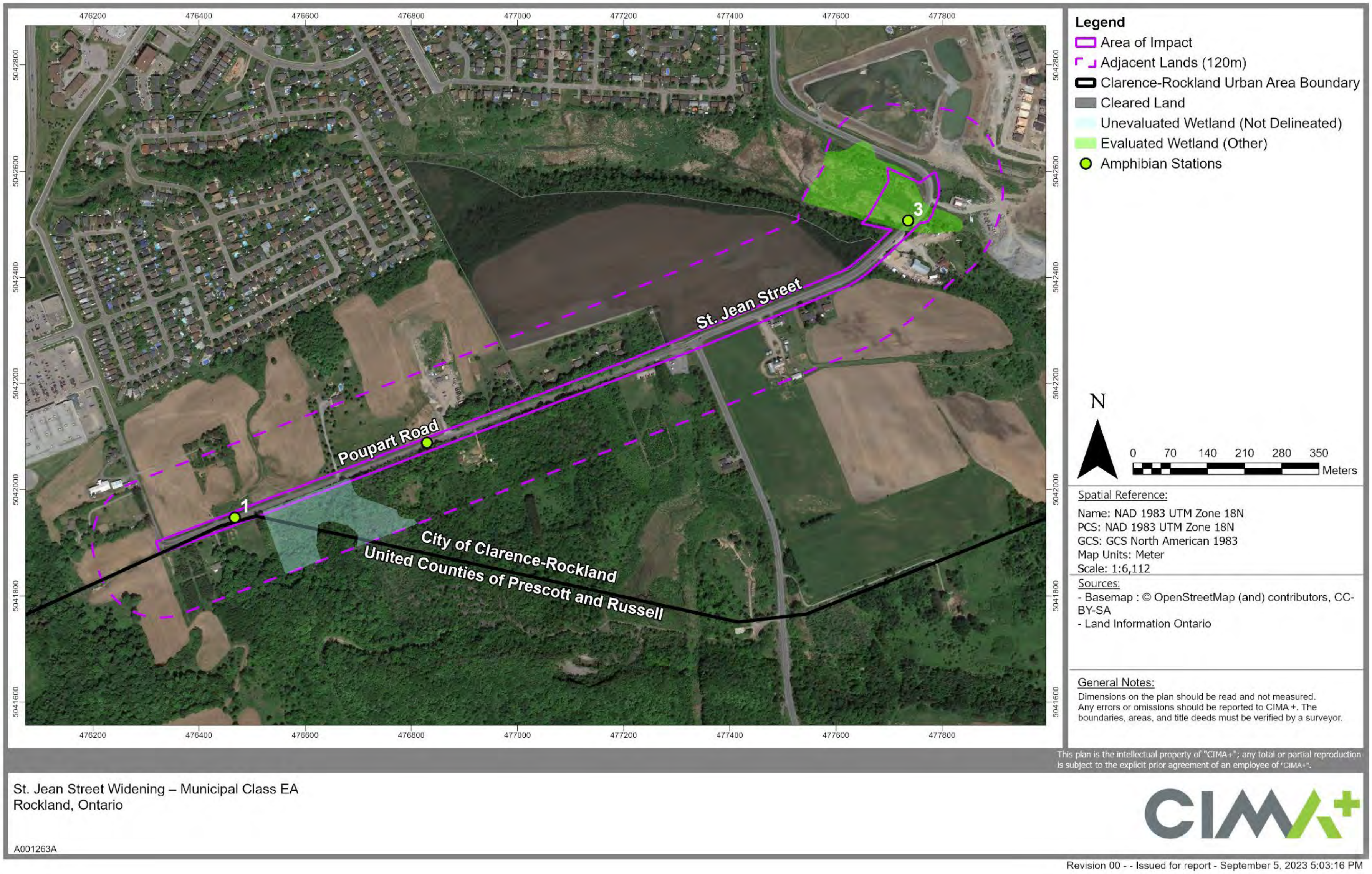
## Figure 4: Butternut Search Area



## Figure 5: Amphibian Survey Stations



# 4. BACKGROUND REVIEW

The terms of reference notes that the following features will be evaluated:

+ Terrestrial
  - Vegetation Communities
  - Wetlands
  - Woodlands
+ Aquatic Environment
  - Fish and Fish Habitat
+ Species at Risk
+ Incidental Wildlife Observations

## 4.1 Background Review on Terrestrial Component

The descriptions of the terrestrial and aquatic environments, including inventories and incidental observations, are based on the site investigations and are provided in Section 5. The natural heritage features identified during the background review were:

+ Wetland:
  - Lafontaine River Marsh, evaluated as Other (not provincially significant)
+ Woodlands
  - Outside of the Urban Area (within UCPR)

## 4.2 Background Information on Aquatic Component and Fish Communities

The review of background information identified a single fish habitat feature, Lafontaine Creek, noted on the schedules of the OP, Land Information Ontario, and DFO's NASAR mapping. The St. Jean Street widening will include a new culvert at Lafontaine Creek. There is no fisheries information available outside of surveys conducted by Bowfin. The full list of species is included in the table below for Lafontaine Creek between Lemay Circle and in its headwaters. Among the fish captured, one sport fish (northern pike) and two pan fish (pumpkinseed and yellow perch) were identified. It is noted that young-of-the-year (YOY) northern pike have been captured between Lemay Circle and St. Jean Street, and further upstream (Figure 6). There are no SAR protected by ESA listed for Lafontaine Creek. The DFO National Aquatic Species at Risk Mapping (NASAR) indicated that there are no recordings of federal endangered, threatened, or special concern in Lafontaine Creek (**Appendix D**).

As this project is within 720 m of the Ottawa River, Lac Dollard-des-Ormeaux reach, the list from Land Information Ontario (LIO) is also provided in the table below. LIO provided a list of 75 warm to cold water fish species in the river near the site (Table 2). Of these, twelve sport fish were identified: longnose gar, channel catfish, cisco, brown trout, northern pike, muskellunge, burbot, smallmouth bass, largemouth bass, sauger, and walleye. In addition, six pan fish were identified: rock bass, pumpkinseed, bluegill, white crappie, black crappie, and yellow perch. The provincial background databases identified three species at risk (SAR) protected by ESA as potentially occurring in the Ottawa River; one endangered species (American eel) and two threatened species (lake sturgeon, cutlip minnow). Again, all three are identified in Ottawa River but have not been documented in Lafontaine Creek.

**Figure 6: Summary of Background Review (Mapped Natural Heritage Features and Fish Community Information)**

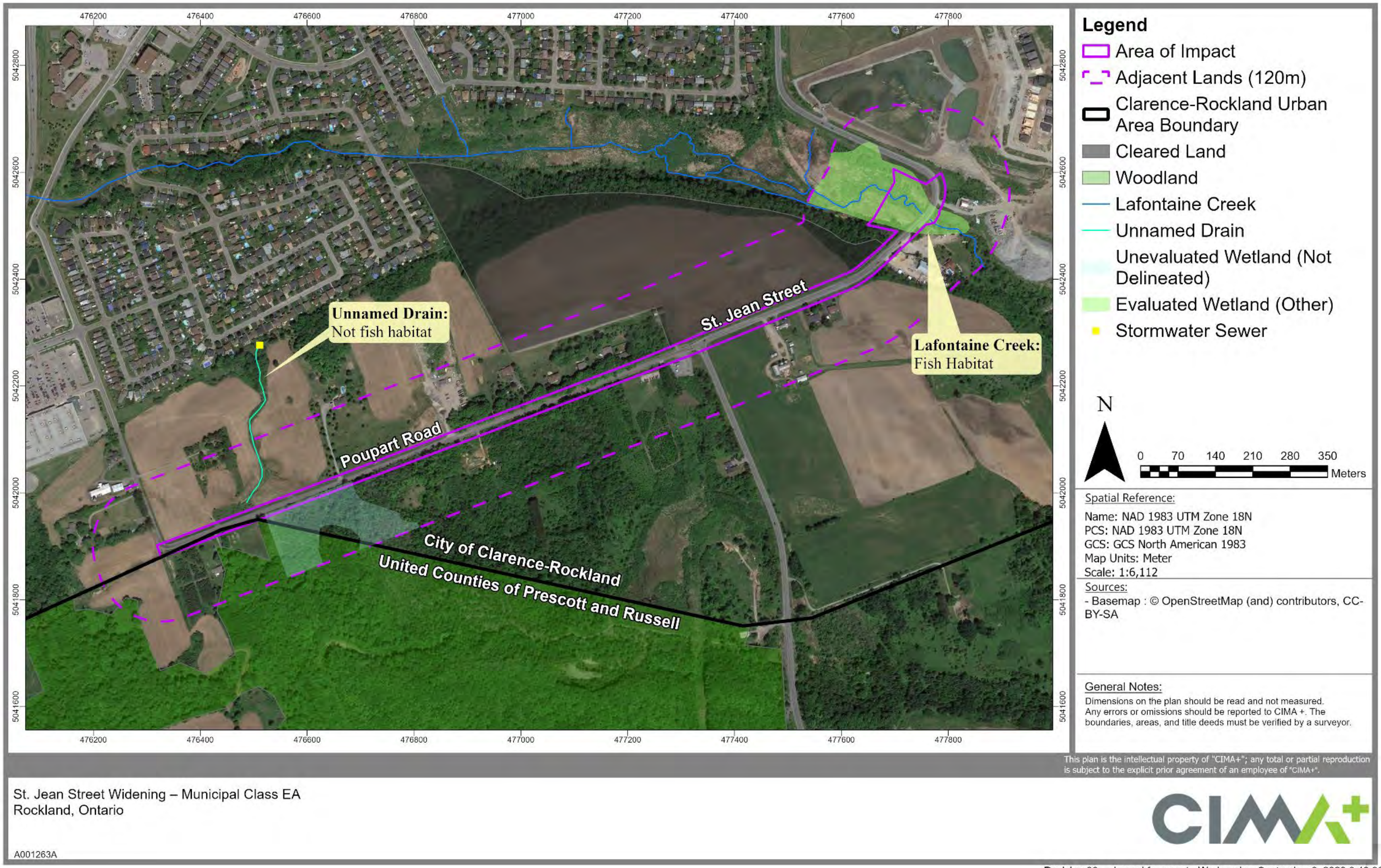



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**Table 2: Available Background Fish Community Information**

| Species Name | Scientific Name | Trophic Class | Thermal Regime | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Lafontaine Creek and its Tributaries | Ottawa River (Lac Dollard-des-Ormeaux Reach) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Northern Brook Lamprey** | *Ichthyomyzon fossor* | nonfeeding | cool | SNR | SC | SC | | Y | LIO 2019 |
| **Silver Lamprey** | *Ichthyomyzon unicuspis* | herbivore/ detritivore | cool | S3 | SC | SC | | Y | LIO 2019 |
| **American Brook Lamprey** | *Lethenteron appendix* | herbivore | cold | S3 | No Status | No Status | | Y | LIO 2019 |
| **Lake Sturgeon** | *Acipenser fulvescens* | invertivore/ herbivore | cool | S2 | THR | No Status | | Y | LIO 2019 |
| **Longnose Gar** | *Lepisosteus osseus* | carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **American Eel** | *Anguilla rostrata* | invertivore/ carnivore | cool | S1? | END | No Status | | Y | LIO 2019 |
| **Alewife** | *Alosa pseudoharengus* | planktivore | cold | SNA | No Status | No Status | | Y | LIO 2019 |
| **American Shad** | *Alosa sapidissima* | planktivore | cool | S1 | No Status | No Status | | Y | LIO 2019 |
| **Mooneye** | *Hiodon tergisus* | invertivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Brown Trout** | *Salmo trutta* | invertivore/ carnivore | cold/cool | SNA | No Status | No Status | | Y | LIO 2019 |
| **Cisco** | *Coregonus artedii* | planktivore/ invertivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **Rainbow Smelt** | *Osmerus mordax* | invertivore/ carnivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **Northern Pike** | *Esox lucius* | carnivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Muskellunge** | *Esox masquinongy* | carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Central Mudminnow** | *Umbra limi* | invertivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Spotfin Shiner** | *Cyprinella spiloptera* | invertivore/ herbivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |

| Species Name | Scientific Name | Trophic Class | Thermal Regime | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Lafontaine Creek and its Tributaries | Ottawa River (Lac Dollard-des-Ormeaux Reach) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Common Carp** | *Cyprinus carpio* | invertivore/ detritivore | warm | SNA | No Status | No Status | | Y | LIO 2019 |
| **Cutlip Minnow** | *Exoglossum maxillingua* | invertivore | warm | S1S2 | THR | SC | | Y | LIO 2019 |
| **Brassy Minnow** | *Hybognathus hankinsoni* | planktivore/ detritivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Eastern Silvery Minnow** | *Hybognathus regius* | herbivore/ detritivore | warm | S2 | No Status | No Status | | Y | LIO 2019 |
| **Common Shiner** | *Luxilus cornutus* | invertivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Northern Pearl Dace** | *Margariscus nachtriebi* | invertivore/ carnivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Golden Shiner** | *Notemigonus crysoleucas* | invertivore/ herbivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, LIO 2019 |
| **Emerald Shiner** | *Notropis atherinoides* | planktivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Blackchin Shiner** | *Notropis heterodon* | invertivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Spottail Shiner** | *Notropis hudsonius* | invertivore/ planktivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, LIO 2019 |
| **Rosyface Shiner** | *Notropis rubellus* | invertivore/ detritivore/ herbivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Sand Shiner** | *Notropis stramineus* | invertivore/ detritivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Mimic Shiner** | *Notropis volucellus* | invertivore/ herbivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Northern Redbelly Dace** | *Chrosomus eos* | invertivore/ planktivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |

| Species Name | Scientific Name | Trophic Class | Thermal Regime | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Lafontaine Creek and its Tributaries | Ottawa River (Lac Dollard-des-Ormeaux Reach) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Finescale Dace** | *Chrosomus neogaeus* | invertivore/ planktivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Bluntnose Minnow** | *Pimephales notatus* | detritivore | warm | S5 | No Status | No Status | Y | Y | Bowfin 2008, LIO 2019 |
| **Fathead Minnow** | *Pimephales promelas* | detritivore/ invertivore | warm | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Western Blacknose Dace** | *Rhinichthys obtusus* | invertivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Longnose Dace** | *Rhinichthys cataractae* | invertivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Creek Chub** | *Semotilus atromaculatus* | invertivore/ carnivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Fallfish** | *Semotilus corporalis* | invertivore/ carnivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Longnose Sucker** | *Catostomus catostomus* | invertivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **White Sucker** | *Catostomus commersonii* | invertivore/ detritivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Quillback** | *Carpiodes cyprinus* | invertivore/ detritivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Silver Redhorse** | *Moxostoma anisurum* | invertivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **River Redhorse** | *Moxostoma carinatum* | invertivore | cool | S2 | SC | SC | | Y | LIO 2019 |
| **Shorthead Redhorse** | *Moxostoma macrolepidotum* | invertivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Greater Redhorse** | *Moxostoma valenciennesi* | invertivore | warm | S3 | No Status | No Status | | Y | LIO 2019 |
| **Yellow Bullhead** | *Ameiurus natalis* | invertivore/ carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |

| Species Name | Scientific Name | Trophic Class | Thermal Regime | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Lafontaine Creek and its Tributaries | Ottawa River (Lac Dollard-des-Ormeaux Reach) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Brown Bullhead** | *Ameiurus nebulosus* | invertivore/ herbivore/ carnivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Channel Catfish** | *Ictalurus punctatus* | invertivore/ carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Stonecat** | *Noturus flavus* | invertivore/ carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Tadpole Madtom** | *Noturus gyrinus* | invertivore/ planktivore | warm | S4 | No Status | No Status | Y | Y | Bowfin 2008, LIO 2019 |
| **Margined Madtom** | *Noturus insignis* | invertivore | warm | SU | No Status | No Status | | Y | LIO 2019 |
| **Trout-Perch** | *Percopsis omiscomaycus* | invertivore/ carnivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **Burbot** | *Lota lota* | invertivore/ carnivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **Banded Killifish** | *Fundulus diaphanus* | invertivore/ planktivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Brook Silverside** | *Labidesthes sicculus* | planktivore/ invertivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Brook Stickleback** | *Culaea inconstans* | planktivore/ invertivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |
| **Ninespine Stickleback** | *Pungitius pungitus* | planktivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Mottled Sculpin** | *Cottus bairdii* | invertivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Slimy Sculpin** | *Cottus cognatus* | invertivore | cold | S5 | No Status | No Status | | Y | LIO 2019 |
| **Rock Bass** | *Ambloplites rupestris* | invertivore/carni vore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Pumpkinseed** | *Lepomis gibbosus* | invertivore/ carnivore | warm | S5 | No Status | No Status | Y | Y | Bowfin 2008, Bowfin 2019, LIO 2019 |

| Species Name | Scientific Name | Trophic Class | Thermal Regime | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Lafontaine Creek and its Tributaries | Ottawa River (Lac Dollard-des-Ormeaux Reach) | Reference |
|---|---|---|---|---|---|---|---|---|---|
| **Bluegill** | *Lepomis macrochirus* | invertivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Northern Sunfish** | *Lepomis peltastes* | invertivore | warm | S3 | SC | SC | | Y | LIO 2019 |
| **Smallmouth Bass** | *Micropterus dolomieu* | invertivore/ carnivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Largemouth Bass** | *Micropterus salmoides* | invertivore/ carnivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **White Crappie** | *Pomoxis annularis* | invertivore/ carnivore | warm | S4 | No Status | No Status | | Y | LIO 2019 |
| **Black Crappie** | *Pomoxis nigromaculatus* | invertivore/ carnivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Iowa Darter** | *Etheostoma exile* | invertivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Fantail Darter** | *Etheostoma flabellare* | invertivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Johnny Darter** | *Etheostoma nigrum* | invertivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Tessellated Darter** | *Etheostoma olmstedi* | invertivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Yellow Perch** | *Perca flavescens* | invertivore/ carnivore | cool | S5 | No Status | No Status | Y | Y | Bowfin 2008, LIO 2019 |
| **Logperch** | *Percina caprodes* | invertivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Sauger** | *Sander canadensis* | invertivore/ carnivore | cool | S4 | No Status | No Status | | Y | LIO 2019 |
| **Walleye** | *Sander vitreus* | invertivore/ carnivore | cool | S5 | No Status | No Status | | Y | LIO 2019 |
| **Freshwater Drum** | *Aplodinotus grunniens* | invertivore/ carnivore | warm | S5 | No Status | No Status | | Y | LIO 2019 |
| **Shows Presence/Absence** | Y | | | | | | | | |

(Bowfin 2008, Bowfin 2019, Coker et al. 2001, MTO 2006, Page et al. 2013, LIO 2019, OMNRF 2013)
Table updated: January 2023

**SRANK Definitions**

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

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

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

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

S5 Secure, Common, widespread, and abundant in the nation or state/province.

SNR Unranked, Nation or state/province conservation status not yet assessed.

SU Unrankable, Currently unrankable due to lack of information or due to substantially conflicting information about status or trends.

SNA Not Applicable, A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

S#S# Range Rank, A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

? Inexact Numeric Rank—Denotes inexact numeric rank

**SARO Status Definitions**

END Endangered: A species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's ESA.

THR Threatened: A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.

SC Special Concern: A species with characteristics that make it sensitive to human activities or natural events.

**SARA Status Definitions**

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

## 4.3 Endangered and Threatened Species and their Habitat

Endangered and threatened Species at Risk (SAR) are protected under the provincial *Endangered Species Act*. The federal Species at Risk Act (SARA) applies only to fish species on private land. Most birds, including SAR, also receive protection from *Migratory Bird Convention Act* and/or *Fish and Wildlife Conservation Act*. Together, provincially, and federally protected species are referred, herein, to as SAR, herein. This site is situated on private lands and as such, the evaluation of presence was complete following the province's guidelines.

The locations of Endangered and Threatened species are not mapped to protect those species. A list of potential SAR was compiled using various sources. The NHIC database provides information available to the public on those SAR documented as occurring within the general area. It should be noted that not all information for all species is available to the public. Furthermore, the absence of a record does not necessarily indicate that the species is absent from the area. The purpose of the NHIC database is to help determine what species may occur within the project area. The background review included looking at the list of birds observed as part of the Ontario Breeding Bird Atlas (OBBA) and any SAR species listed on these lists were considered as potentially occurring within the subject lands. Added to this list were species that often occur within the general area based on personal experience or observations. The resulting list includes 16 SAR: 3 fish (lake sturgeon, American eel and cutlip minnow), 1 reptile (Blanding's turtle), 6 birds (least bittern, eastern whip-poor-will, chimney swift, bank swallow, bobolink, and eastern meadowlark), 4 mammals (little brown myotis, northern myotis, eastern small-footed myotis, and the tri-colored bat), 1 plant (butternut), and 1 lichen (pale-bellied frost lichen) (Table 3). Note that following site investigations, this list of species and potential occurrence of them or their habitat was reviewed and adjusted. Finally, as noted above, not all species can be discussed in public documents, these restricted species are not discussed herein, but are reviewed through a separate process with the applicable government agency.

For some species, the federal and/or provincial governments provide guidelines on what habitats should receive automatic protection. This is usually based on distances from known sightings or suitable habitat. Federally, the habitat is typically classed based on function and provincially it is either regulated or general habitat. Regulated habitat has detailed description and is prescribed in an Ontario Regulation. General habitat often splits the habitat needs into up to three categories, listed as Categories 1-3 with 1 being the most sensitive to disturbances. Note the exception with Butternuts where Category 1 individuals are least sensitive. In the table below, the candidate SAR for the Site are listed along with their habitat needs. Where provided, guidance by provincial or federal governments is used to evaluate whether to bring the species forward to assessment. When there is no guidance available, the available literature is used to evaluate the suitability of the habitat on-site for that species.

**Table 3: List of Potential Endangered or Threatened Species and Identification of those Brought Forward following Site Investigations**

| Common Name/ Population | Scientific Name | SRANK | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Preferred Habitat Guidelines | Evaluation | Brought Forward (Yes/No) |
|---|---|---|---|---|---|---|---|
| **FISH** | | | | | | | |
| Lake Sturgeon | *Acipenser fulvescens* | S2 | THR | No Status | Bottoms of lakes and large rivers. Adults are typically found in highly productive shoal areas of large rivers and large lakes (COSEWIC 2017). | No appropriate watercourses on site. NHIC records were from Ottawa River >1 km from site. Fish sampling was conducted, and none were observed. This species is considered absent. | No |
| American Eel | *Anguilla rostrata* | S1? | END | No Status | Near cover over muddy, silty bottoms of lakes, rivers, and creeks (COSEWIC 2012). | Low chance of occurring within Lafontaine Creek. Fish sampling was conducted by Bowfin in previous years, and none were observed. This species is considered unlikely to occur. | Yes |
| Cutlip Minnow | *Exoglossum maxillingua* | S1S2 | THR | SC | Requires areas with rocky substrate, free of silt and with clear water. Found in clear waters with gravel substrate. (COSEWIC 2013) | Lafontaine Creek lacks suitable habitat (i.e., no clear water with rocky substrate). This species is considered absent. | No |

| Common Name/ Population | Scientific Name | SRANK | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Preferred Habitat Guidelines | Evaluation | Brought Forward (Yes/No) |
|---|---|---|---|---|---|---|---|
| **REPTILES** | | | | | | | |
| Blanding's Turtle | *Emydoidea blandingii* | SNR | THR | END | Shallow water, large marshes, shallow lakes, or similar such water bodies (COSEWIC, 2016). Provincial guidelines provide general habitat protection to suitable habitat within 2 km of an occurrence when certain conditions are met (MECP, 2019). | No occurrences within 10 km, wetlands on eastern end were surveyed in 2022 and none were observed. | No |
| **BIRDS** | | | | | | | |
| Least Bittern | *Ixobrychus exilis* | S4B | THR | THR | Freshwater marshes habitat with dense vegetation (Sandilands, 2005; COSEWIC, 2009a). Nests are typically in cattail marshes, near edge or openings but they have been found in other emergents and occasionally in willow (Woodcliff, 2007). Recovery strategy states that the species must have permanent marsh/shrub swamps and a mosaic of tall and robust herbaceous or woody vegetated with open water areas and natural regime water levels (ECCC, 2014). The open water areas can be shallow (10-50cm) (OMNRF, 2016). Movements within this suitable habitat can extend within a 500m radius of the nest (ECCC, 2014). and are usually found in those that are larger than 5 ha (COSEWIC 2009; OMNRF, 2014). The province does not currently have any guidance on the general habitat requirements of this species. | Wetlands within the adjacent lands on the eastern end were surveyed for Least Bittern in 2022 and none were observed. No records in Rockland area. | No |

| Common Name/ Population | Scientific Name | SRANK | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Preferred Habitat Guidelines | Evaluation | Brought Forward (Yes/No) |
|---|---|---|---|---|---|---|---|
| Eastern Whip-poor-will | *Caprimulgus vociferus* | S4B | THR | THR | Rock or sand barrens with scattered trees, savannahs, old burns or other disturbed sites in a state of early to mid-forest succession, or open conifer plantations (COSEWIC, 2009). The province's General Habitat Description outlines Category 1-3 requirements, which are described in Section 5.2.2. Provincial guidelines provide general habitat protection to suitable habitat within 500 m of an occurrence when certain conditions are met (MECP 2019). The province adopted the federal recovery strategy (MECP, 2019). | Surveys conducted in 2022 as per the provincial guidelines; none observed. This species is considered absent. | No |
| Chimney Swift | *Chaetura pelagica* | S4B, S4N | THR | THR | Cities, towns, villages, rural, and wooded areas. Birds rarely utilize trees, but when they do, they prefer those that are >50 cm in diameter and that are within 1 km of waterbodies (large enough that can be seen on 1:50,0000 topographic maps) (COSEWIC, 2007). Provincially, the 90 m surrounding a roosting site is protected (MECP, 2013). | The site does not meet the preferred critical habitat. None observed during bird surveys of 2022; or during the first visit of 2023 | No |
| Bank Swallow | *Riparia riparia* | S4B | THR | THR | Variety of forest types, most common in wet, mixed deciduous-coniferous forest with a well-developed shrub layer (COSEWIC, 2013). It is often found in shrub marshes, red maple stands, cedar stands, conifer swamps dominated by black spruce and larch and riparian woodlands along rivers and lakes. It is also associated with ravines and steep brushy slopes near these habitats (COSEWIC, 2013). Provincially, the species protected habitat is the 50 m in front of a breeding colonies bank face and all suitable foraging habitat within 500 m (MECP, 2015) | No suitable vertical banks present. None observed during bird surveys, this species is considered absent. | No |

| Common Name/ Population | Scientific Name | SRANK | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Preferred Habitat Guidelines | Evaluation | Brought Forward (Yes/No) |
|---|---|---|---|---|---|---|---|
| Bobolink | *Dolichonyx oryzivorus* | S4B | THR | THR | Primarily in forage crops and grassland habitat. It is sensitive to edge effects, size of habitat and areas with dense shrub vegetation or a litter layer deeper than a few centimetres (COSEWIC, 2010). Provincially, this species protected habitat is the area extending 60 m from the nest as well as the 300 m of suitable habitat around the nest (MECP, 2021). | A male bobolink was observed within the adjacent lands but in an area that was under active agricultural uses on June 29, 2023. Active farm fields are exempt from the ESA. General mitigation measures have been provided to avoid impacts should the land use change. | Yes |
| Eastern Meadowlark | *Sturnella magna* | S4B | THR | THR | Typically require larger grasslands but have been known to breed in habitats that were 1 ha in the United States. Usually, their defended territories are of 2.8-3.2 ha of uncut meadow or field (OMNR, 2014). Personal observations of successful nesting habitat for this species in Eastern Ontario has not found any successful nesting pairs in habitats that were less than 5 ha, which is estimated to be this species' approximate area requirement (COSEWIC, 2011). Provincially, this species' protected habitat is the area extending 100 m from the nest as well as the 300 m of suitable habitat around the nest (MECP, 2013). This is outlined in Section 5.2. | Grassland bird surveys were conducted, and none were found. Most fields were under active agricultural uses and cut. General mitigation measures have been provided to avoid impacts should the land use change. | Yes |
| **BATS** | | | | | | | |
| Little Brown Myotis | *Myotis lucifugus* | S4 | END | END | Females establish summer maternity colonies, often in buildings or large-diameter trees. Foraging occurs over water, along waterways, and forest edges. Overwinter in cold and humid hibernacula (caves/mines). (COSEWIC, 2013). | MECP recommends the use of avoidance timing window for clearing of trees (>10 cm in diameter) if this | Yes |

| Common Name/ Population | Scientific Name | SRANK | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Preferred Habitat Guidelines | Evaluation | Brought Forward (Yes/No) |
|---|---|---|---|---|---|---|---|
| Northern Myotis/Northern Long-eared Bat | *Myotis septentrionalis* | S3 | END | END | Older (late successional or primary forests) with large interior habitat and snags that are in the mid-stage of decay. They prefer intact interior habitat and are sensitive to edge habitats (Menzel et al., 2002; Broders et al., 2006; SWH 6E Ecoregion Criterion Schedule) | can be accomplished then no impacts. General mitigation measures are brought forward for these species | |
| Eastern Small-footed Myotis | *Myotis leibii* | S2S3 | END | No Status | Preferred maternity roosting locations are under rocks, in rock outcrops, or in caves, mines, or hollow trees. Rarely in buildings or under bridges. In the winter, these bats hibernate, most often in caves and abandoned mines (Humphrey, 2017). Critical habitat has not yet been defined by the province. | | |
| Tri-colored Bat | *Perimyotis subflavus* | S3? | END | END | Females establish summer maternity colonies, often in buildings or large-diameter trees. Foraging occurs over water, along waterways, and forest edges. Overwinter in cold and humid hibernacula (caves/mines). (COSEWIC, 2013). | | |
| **PLANTS** | | | | | | | |
| Butternut | *Juglans cinerea* | S3? | END | END | Found in a variety of habitat types, but grows best on well-drained fertile soils in shallow valleys and on gradual slopes (COSEWIC, 2017). Provincially, butternuts are assessed and categorized based on the amount of canker. These categories are outlined in Section 5. | Suitable habitat and site are well within the range for this species. Inventory completed in 2023 identified 4 individuals. | Yes |
| **LICHEN** | | | | | | | |
| Pale-bellied Frost Lichen | *Physconia subpallida* | S3 | END | END | Interior forest/woodland species found in suitable mature forests, grows mainly on hardwood tree species of suitable bark pH, calcium content, and moisture holding capacity. This lichen requires bark with high pH and moisture holding capacity, which occur predominantly on the thicker bark of its preferred host species (e.g., *Ostrya virginiana*) (Environment Canada, 2015; COSEWIC, 2009). | No old growth on site, but several communities have low potential for this species to occur. | Yes |

Table Updated: May 4, 2023

**SRANK Definitions**

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

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

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

S#S# Range Rank, A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one rank (e.g., SU is used rather than S1S4).

? Inexact Numeric Rank—Denotes inexact numeric rank

S#B Breeding

**SARO Status Definitions**

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THR Threatened: A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.

SC Special Concern: A species with characteristics that make it sensitive to human activities or natural events.

**SARA Status Definitions**

END Endangered, a wildlife species facing imminent extirpation or extinction.

THR Threatened, a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

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

# 5. SITE INVESTIGATIONS – RESULTS

## 5.1 Site Visit Dates and Purpose

As mentioned above, some site investigations were completed previously and are also included herein. With permission, other surveys completed on adjacent lands for other proponents have been included in the background review, unless permission to include the data was provided.

A summary of the dates, times, ambient conditions, and purpose for the visits are provided in Table 4. Rainfall and water level conditions are included alongside the aquatic field work to capture the general watershed conditions at the time of the work. The vegetation communities are described in the section below, followed by the results from the species-specific surveys.

**Table 4: Summary of Dates, Times, Conditions and Purpose of Site Investigations**

| Date | Time (h) | Staff | Air Temperature (Min-Max) °C* | Cloud Cover (%) Beaufort Wind Scale [Descriptor (scale)] | Total Rainfall (mm) 7 days prior to visit* | Water Level Conditions *** | Moon Illumination | Purpose |
|---|---|---|---|---|---|---|---|---|
| July 22, 2019 | 0715-1315 | M. Lavictoire<br>M. Brochu | 16.0-22.0<br>(13.5-23.7) | 100% cloud cover<br>Wind: light air (1) | 1.8 | Water Safety Statement | n/a | -Fish Community Sampling |
| | 0715-0915 | E. Theberge<br>A. Yates | | | | | n/a | |
| July 23, 2019 | 0815-0930 | C. Fontaine<br>M. Brochu | 16.0-20.0<br>(11.2-26.6) | 0% cloud cover<br>Wind: calm (0) | 1.8 | Water Safety Statement | n/a | -Fish Community Sampling<br>-Fish Habitat Assessment |
| April 6, 2022 | 0800-0915 | M. Lavictoire | 8.0<br>(2.8-15.2) | 25% cloud cover<br>Wind: gentle breeze (3) | 3.3 | Water Safety Statement | n/a | -Fish Habitat |
| April 15, 2022 | 0800-1000 | A. Quinsey | 8.0<br>(0.9-14.1) | Partly Cloudy<br>Wind: Gentle Breeze (3) | 10.8 | Water Safety Statement | n/a | -Turtle Basking Survey |

| Date | Time (h) | Staff | Air Temperature (Min-Max) °C* | Cloud Cover (%) Beaufort Wind Scale [Descriptor (scale)] | Total Rainfall (mm) 7 days prior to visit* | Water Level Conditions *** | Moon Illumination | Purpose |
|---|---|---|---|---|---|---|---|---|
| April 28, 2022 | 1200-1330 | A. Quinsey | 6.0 (-1.5-10.3) | Clear Sky Wind: Gentle Breeze (3) | 16.9 | Flood Outlook Statement | n/a | -Turtle Basking Survey |
| May 5, 2022 | 0945-1130 | A. Quinsey | 11.0 (4.1-17.2) | Clear Sky Wind: Light Breeze (2) | 9.2 | Flood Outlook Statement | n/a | -Turtle Basking Survey |
| May 9, 2022 | 1100-1300 | M. Lavictoire | 20.0 (3.0-22.9) | 0% cloud cover Wind: calm (0) to light breeze (2) | 8.9 | Water Safety Statement | n/a | -Watercourse Delineation -Fish Habitat - Turtle Basking |
| May 10, 2022 | 1100-1245 | A. Quinsey | 20.0 (5.9-25.4) | 0% cloud cover Wind: light breeze (2) | 8.1 | Water Safety Statement | n/a | -Turtle Basking Survey -Watercourse Delineation |
| May 25, 2022 | 0830-915 1200-1315 | A. Quinsey | 13.0-20.0 (4.7-21.2) | Clear Sky Wind: Light Air (1) Light Breeze (2) | 26.9 | Water Safety Statement | n/a | -Wetland Bird Survey -Turtle Basking Survey |
| June 8, 2022 | 2215-2330 | S. Lafrance G. Fortin | 19.1 (14.2-24) | 20% cloud cover Wind: Light breeze (2) | 41 | n/a | 64.4 | -Eastern Whip-poor-will survey #1 |
| June 10, 2022 | 2200-2330 | S. Lafrance G. Fortin | 16.0 (11.3-21.7) | 5% cloud cover Wind: Light air (1) | n/a | n/a | 84.1 | -Eastern Whip-poor-will survey #2 |
| June 13, 2022 | 0730-0815 | A. Quinsey | 16.0 (11.2-22.6) | Partly Cloudy Wind: Light Air (1) | n/a | n/a | n/a | -Wetland Bird Survey |
| June 28, 2022 | 0900-0930 | A. Quinsey | 21.0 (12.7-24.7) | Clear Sky Wind: Light Breeze (2) | n/a | n/a | n/a | -Wetland Bird Survey |
| June 30, 2022 | 0000-0045 | S. Lafrance | 21.0 (10.4-25.0) | Clear Sky Wind: Light Air (1) | n/a | n/a | n/a | -Butternut Inventory |

| Date | Time (h) | Staff | Air Temperature (Min-Max) °C* | Cloud Cover (%) Beaufort Wind Scale [Descriptor (scale)] | Total Rainfall (mm) 7 days prior to visit* | Water Level Conditions *** | Moon Illumination | Purpose |
|---|---|---|---|---|---|---|---|---|
| July 15, 2022 | 2130-0010 | A. Quinsey<br>A. Rondot | 17.0<br>(11.6-27.5) | 5% cloud cover<br>Wind: Light air (1) | n/a | n/a | 96.4 | -Eastern Whip-poor-will survey #3 |
| August 3, 2022 | 1415-1730 | G. Alba<br>A. Quinsey | 25.0<br>(8,7-27.5) | Mostly Cloudy<br>Wind: Light Breeze (2) | n/a | n/a | n/a | -Butternut Evaluation |
| August 16, 2022 | 1415-1730 | C. Little<br>A. Quinsey | 21.7<br>(15.8-27.5) | Clear Skies<br>Wind: Light Breeze (2) | n/a | n/a | n/a | -Butternut Evaluation |
| May 17, 2023 | 1200-1330 | S. Lafrance<br>A. Quinsey | 7.0<br>(-0.2-9.9) | Mainly Clear<br>Wind: gentle breeze (3) | 0.4 | Flood Warning | n/a | - Review of potential aquatic habitat<br>- Amphibian egg mass survey |
| May 23, 2023 | 2245-2300 | A. Quinsey | 15.0<br>(2.6-23.6) | Mostly Cloudy<br>Wind: light breeze (2) | n/a | n/a | n/a | -Amphibian Survey |
| June 4, 2023 | 0645-0745 | A. Quinsey | 11.0<br>(6.2-23.0) | Mainly Clear<br>Wind: light air (1) | n/a | n/a | n/a | - Grassland Bird Survey |
| June 19, 2023 | 0645-0745<br>2250-2330 | A. Quinsey<br>A. Siddiqui<br>J. Zientek | 15-18.0<br>(12.7-22.9) | Mainly Clear<br>Wind: none (0) | n/a | n/a | n/a | - Grassland Bird Survey<br>-Amphibian Survey |
| June 29, 2023 | 0700-0815 | A. Quinsey | 21.0<br>(12.8-26.2) | Mainly Clear<br>Wind: light air (1) | n/a | n/a | n/a | - Grassland Bird Survey |

M. Lavictoire – Michelle (Nunas) Lavictoire – B. Sc. Wildlife Resources and M.Sc. Natural Resources
C. Fontaine - Cody Fontaine - Fisheries and Wildlife Technologist
M. Brochu – Melissa Brochu – M. Sc. Environmental and Life Sciences and Fisheries and Wildlife Technician
E. Theberge – Elysabeth Theberge —B.Sc., M.Sc. Biology
A. Yates – Abby Yates – B.Sc. Env. Ecology
A. Quinsey – Al Quinsey – B.Sc. Environnemental Biology
S. Lafrance – Sophie Lafrance – B.Sc. Biology, Graduate Diploma in Ecosystem Restoration

C. Little – Casey Little – Graduate Diploma, Ecosystems Management
G. Alba - Guillermo Alba – M.Sc. Ecology
A. Siddiqui – Amal Siddiqui – B.Sc. Biology, MFC Forestry
J. Zientek – Jake Zientek – Graduate Diploma, Fisheries and Wildlife Technician

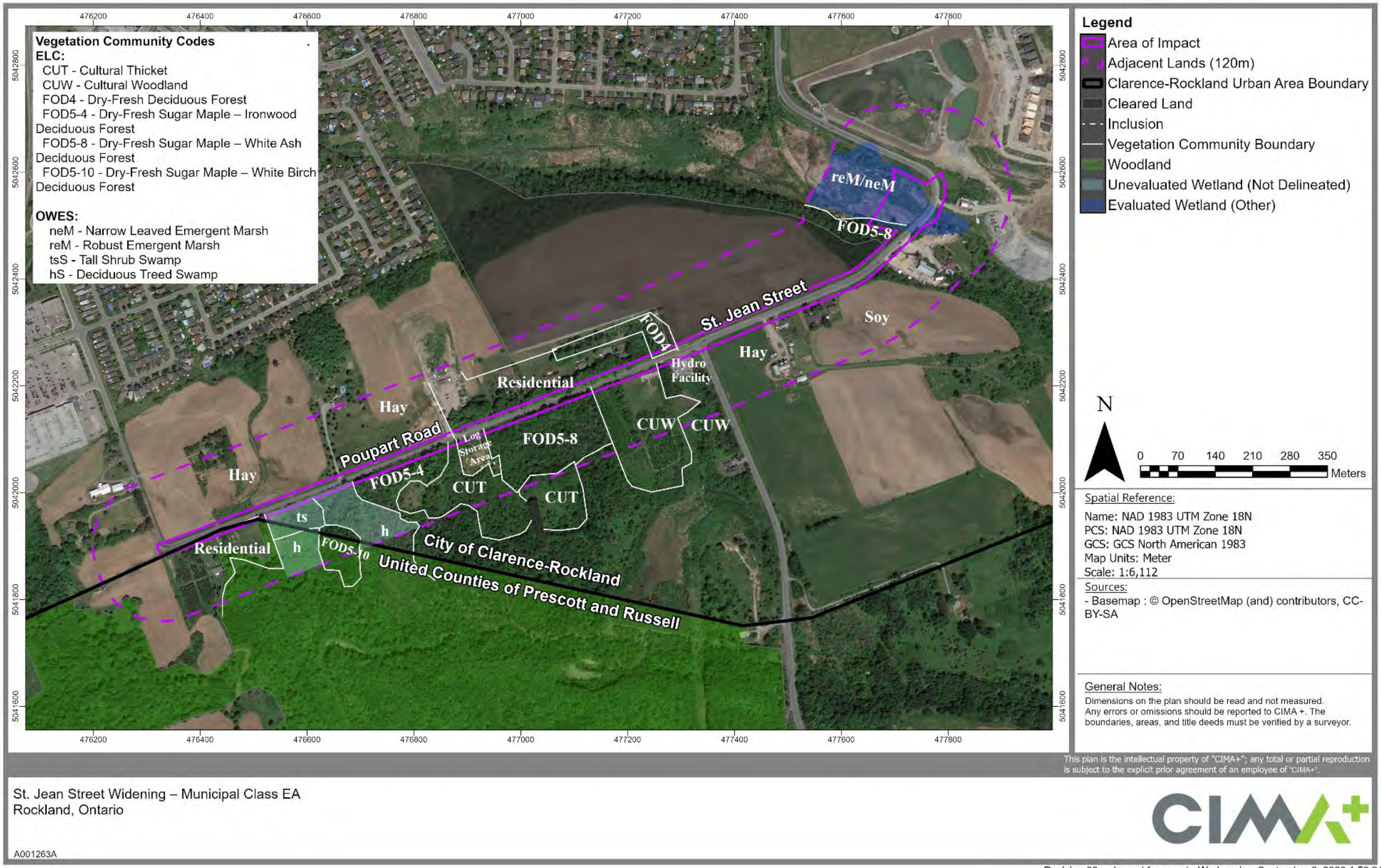
*Min-Max Temp Taken From: Environment Canada. National Climate Data and Information Archive. Available http://climate.weatheroffice.gc.ca/ [June 12, 2023]
**Water Level Conditions taken from South Nation Conservation Authority: https://www.nation.on.ca/

## 5.2 Terrestrial and Wetland Community Descriptions

The site was visited many times during the growing seasons to document various natural heritage features, including vernal pools. The vegetation communities (minimum size 0.5 ha as per both ELC and OWES, unless a significant smaller community is identified) are described below along with the dominant plant species and a representative photograph. There were no smaller communities on this site that warranted delineation. The habitat includes one wetland, described by an OWES certified evaluator. The vegetation descriptions for the natural communities are provided in the paragraphs below. These descriptions include the most dominant flora species (in order of decreasing abundance), comments on items such as vernal pools, and a representative photograph. The lands on site contain a mixture of agricultural fields (crops), and natural environments. The natural environment includes:

- Cultural Thickets (dominated by shrub species that provide >25% cover and have <25% tree cover)
- Cultural Woodland (have between 35-59% tree cover)
- Deciduous Forests (communities with >75% canopy cover by deciduous trees)
- Marsh (wetland plant species provide 50% or more cover, and community contains <25% of woody vegetation, and <50% low shrubs).
- Tall Shrub Swamp (wetland plant species provide 50% or more cover; and community is dominated by woody species that are at least 1m tall)
- Deciduous Swamp (wetland plant species provide 50% or more cover; and community is dominated by woody species that are at over 6m tall)

## Figure 7: Vegetation Communities

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### 5.2.1 Terrestrial Communities

**Cultural Thicket (CUT)**
There were two cultural thickets situated next to one another. The western community was located just south of the log storage area. Overall, the tree cover was 20% (deciduous trees) and the shrub cover was 40%. The canopy was 3-4 m tall and provided 40% cover. It consisted of staghorn sumac. There was no sub-canopy present. The understory (1 m tall; 20% cover) consisted of wild red raspberry, and purple flowering raspberry. The ground layer provided 100% cover and included: tall goldenrod, flat topped white aster, Canada goldenrod, and rough goldenrod. There was one inclusion noted within this community, a small red pine coniferous plantation. The average DBH was 10-20 cm. The canopy (the only layer) was 10-12 m tall and provided 100% cover. It consisted of red pines which were clearly planted (in rows).

The east community had an overall tree cover of 20% (deciduous trees) and the shrub cover was 40%. The canopy was 3-4 m tall and provided 40% cover. It was dominated by apples followed by hawthorns, white ash, and staghorn sumac. There was no sub-canopy present. The understory (1 m tall; 20% cover) consisted of wild red raspberry, common blackberry, and purple flowering raspberry. The ground layer provided 100% cover and included: Canada goldenrod, late goldenrod and rough goldenrod.

Photo 1: Sumac Cultural Thicket (CUT1-1) – West (September 1, 2022)

**Photo 2: Cultural Thicket (CUT) – East Community (September 1, 2022)**

**Cultural Woodland (CUW)**

There were also two cultural woodland communities situated next to each other at the southwest corner of Poupart and St. Jean. The west community had an overall tree cover of 40-55% (deciduous trees) and the shrub cover was 30%. The canopy was 3-4 m tall and provided 40-55% cover. It was dominated by American elm followed by common buckthorn, white ash, staghorn sumac, and balsam poplar. There was no sub-canopy present. The understory (1 m tall; 30% cover) consisted of common blackberry, purple flowering raspberry, and red-osier dogwood. The ground layer provided 100% cover and included: Canada goldenrod, rough goldenrod, and tall goldenrod. Fencing and trails were present within this community. An inclusion was located within the southeastern portion of this community and consisted of a cultural thicket dominated by staghorn sumac.

The east community was located along St. Jean Street. The canopy was 8-10 m tall and provided 10-50% cover (variable). It was dominated by trembling aspen followed by white ash. The sub-canopy (6 m tall; 10-50% cover) was dominated by trembling aspen and staghorn sumac followed by white ash and white pine. The understory (4 m tall; 40% cover) consisted of staghorn sumac, pussy willow and balsam poplar. The ground layer provided 100% cover and included: grasses, tall goldenrod, and wild parsnip. There was a wetland patch consisting of speckled alder adjacent to the watercourse running along the south end.

**Photo 3: Cultural Woodland (CUW) – West Community (September 1, 2022)**


**Photo 4: Cultural Woodland (CUW) – East Community (September 1, 2022)**

**Dry-Fresh Deciduous Forest (FOD4)**

This deciduous forest community consisted of a remnant patch of deciduous forest around the houses along Poupart Road, abutting the northern edge of the site. This community was disturbed by trails. The forest cover was entirely deciduous trees with an average DBH of 15 cm. The vegetation was variable. The canopy varied between 6-12 m tall and provided 60% cover. Along the northern edge the community was dominated by trembling aspen (average 15-20 cm) followed by white ash (DBH 10-15 cm) and some American elm (DBH 14-21 cm). Along the road there was more basswood (DBH 10-25 cm) and sugar maple (DBH 10-35 cm). Where the sub-canopy was present it had an average height of 3-4 m and provided 30% cover. The primary species were staghorn sumac, common buckthorn, and young white ash. The understory varied from 0.5-2 m and 60% cover to 2-4 m tall and 25% cover. The species composition of this layer included to varying degrees: purple flowering raspberry, sugar maple, alternate-leaved dogwood, prickly-ash, common buckthorn and American elm. In the areas with a sub-canopy the ground layer provided 20% cover and was dominated by Virginia creeper and riverbank grape. In the areas without a sub-canopy the ground cover was up to 70% and was dominated by grasses, large flowered trillium, and dame's rocket.


**Photo 5: Dry-Fresh Sugar Maple (FOD4) (May 17, 2023)**

**Dry-Fresh Sugar Maple – Ironwood Deciduous Forest (FOD5-4)**

This deciduous forest community is the easternmost forest, south of Poupart Road and just west of the log storage area. Selective tree removal was noted within this community which results in varying tree cover (60-100%) and dominance. The canopy was 10-12 m tall and provided 60% cover. It was dominated equally by sugar maple (avg DBH 25-30cm, range 20-30cm), and bitternut hickory (avg DBH 20cm, range 20-32cm) followed by dead white ash (avg DBH 30cm, range 30cm). The sub-canopy (6-8 m tall; 60% cover) was dominated by sugar maple followed by ironwood, and bitternut hickory. The understory (1-3 m tall; 40% cover) consisted of sugar maple followed by bitternut hickory. The ground layer provided 10% cover and included: grasses, northern lady fern, and blue cohosh. There was evidence of vernal pools.


**Photo 6: Dry-Fresh Sugar Maple – Ironwood Deciduous Forest (FOD5-4) (May 17, 2023)**

**Dry-Fresh Sugar Maple – White Ash Deciduous Forest (FOD5-8)**

There were two Dry-Fresh Sugar Maple – White Ash Deciduous Forest communities along the right-of-way. The first was located south of the road, halfway along Poupart Road. Overall, the tree cover was 90% (deciduous trees). The average DBH was 25-30 cm. The canopy was 8-14 m tall and provided 80% cover. It was dominated by sugar maple (85%; avg DBH 25-30cm, range 15-30cm) followed by white ash (10%; avg DBH 25-30cm, range 15-30cm), and American elm (5%; avg DBH 21cm, range 21cm). The sub-canopy (4-6 m tall; 60% cover) was dominated equally by white ash and sugar maple followed by ironwood. The understory (0.5-2 m tall; 90% cover) was dominated by sugar maple followed by white ash, bitternut hickory, prickly gooseberry, and prickly-ash (some area near the edge of the community had a higher percentage of prickly-ash). The ground layer provided 1% cover and included: Virginia creeper, early blue cohosh, and northern lady fern. Some evidence of vernal pools was noted.

The second was a long narrow band of primarily deciduous trees was present along the top and along the valley wall of Lafontaine Creek (size 5.5 ha). The average DBH of the community was 15-20 cm though several trees with a DBH over 25 cm were present. The outer edge of this community consisted solely of a narrow band of staghorn sumac. The canopy was 8-10 m tall and provided 75% canopy cover. The dominant species were sugar maple (average DBH 20 cm, range 16-53 cm) and white ash (average DBH 20 cm, range 15-55 cm) followed by Manitoba maple (average DBH 25 cm, range 25-42 cm). The sub-canopy (4-6 m tall; 15% cover) consisted of white ash with some Manitoba maple and common buckthorn. The understory (1-3 m tall; 60% cover) included common buckthorn, young ironwood and then white ash. The ground layer (10% cover) was dominated by Virginia creeper, Canada enchanter's nightshade and false Solomon's seal.


**Photo 7: Dry-Fresh Sugar Maple – White Ash Deciduous Forest (FOD5-8) (May 17, 2023)**

**Photo 8: FOD5-8 – Dry-Fresh Sugar Maple – White Ash Deciduous Forest (July 24, 2013)**

### Dry-Fresh Sugar Maple – White Birch Deciduous Forest (FOD5-10)

This small community was located within the adjacent lands on the west side of the Site, south of Poupart Road. Overall, the tree cover was 100% consisting of deciduous trees. The average DBH was 5-13 cm. The dominant layer was the canopy which was 9 m tall and provided 90% cover. It was dominated by sugar maple (80%; avg DBH 15cm, range 5-15cm) followed by white birch (20%; avg DBH 25-30cm, range 25-30cm). The sub-canopy (8 m tall; 40% cover) consisted of white birch. The understory (1 m tall; 1% cover) was dominated by sugar maple followed by black maple, and bitternut hickory. There was no ground layer noted.


**Photo 9: View of FOD5-10 community within the Site**

### 5.2.2 Wetland Communities

**Narrow-leaves / Robust Emergent Marsh**

This marsh community was located with the northeastern portion of the site, part of Lafontaine River Marsh. The community included a mixture of narrow leaved emergent marsh and robust emergent marshes with two forms: the dominant form was either narrow leaved emergent (reed canary grass and lake bank sedge) or robust emergent (broad leaved cattail). Lafontaine Creek ran through middle of this community and is described in Section 5.2.2.

**Photo 10: Narrow Leaved Emergent Marsh (June 13, 2022)**

**Tall Shrub Swamp**

This community was located along the west side of the alignment, on the south side of Poupart Road. The community was a swamp with three forms: the dominant form was tall shrub (speckled alder, slender willow, pussy willow, and black willow), followed by narrow-leaved emergent (reed canary grass, bladder sedge, and greenish sedge), and herbaceous (sensitive fern, water horsetail, and spotted joe-pye-weed.

**Photo 11: Tall Shrub Swamp – Wetland 2 (September 1, 2022)**

**Deciduous Swamp**

There were two deciduous swamps within the site, both within the wetland on the west side of the alignment.

The west community was a deciduous tree swamp with three forms: the dominant form was deciduous trees (American elm, red maple, trembling aspen, and dying green ash), followed by narrow-leaved emergent (grasses, and sedges), and herbaceous (sensitive fern, wood nettle, and spotted jewel-weed). No surface water was noted within this community.

The second community abutted Poupart Road. The community was a deciduous tree swamp with four forms: the dominant form was deciduous tree (green ash, red maple, and black ash), followed by tall shrub (speckled alder, slender willow, pussy willow, and black willow), narrow-leaved emergent (reed canary grass, bladder sedge, and greenish sedge), and herbaceous (sensitive fern, water horsetail, and spotted joe-pye-weed).


**Photo 12: Deciduous Swamp – West Community (September 1, 2022)**

Photo 13: Deciduous Swamp – West Community (September 1, 2022)

### 5.2.3 Terrestrial and Wetland Fauna Inventories

#### 5.2.3.1 Wetland Birds

Wetland breeding bird surveys were conducted on May 25, June 13, and June 28, 2022. In total 23 species of birds were within the adjacent lands (Table 5). Of these, 10 species were found to likely be nesting on site or within the adjacent lands: red-eyed vireo, grey catbird, yellow warbler, American redstart, common yellowthroat, song sparrow, swamp sparrow, northern cardinal, and American goldfinch. During the turtle basking surveys an additional 18 species were observed during the breeding season: Canada goose, wood duck, mallard (pair), American bittern, green heron, turkey vulture (flyover), bald eagle (flyover) (Special Concern), northern harrier (flyover), killdeer, spotted sandpiper, solitary sandpiper, greater yellowlegs, belted kingfisher, eastern phoebe, tree swallow, chipping sparrow, dark-eyed junco, and house finch. No Threatened or Endangered species were observed.

Table 5: Wetland Bird Survey Results

| Common Name | Scientific Name | May 25, 2022 | June 13, 2022 | June 28, 2022 |
|---|---|---|---|---|
| **Great Blue Heron** | *Ardea herodias* | 1 | | |
| **Mourning Dove** | *Zenaida macroura* | 1 | | 1 |
| **Hairy Woodpecker** | *Picoides villosus* | 1 | | |

| Common Name | Scientific Name | May 25, 2022 | June 13, 2022 | June 28, 2022 |
|---|---|---|---|---|
| **Northern Flicker** | *Colaptes auratus* | | | 1 |
| **Red-eyed Vireo** | *Vireo olivaceus* | 1 | 1 | 1 |
| **Blue Jay** | *Cyanocitta cristata* | 1 | | |
| **American Crow** | *Corvus brachyrhynchos* | | 1 | |
| **Black-capped Chickadee** | *Poecile atricapilla* | | | 1 |
| **White-breasted Nuthatch** | *Sitta carolinensis* | 1 | | |
| **American Robin** | *Turdus migratorius* | | 1 | 1 |
| **Gray Catbird** | *Dumetella carolinensis* | | 1 | 1 |
| **Cedar Waxwing** | *Bombycilla cedrorum* | | | 1 |
| **Yellow Warbler** | *Dendroica petechia* | 3 | 1 | |
| **American Redstart** | *Setophaga ruticilla* | 1 | 1 | |
| **Common Yellowthroat** | *Geothlypis trichas* | 4 | 2 | |
| **Song Sparrow** | *Melospiza melodia* | 2 | 1 | 2 |
| **Swamp Sparrow** | *Melospiza georgiana* | 3 | 2 | 1 |
| **Northern Cardinal** | *Cardinalis cardinalis* | 1 | 1 | |
| **Rose-breasted Grosbeak** | *Pheucticus ludovicianus* | | | 2 |
| **Red-winged Blackbird** | *Agelaius phoeniceus* | 14 | 8 | 7 |
| **Common Grackle** | *Quiscalus quiscula* | | 1 | |
| **Baltimore Oriole** | *Icterus galbula* | | 1 | |
| **American Goldfinch** | *Carduelis tristis* | 1 | 2 | 1 |

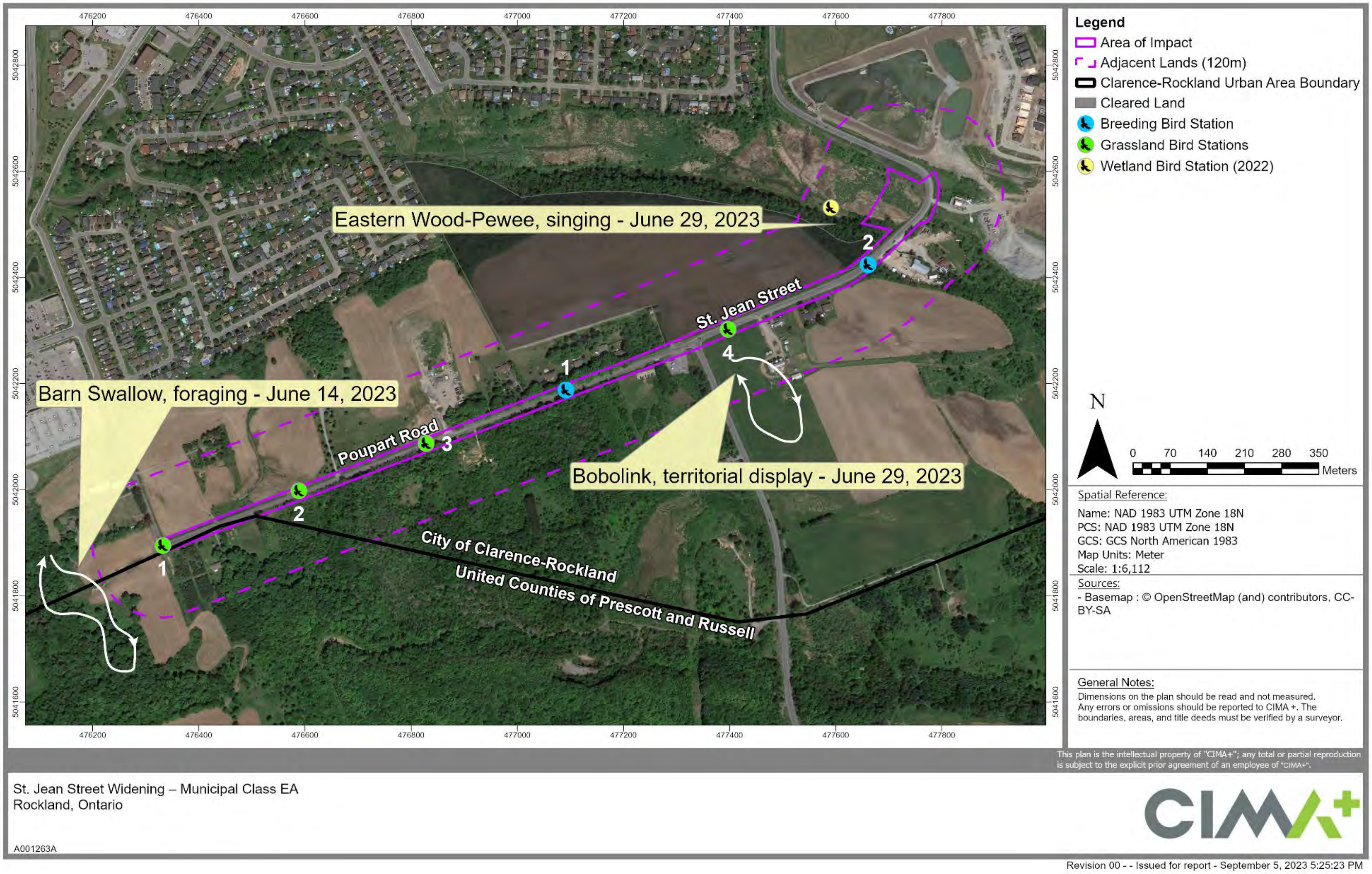
### 5.2.3.2 Grassland and General Breeding Bird Results

Daytime breeding bird surveys were conducted on June 4, June 14, and June 29, 2023. In total 41 species of birds were observed on site and within the adjacent lands (Appendix B). Of these, 16 species were found to likely be nesting on site or within the adjacent lands (Table 6). A bobolink (threatened) was observed on June 29, displaying over the field southeast of the corner of St. John and Poupart. This species is discussed further in the species at risk section of the report. Two species of conservation value were observed (barn swallow and eastern wood-pewee). Neither of these species were observed on a second occasion and as such are not likely to be breeding on site.

**Table 6: Probable and Confirmed Breeding**

| Common Name | Scientific Name | SRank | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status | Highest Breeding Evidence |
|---|---|---|---|---|---|
| **Rock Dove** | *Columba livia* | SNA | No Status | No Status | AE |
| **Eastern Phoebe** | *Sayornis phoebe* | S5B | No Status | No Status | T |
| **Red-eyed Vireo** | *Vireo olivaceus* | S5B | No Status | No Status | T |
| **Blue Jay** | *Cyanocitta cristata* | S5 | No Status | No Status | T |
| **Black-capped Chickadee** | *Poecile atricapilla* | S5 | No Status | No Status | T |
| **White-breasted Nuthatch** | *Sitta carolinensis* | S5 | No Status | No Status | P |
| **American Robin** | *Turdus migratorius* | S5B | No Status | No Status | T |
| **American Redstart** | *Setophaga ruticilla* | S5B | No Status | No Status | T |
| **Common Yellowthroat** | *Geothlypis trichas* | S5B | No Status | No Status | T |
| **Chipping Sparrow** | *Spizella passerina* | S5B | No Status | No Status | T |
| **Savannah Sparrow** | *Passerculus sandwichensis* | S4B | No Status | No Status | T |
| **Song Sparrow** | *Melospiza melodia* | S5B | No Status | No Status | T |
| **Northern Cardinal** | *Cardinalis cardinalis* | S5 | No Status | No Status | T |
| **Indigo Bunting** | *Passerina cyanea* | S4B | No Status | No Status | T |
| **Red-winged Blackbird** | *Agelaius phoeniceus* | S4 | No Status | No Status | T |
| **American Goldfinch** | *Carduelis tristis* | S5B | No Status | No Status | T |

## Figure 8: Observed Species at Risk and Species of Conservation Value Birds



#### 5.2.3.3 Turtle Inventory - 2022

The only potential overwintering habitat for turtles was in the Lafontaine River Marsh. Turtle basking surveys were conducted there on April 15, 28, May 5, 9, 10, 25, 2022. Two species were observed: midland painted turtles and common snapping turtles. Most turtles were located in the wider ponded habitats far downstream of St. Jean Street, away from this project's footprint, rather than the more channelized sections nearer to St. Jean Street. No threatened or endangered turtles were encountered.

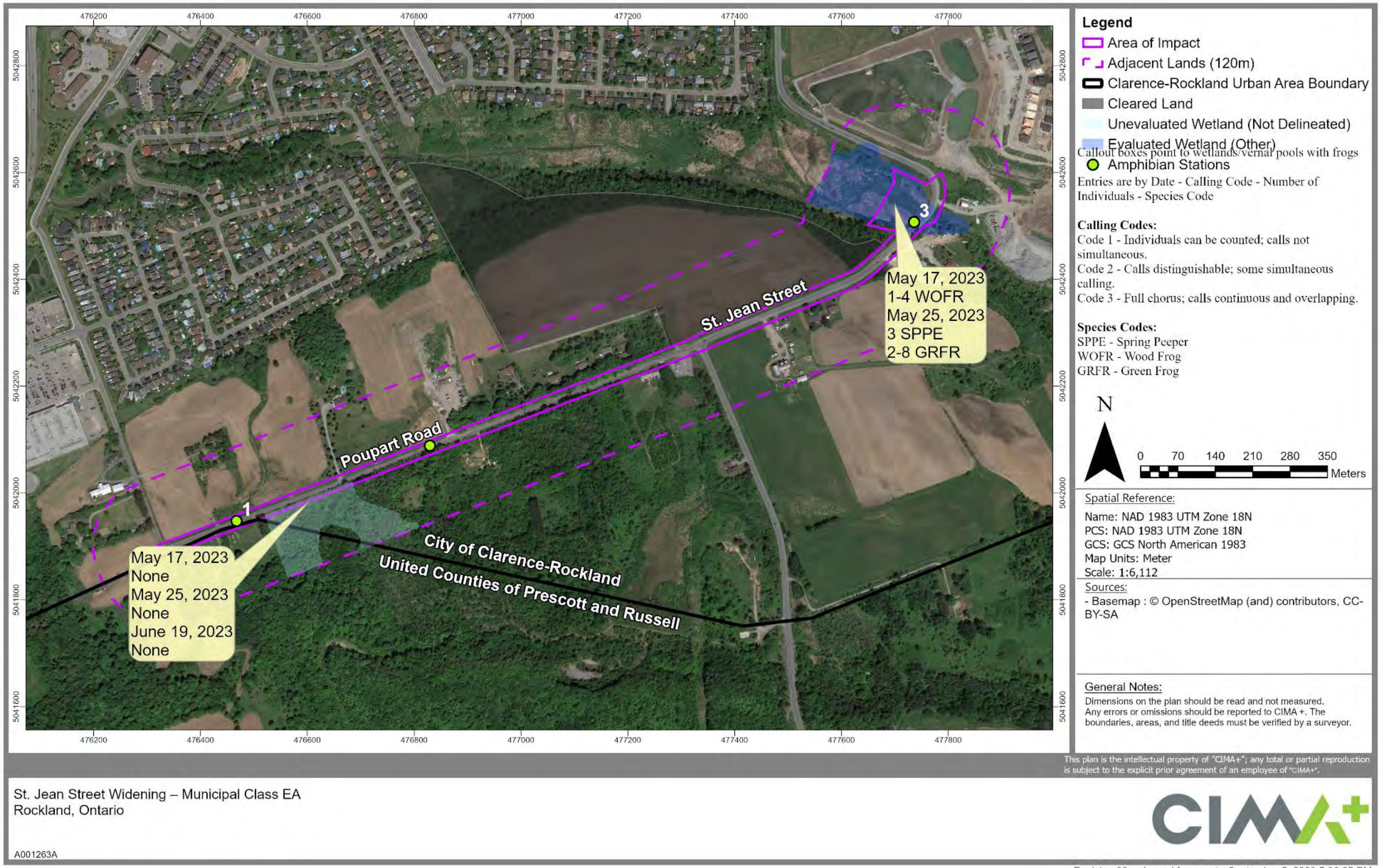
**Table 7: Summary of Turtle Observations (2022)**

| Date | Turtles Observed |
|---|---|
| **April 15, 2022** | None |
| **April 28, 2022** | Midland Painted Turtle: 9 |
| **May 5, 2022** | Midland Painted Turtle: 13<br>Common Snapping Turtle: 2 |
| **May 9, 2022** | Midland Painted Turtle: 2<br>Common Snapping Turtle: 1 |
| **May 10, 2022** | Midland Painted Turtle: 39<br>Common Snapping Turtle: 7 |
| **May 25, 2022** | Midland Painted Turtle: 4<br>Common Snapping Turtle: 9 |

#### 5.2.3.4 Amphibian Surveys

The amphibian surveys included two nighttime visits on, May 25 and June 19, 2023. These visits took place in the in the evening as per the methods listed in Section 2, and on days with appropriate weather conditions. Because the first April survey period was missed, a daytime visit was made on May 17, 2023, to look for amphibian egg masses in the vernal pools, none were found within the St. Jean Street widening Site. This habitat was dry. While amphibians were heard calling from all survey points, there was no amphibian habitat along the alignment area of impact outside of the Lafontaine River Marsh. All other observations were calling from further away and consisted of a few gray treefrogs and spring peppers. The results within the Area of Impact consisted of a few individuals bellowing to three species (wood frog, spring peeper, and green frog) and are depicted on the figure below (Figure 9).

## Figure 9: Amphibian Survey Results within the Area of Impact

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## 5.3 Fish Habitat and Fish Community

The potential for fish habitat along the entire length of the proposed works was reviewed in 2023. This visit confirmed that the habitats remained the same as observed during previous surveys. The only fish habitat that would be crossed is Lafontaine Creek. Information collected by Bowfin from 2008 to 2019 and from CIMA+ in 2022 has been used for this section. The data from 2008 was used to describe the downstream section of Lafontaine Creek (Station 1) and consisted of habitat description and fish community sampling through the use of traps. The two stations centred around St. Jean Street (Stations 2 and 3) were surveyed in 2019 using hoop nets and backpack electrofishing.

### 5.3.1 Lafontaine Creek

Lafontaine Creek, a tributary to the Ottawa River (Lac Dollars-des-Ormeaux reach), is approximately 5.3 km in length. The land use surrounding Lafontaine Creek (in and outside of this Site's study area) vary from agricultural fields, meadows, forests to wetlands. The works associated with St. Jean Street roughly 1020m upstream from the confluence with the Ottawa River. The portion of the channel within this area of focus, downstream of St. Jean Street, travels within the Lafontaine River Marsh.

The channel upstream of St. Jean Street is defined within a narrow valley. There, the floodplain floods periodically, but not for long periods (see Photo 14). From here, the water travels through a 1500mm diameter CSP culvert into the Lafontaine River Marsh. Monitoring of this channel over the years has found that there is little fish habitat within the wetland itself as the flow is typically confined to the channel (Photo 15). The extent of the wetland habitat that becomes flooded is ephemeral in nature and is depicted in Photo 18. In addition to the main channel through the wetland, there is ponding at the base of the steep south valley wall. The portions of this ponding that are accessible to fish for at least a period of the year are depicted as fish habitat on the figures herein (Photo 16 and Photo 17). Additional flow, originating from a stormwater management facility north of St. Jean Street, reaches the main channel about 215m downstream of the culvert (Figure 10). The channel then splits into two at another 160m downstream of this influx of flow. For the next 500m, the fish habitat is no longer confined to the two channels but includes smaller secondary channels in the marsh (Photo 19 and Photo 20). Outside of this smaller channels, the marsh habitat itself remains dry despite the presence of a beaver dam observed in the same location since surveys began in 2008 (Photo 21). The final length of Lafontaine Creek investigated and depicted on the figures herein, consists of a confined single channel (Photo 22).

## Figure 10: Information Collected by Bowfin and CIMA+ on Lafontaine Creek

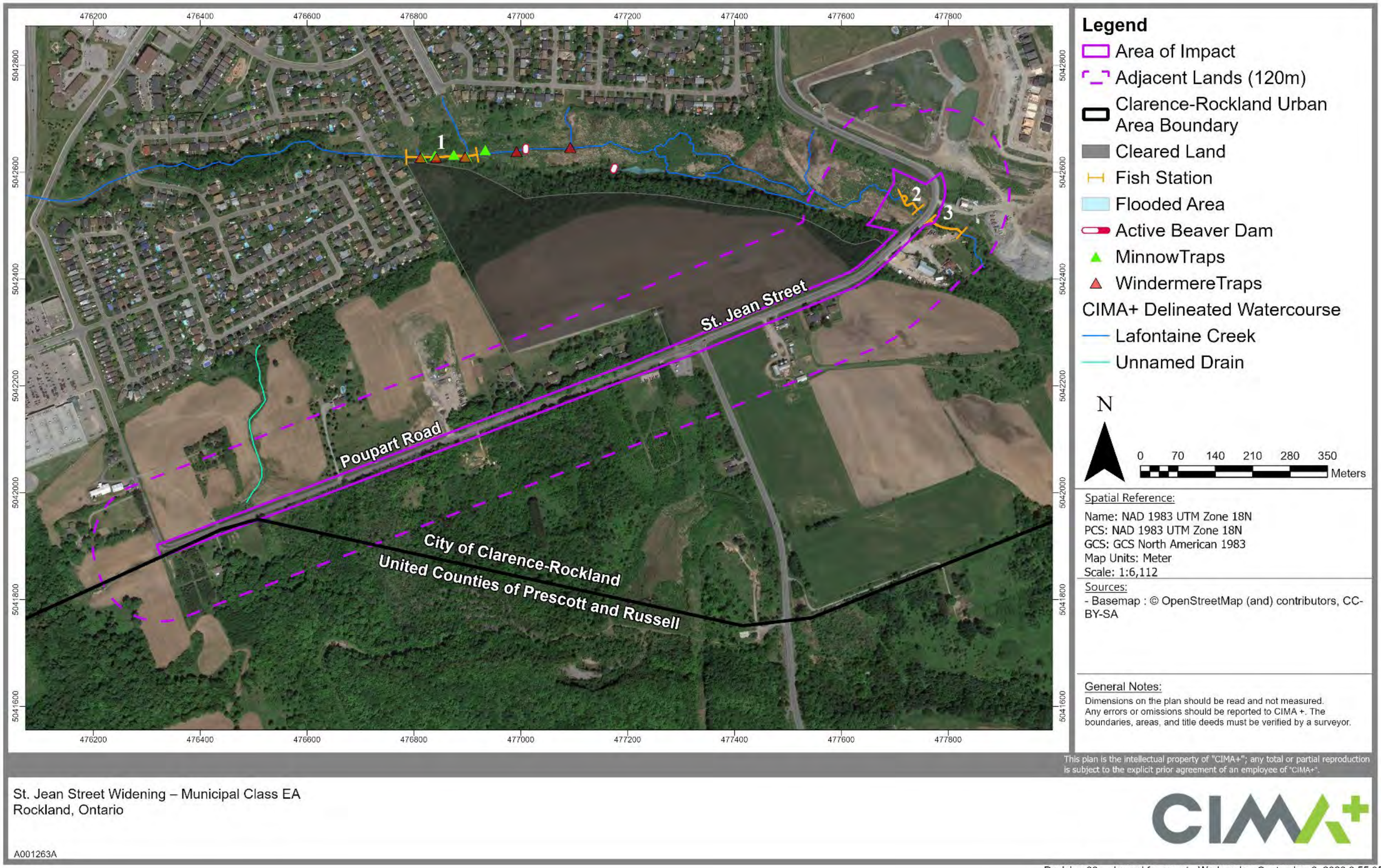


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**Photo 14 : Looking upstream from St. Jean Street (May 9, 2022)**

**Photo 15 : Looking downstream at Station 2 (April 16, 2019)**


**Photo 16: Further downstream where channel approaches the valley banks (May 9, 2022)**

**Photo 17: Further downstream where channel approaches the valley banks (May 9, 2022)**

**Photo 18: Looking at the cattail marsh portion of the wetland with little water (May 10, 2022)**

**Photo 19: Further downstream looking towards the wetland, just upstream of the beaver dam in the next photograph, wetland is not inundated (May 9, 2022)**


**Photo 20: Portion of wetland flooded by beaver dam in next photo (May 9, 2022)**


**Photo 21: Downstream beaver dam (noted during visits since 2008) (April 6, 2022)**


**Photo 22 : Looking downstream from near the downstream end of Lafontaine River Marsh (towards Lemay Circle) (April 8, 2022)**

#### 5.3.1.1 Station 1

Station 1 was situated near the downstream of the site and was 280 m in length. On July 29, 2008, the wetted width was 4.8 m with an average water depth of 69 cm (range: 13-111 cm). The habitat was a glide.

The substrate consisted exclusively of fines. In-water cover consisted of aquatic vegetation (yellow water lily, lesser duckweed, frog bite, Canada waterweed, slender pondweed, floating burreed, coontail, flowering rush and algae), overhanging vegetation (purple loosestrife, reed canary grass, tufted vetch, common burdock, sedges, and goldenrod), and large woody debris. This station was poorly shaded.

The tops of the banks were fully vegetated with mostly herbaceous and some woody species. The most common species were purple loosestrife, reed canary grass, tufted vetch, common burdock, sedges, goldenrod, and staghorn sumac. No canopy cover was present.

The fish community was sampled in the spring with minnow and Windemere traps set overnight on April 24, 2008, and April 29, 2008, respectively. No fish were captured using the minnow traps. A total of 41 fish representing 10 species were captured with the Windermere traps (Table 8). In the summer, only Windemere traps were set on July 22, 2008, as they provided the highest efficiency during spring sampling. A total of 295 fish representing 8 species were captured.

**Table 8: Station 1 - Spring and Summer Catch (2008)**

| Species Name | Scientific Name | Station 1 No. of fish (size range, mm) | |
|---|---|---|---|
| | | **April 29, 2008 (Windemere Traps)** | **July 22, 2008 (Windemere Traps)** |
| Northern Pike | *Esox lucius* | | 4 (104-172) |
| Central Mudminnow | *Umbra limi* | 8 (59-174) | 0 |
| Brassy Minnow | *Hybognathus hankinsoni* | 1 (69) | 0 |
| Common Shiner | *Luxilus cornutus* | 2 (75-92) | 115 (75-141) |
| Golden Shiner | *Notermigonus crysoleucas* | 0 | 1 (78) |
| Spottail Shiner | *Notropis hudsonius* | 6 (61-74) | 0 |
| Northern Redbelly Dace/Finescale Dace | *Phoxinus eos/ P. neogaeus* | 2 (57-60) | 0 |
| Bluntnose Minnow | *Pimephales notatus* | 0 | 1 (55) |
| Fathead Minnow | *Pimephales promelas* | 3 (49-60) | 0 |
| Creek Chub | *Semotilus atromaculatus* | 1 (125) | 87 (53-195) |
| White Sucker | *Catostomus commersonii* | 2 (118-136) | 54 (110-229) |
| Tadpole Madtom | *Noturus gyrinus* | 5 (64-73) | 0 |
| Brook Stickleback | *Culaea inconstans* | 11 (36-53) | 0 |
| Pumpkinseed | *Lepomis gibbosus* | 0 | 22 (55-117) |
| Yellow Perch | *Perca flavescents* | 0 | 11 (54-153) |
| **Effort** | | **5 Traps** | **5 Traps** |
| **Total No. Species** | | **10** | **8** |
| **No. Individuals** | | **41** | **295** |

**Photo 23 : Looking upstream from downstream at Station 1 (July 29, 2008)**

#### 5.3.1.2 Station 2

Station 2 was situated just downstream of St Jean Street on its north side, and was 60 m in length. The average channel width was 2.3 m and the average bankfull height was 37 cm. On April 17, 2019, the wetted width was 3.3 m with an average water depth of 43 cm (range: 25-77 cm). The May 12 wetted width and water depth were 1.5 m and 34 cm (range: 22-64 cm), respectively. By July 22, the wetted width was 1.8 m with an average water depth of 20 cm (range: 0-53 cm). The habitat consisted of a mix of pools and glides.

The substrate consisted mostly of fines with some gravel. In-water cover consisted of overhanging vegetation (reed canary grass), undercut banks, and pools. Deeper pools were located near the St Jean culvert, but more shallow pools were located throughout (55-60 cm in the spring). Portions of this station were shaded by the tall overhanding herbaceous vegetation in the summer.

The tops of the banks were fully vegetated with herbaceous vegetation species. The most common species were reed canary grass, field bindweed, jewelweed, bittersweet nightshade and hog peanut. No canopy cover was present.

The fish community was sampled three times: once during the early spring to look for upstream migrating northern pike (overnight set of a single hoop net), again later in the spring (backpack electrofishing), and a third time in the summer (one hoop net and backpack electrofishing). The hoop net, set on April 17, 2019, did not capture any adult pike but did catch 5 fish representing 4 species: common shiner, creek chub, brook stickleback and white suckers (Table 9).

The spring electrofishing on May 12, 2019, took place over an area of approximately 90 $m^2$ for 648 seconds. A total of 9 fish representing 3 species were captured: brassy minnow, creek chub, and white sucker (**Table 9**).

Summer sampling (July 22-23, 2019) captured 8 species between the two sampling methods. The hoop net captured a total of 31 fish representing 6 species: central mudminnow, common shiner, fathead minnow, creek chub and white sucker. The electrofishing which sampled approximately 108 $m^2$ for 386 seconds captured 15 fish representing 4 species: northern pike, common shiner, creek chub, and pumpkinseed (**Table 9**). The northern pike was a young-of-the-year (YOY).

**Table 9: Station 2 - Spring and Summer Catches (2019)**

| Species Name | Scientific Name | Station 2 No. of fish (size range, mm) | | | |
|---|---|---|---|---|---|
| | | April 17, 2019 (Hoop Net) | May 12, 2019 (Electrofishing) | July 22, 2019 (Hoop Net) | July 22, 2019 (Electrofishing) |
| Northern Pike | *Esox lucius* | 0 | 0 | 0 | 1 (95) |
| Central Mudminnow | *Umbra limi* | 0 | 0 | 3 (94-100) | 0 |
| Brassy Minnow | *Hybognathus hankinsoni* | 0 | 2 (70-75) | 0 | 0 |
| Common Shiner | *Luxilus cornutus* | 1 (145) | 0 | 6 (56-99) | 2 (88-91) |
| Fathead Minnow | *Pimephales promelas* | 0 | 0 | 3 (55-62) | 0 |
| Creek Chub | *Semotilus atromaculatus* | 1 (65) | 6 (55-176) | 1 (129) | 9 (66-115) |
| White Sucker | *Catostomus commersonii* | 2 (108-194) | 1 (100) | 3 (97-100) | 0 |
| Brook Stickleback | *Culaea inconstans* | 1 (50) | 0 | 0 | 0 |
| Pumpkinseed | *Lepomis gibbosus* | 0 | 0 | 15 (50-87) | 3 (50-60) |
| **Effort** | | **1 Hoop Net** | **7s/m$^2$** | **1 Hoop Net** | **4s/m$^2$** |
| **Total No. Species** | | **4** | **9** | **6** | **4** |
| **No. Individuals** | | **5** | **3** | **31** | **15** |


**Photo 24 : Station 2 looking upstream from the downstream end (May 25, 2022)**

#### 5.3.1.3 Station 3

Station 3 was situated just upstream of the culvert on the west side of St Jean Street, and was 67 m in length. The average channel width was 2.9 m and the average bankfull height was 34 cm. On April 17, 2019, the wetted width was 2.0 m with an average water depth of 54 cm (range:42-78 cm). The May 12 wetted width and water depth were 2.6 m and 17 cm (range: 8-45 cm), respectively. By July 22, the wetted width was 2.0 m with an average water depth of 15 cm (range: 0-49 cm). The habitat consisted of a mix of pools, glides, and glides runs.

The substrate consisted mostly of gravel, with a few areas of bedrock and fines. The in-water cover consisted of overhanging vegetation (reed canary grass, Manitoba maple), with few areas of terrestrial vegetation (tree roots), rock, woody debris and undercut banks. Few areas of deep pools (range: 50 cm deep in summer) were noted in the summer visit. The water colour was opaque during the summer and some erosion was noted along the banks.

The tops of the banks were partially to fully vegetated with herbaceous vegetation and woody species. The most common species were reed canary grass, cattails, field bindweed, staghorn sumac, dogwood species, Japanese knotweed, willow species and Manitoba maple. The canopy cover ranged from none to full canopy cover.

The fish community was sampled three times: once during the early spring in an attempt to capture upstream migrating northern pike (overnight set of a single hoop net), again later in the spring (backpack electrofishing), and a third time in the summer (one hoop net and backpack electrofishing). The hoop net, set on April 17, 2019, did not capture any adult pike but did catch 4 fish representing 3 species: central mudminnow, brassy minnow, and creek chub (Table 10).

The spring electrofishing on May 12, 2019 took place over an area of approximately 174 $m^2$ for 392 seconds. A total of 6 fish representing 2 species were captured: creek chub, and white sucker (Table 10)

Summer sampling (July 22-23, 2019) captured 5 species between the two sampling methods. The hoop net captured a total of 3 fish representing 2 species: pumpkinseed and northern pike. The pike was another YOY. The electrofishing, which sampled approximately 134 $m^2$ for 345 seconds, captured 27 fish representing 5 species: northern pike, common shiner, creek chub, white sucker, and pumpkinseed (Table 10). All pike were YOY.

**Table 10: Station 3 - Spring and Summer Catches (2019)**

| Species Name | Scientific Name | Station 3 No. of fish (size range, mm) | | | |
|---|---|---|---|---|---|
| | | April 17, 2019 (Hoop net) | May 12, 2019 (Electrofishing) | July 22, 2019 (Hoop Net) | July 22, 2019 (Electrofishing) |
| Northern Pike | *Esox lucius* | 0 | 0 | 2 (96-110) | 2 (105-110) |
| Central Mudminnow | *Umbra limi* | 1 (80) | 0 | 0 | 0 |
| Brassy Minnow | *Hybognathus hankinsoni* | 2 (65-73) | 0 | 0 | 0 |
| Common Shiner | *Luxilus cornutus* | 0 | 0 | 0 | 8 (66-91) |
| Creek Chub | *Semotilus atromaculatu s* | 1 (66) | 5 (50-68) | 0 | 12 (70-133) |
| White Sucker | *Catostomus commersonii* | 0 | 1 (150) | 0 | 3 (85-127) |
| Pumpkinseed | *Lepomis gibbosus* | 0 | 0 | 1 (55) | 2 (49-56) |
| **Effort** | | **1 Hoop Net** | **2/$m^2$** | **1 Hoop Net** | **3s/$m^2$** |
| **Total No. Species** | | **3** | **2** | **2** | **5** |
| **Total No. Individuals** | | **4** | **6** | **3** | **27** |

**Photo 25 : Hoop net set in Station 2 (April 17, 2019)**

**Photo 26 : Station 2 looking upstream from the downstream end (July 22, 2019)**

# 6. EVALUATION OF SIGNIFICANT

The following section looks at the results from the desktop review and updates these with the findings from the site investigations. Where known or potential natural features were identified, these are tested for significant based on the appropriate reference document.

As mentioned above, the only natural heritage featured identified in the background review were: the potential for SAR (endangered or threatened species), woodland (restricted to the adjacent lands south of the alignment where the jurisdiction of UCPR is applied), and fish habitat. Following site investigations by CIMA+ updated those results as followings.

- Confirmed or Potential for Endangered or Threatened Species and/or their Habitat
    - Confirmed presence of Butternuts
    - Potential presence of Bat Maternity Sites or Day-Roosts
    - Presence and potential for grassland species at risk birds, but restricted to habitats that were active agricultural (cropped)
- Unevaluated wetland
- Significant Woodlands (south side, outside of the Urban Boundary)
- Potential for Significant Wildlife Habitat (outside of the Urban Boundary)
- Confirmed Fish Habitat

The determination as to whether the above features are present and significant has been completed in the sections below based on the appropriate reference documents and the potential for the proposed project to impact the feature. Where a significant natural heritage feature is present or assumed, these are carried forward to the analysis of impacts section.

## 6.1 Species at Risk (Endangered and Threatened)

Endangered and threatened Species at Risk (SAR) are protected under provincial Endangered Species Act. The federal Species at Risk Act (SARA) applies to only fish species on private land. Most birds, including SAR, also receive protection from *Migratory Bird Convention Act* and/or *Fish and Wildlife Conservation Act*. Together, provincially, and federally protected species are referred, herein, to as SAR, herein. This site is situated on private or municipal lands and as such, the evaluation of presence was complete following the province's guidelines and is discussed in Table 3, earlier in this report. That table was updated to reflect both the findings from background review and field investigations. The species brought forward are discussed here and avoidance and mitigation measures provided in the next section.

Note that if restricted species are potentially present, they will have been excluded from this report. This is done to protect those species and their habitat. The potential to impact these species are discussed directly with MECP. However, the avoidance and mitigation measures have been expanded herein to ensure that all species are protected.

Note there are a few black ash in the unevaluated wetland. At the time of this report, these do not receive protection under ESA. This is anticipated to change by 2024.

### American Eel

The American eel (*Anguilla rostrata)* is listed as provincially endangered, but the species is not listed federally. The American eel breeds in the Sargasso Sea and matures in freshwater rivers in North America, including the Ottawa River (Becker, 1983; MacGregor *et al*., 2013; Scott and Crossman, 1998). The freshwater eel population within Ontario has been declining since the 1980s (McGregor *et al.,* 2013). The eels migrate to the Ottawa River during the spring and then downstream during the fall, spending 5 to 20 years in freshwater (Becker, 1983; MacGregor *et al*., 2013; Scott and Crossman, 1998). Eels inhabiting the Ottawa River are generalists requiring structure (i.e., rocks, logs, undercut banks, vegetation) for cover (COSEWIC, 2012). In the winter, they are known to hibernate in mud. During electrofishing surveys, Bowfin has observed eels along both rocky and areas with soft substrate during nighttime sampling. American eels have been reported in the Ottawa River (Haxton and Chubbuck 2002, pers. comm. Kirby Punt OMNR). But these are very few in numbers (pers obs). None have been captured in Lafontaine Creek. There is a limited potential for the American eel to occur within the project area.

### Bobolink

This species is grassland-breeding-bird typically requires a minimum of 4 ha of uncut meadow or field (McCracken, 2013). It is described as area-sensitive in the general habitat guidelines (MECP, 2021). That same publication also notes that the bobolink's defended territory can range from 1.2-6.1 ha, but that it prefers larger tracks of grassland. The Bobolink General Habitat Description (MECP, 2021) indicates that the protected habitat for this species spans three categories:

| | |
|---|---|
| Category 1 | known nests and 10 m of the nest |
| Category 2 | the area between 10 m and 60 m from the nest or the approximate centre of the defended territory |
| Category 3 | the area of continuous suitable habitat between 60 m and 300 m of the nest or approximate centre of the defended territory |

Three grassland breeding bird surveys were conducted as per provincial protocol. A male bobolink was observed in territorial display within the farm field south of St. Jean Street on June 29, 2023. Because this field is under active agricultural use, it is not protected habitat under the ESA at this time. As such, there is no Category 1-3 habitat. Should the field be left fallow and used for nesting, then it will become protected.

Note that individual birds are protected under the ESA, and their nests under the *Migratory Birds Convention Act.* Avoidance measures are thus included below to minimize disturbances to this bird during breeding bird period.

**Eastern Meadowlark**

Like the bobolink, this species is a grassland breeding bird that typically requires a minimum of 4 ha of uncut meadow or field (McCracken, 2013). The General Habitat Description for the Eastern Meadowlark (MECP, 2021) indicates that the protected habitat for this species spans three categories:

| | |
|---|---|
| Category 1 | known nests and 10 m of the nest |
| Category 2 | the area between 10 m and 100 m from the nest or the approximate centre of the defended territory |
| Category 3 | the area of continuous suitable habitat between 100 m and 300 m of the nest or approximate centre of the defended territory |

Three grassland breeding bird surveys were conducted as per provincial protocol; no individuals were observed. As such, this species is considered absent. However, since its habitat is similar to the bobolink, which was present, avoidance measures are included for this species to minimize impacts and disturbances during breeding bird period.

Note that individual birds are protected under the ESA, and their nests under the *Migratory Birds Convention Act.*

**Bats**

The potential SAR bats within the general area are little brown myotis, northern myotis, eastern small-footed myotis and tri-colored. There are three types of habitats required by bats: hibernation, maternity sites, and day-roost sites. The latter is not considered critical habitat.

These four bat species prefer to hibernate in caves or mines, and rarely hibernate in buildings (COSEWIC, 2013). No caves or mines were present on site.

The recovery strategy for the eastern small-footed myotis indicates that the preferred maternity habitat of this species consists of open rock habitats and that it rarely uses old buildings as roosting/maternity sites (Humphrey, 2017). No rocky habitat or buildings were present within the study area searched; based on this information, these species' maternity sites are considered absent.

The Atlas of Mammals of Ontario (Dobbyn, 1994) suggests that the tri-colored bat is not present within this part of Ontario; however, the NatureServe mapping in the COSSARO (2015) includes all southeastern Ontario. Based on this information, this species is considered to have a very low potential of occurring.

The northern myotis tends to prefer larger expanses of older forests (late successional or primary forests) and choose maternity sites in snags that are in the mid-stage of decay. They prefer habitat with intact interior habitat and is shown to be negatively correlated with edge habitat (Menzel et al., 2002; Broders et al., 2006; Yates et al., 2006; OMNRF, 2015a). The preferred habitat is not present so this species is considered unlikely to have maternity sites on site.

The little brown myotis is one of the few bat species that can use anthropogenic structures as maternity sites. Potential suitable structures can include buildings, bridges, barns, and bat boxes. The little brown myotis can also use tall, large cavity trees that are in the early to mid-stages of decay as maternity roosts, as well as loose/raised tree bark, and/or crevices in cliffs (ECCC, 2018). This bat species occurs in higher densities in mature deciduous and/or mixed forests due to increased opportunities for large snags. However, unlike the northern myotis, the little brown myotis does not exclusively require mature forest stands to find appropriate maternity roosts (COSEWIC, 2013). This commonly observed species could establish maternity roosts in this area; however, MECP guidelines provide advice on avoiding impacts to this species.

Day-roosts are not considered critical habitat and impacts to the bats can be minimized by removing the trees outside of the day-use period. Mitigation measures will be included in Section 7.

**Butternut**

Butternut is listed as an endangered species federally signifying that it is at risk of becoming Extinct or Extirpated in Ontario and in Canada. Butternut is a shade intolerant species that is often found along edge habitats on rich, moist, well-drained loams or well-drained gravels (COESWIC, 2003). The butternut is threatened by a canker for which there is no known control (COESWIC, 2003).

Butternuts are assessed based on the amount of canker (the disease which is killing the species), their size and health, as per the province’s protocols. This method classes the individual trees as one of three categories:

- Category 1 — are those that are heavily infected to the point that they are not expected to survive.
- Category 2 — may have some canker but are still considered healthy.
- Category 3 — are the same as Category 2, but these are larger individuals situated near heavily cankered trees and province believes that some may be showing immunity to the disease.

Four butternuts were identified on site in 2023. Of these, three were Category 1 and one was Category 2. One dead individual, on the ground, was also noted. A butternut health assessment (BHA) will be submitted to MECP. Note that butternut inventories have a validity period of 2 years.

**Pale-bellied Frost Lichen**

The pale-bellied frost lichen is listed as endangered under the ESA and federally. This lichen grows mainly on hardwood tree species of suitable bark pH, calcium content, and moisture holding capacity. It requires bark with high pH and moisture holding capacity, which occur predominantly on the thicker bark of its preferred host species, which include hop-hornbeam (ironwood), ash, and elm (Environment Canada, 2015; COSEWIC, 2009).

Geographical information for recent sightings of this species is currently lacking, and this site does not fall within areas defined by the federal recovery strategy (Algonquin Provincial Park, Haliburton, Hastings, Lanark, Lennox and Addington, Peterborough, Renfrew. Frontenac, Leeds and Greenville or Nipissing) (Environment Canada, 2015). Additionally, though the site is situated in the historical area outlined in the provincial recovery strategy, it does not fall within the species' extant distribution (Lewis, 2011).

No old growth forest is present on site and the trees within the area of impact are young. This species has a low potential of occurring.

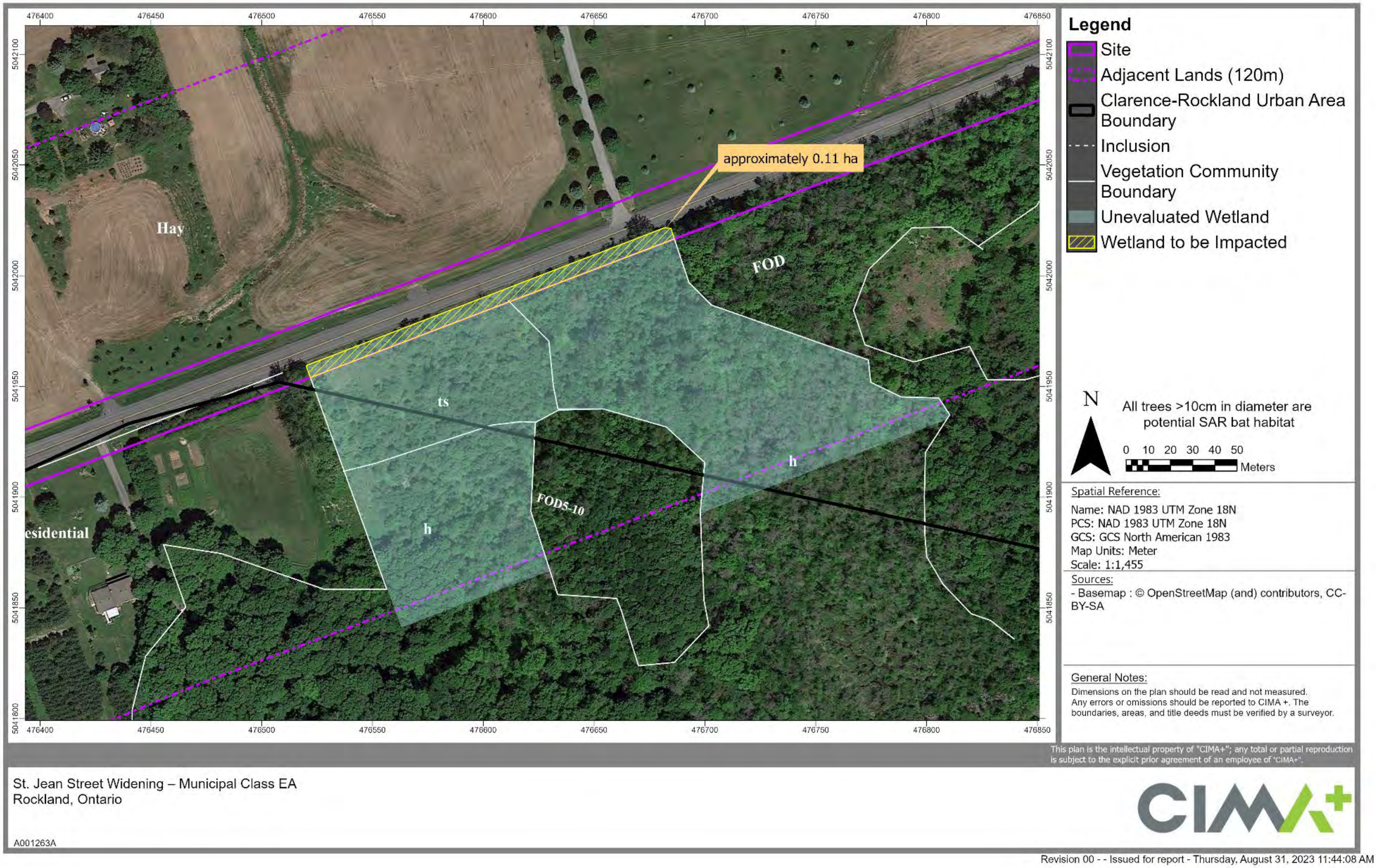
**Conclusion**
There is a potential for Endangered and Threatened species and the Ministry of Environment, Conservation and Parks (MECP) will need to be consulted. Avoidance and mitigation measures are provided in the section below.

## 6.2 Unevaluated Wetland

The UCPR OP includes the caveat that the SNC can request that unevaluated wetlands be reviewed to determine if they display characteristics of a PSW. The presence of wetlands communities was identified within 30 m of the proposed area of impact. There are two wetlands. The marsh community on the east side of site, Lafontaine River Marsh, was previously evaluated and found to be not significant (evaluated as "other"). The swamp community on the west was unevaluated and was estimated at 4.2 ha which meets the minimum size of 2 ha as per the OWES standards. This unevaluated wetland did not contain significant amphibian habitat, overwintering habitat for turtles or fish habitat.

There were no special features noted. It is estimated that up to 1076 $m^2$ of this wetland could be impacted (see figure below). This wetland has been noted on the natural heritage constraints pending receipt of consultation comments. Avoidance and mitigation measures are provided in the section below.

## Figure 11: Unevaluated Wetland



## 6.3 Significant Woodland

The PPS does not permit development in significant woodlands south and east of the Canadian Shield unless it has been demonstrated that there will be no negative impacts on the natural features or the ecological functions. A woodland is defined as a treed area, woodlot, or forested area. For the purposes of this report, a woodland included any community that was described as a treed swamp (deciduous, coniferous, or mixed), tall shrub or low shrub swamp composed of tree species, woodland or forest (regardless of tree size). The data was used in combination with satellite image interpretation to determine the size of the forest stands and the communities within the site and adjacent lands were described using ELC.

The PPS does not permit development in significant woodlands south and east of the Canadian Shield unless it has been demonstrated that there will be no negative impacts on the natural features or the ecological functions. A woodland is defined as a treed area, woodlot, or forested area. For the purposes of this report, a woodland included any community that was described as a treed swamp (deciduous, coniferous, or mixed), tall shrub or low shrub swamp composed of tree species, woodland or forest (regardless of tree size). The data was used in combination with satellite image interpretation to determine the size of the forest stands and the communities within the subject and adjacent lands were described using ELC.

Woodlands are evaluated based on the *Natural Heritage Reference Manual* (NHRM) created by OMNR (2010). A desktop exercise was used in which OMNR mapping and satellite imaging data were combined to locate the extent of the forest patch. The delineation of the woodland patches was based on the NHRM. The woodlands are evaluated in context of their size, ecological functions, uncommon characteristics, and economic and social functional values. A woodland that meets the minimum standards for one or more criteria is considered significant in the PPS. Each of the criteria and how they relate to the forest patch located within the study area discussed below. The evaluation varies based on the forest cover in the jurisdiction of the stand being evaluated. The Official Plan for the UCPR states that forest cover for the region is approximately 26%.

***Woodland Size***

The stand that is partially within the site is 150.7 ha in size. Based on the forest cover of approximately of 26% for this area, any forest stand that is ≥20 ha should be considered significant. The stand is considered significant in terms of size. The area directly impacted by the road is 25 square meters which will not impact this woodlands significance in terms of size.

***Ecological Functions Criteria***

This criterion is based on five factors. The stand is considered significant in terms of ecological functions as it meets the 5 ha minimum size required for proximity, linkages, water protection, and woodland diversity while possessing the necessary features (Table 11). It also meets the minimum size threshold 2 ha to be significant for woodland interior.

***Uncommon Characteristics***

The woodland meets the 0.8 ha minimum size criteria but possessed no uncommon characteristics within the area evaluated along the road.

***Economic and Social Functional Values***

This site is not known to have a significant economic or social function. It did meet the 4-10 ha[1] minimum size threshold but is primarily on private lands and not accessible for social or economic functions.

**Conclusion**

The woodland stand outside of the Urban Boundary is significant. Avoidance and mitigation measures are provided in the section below.

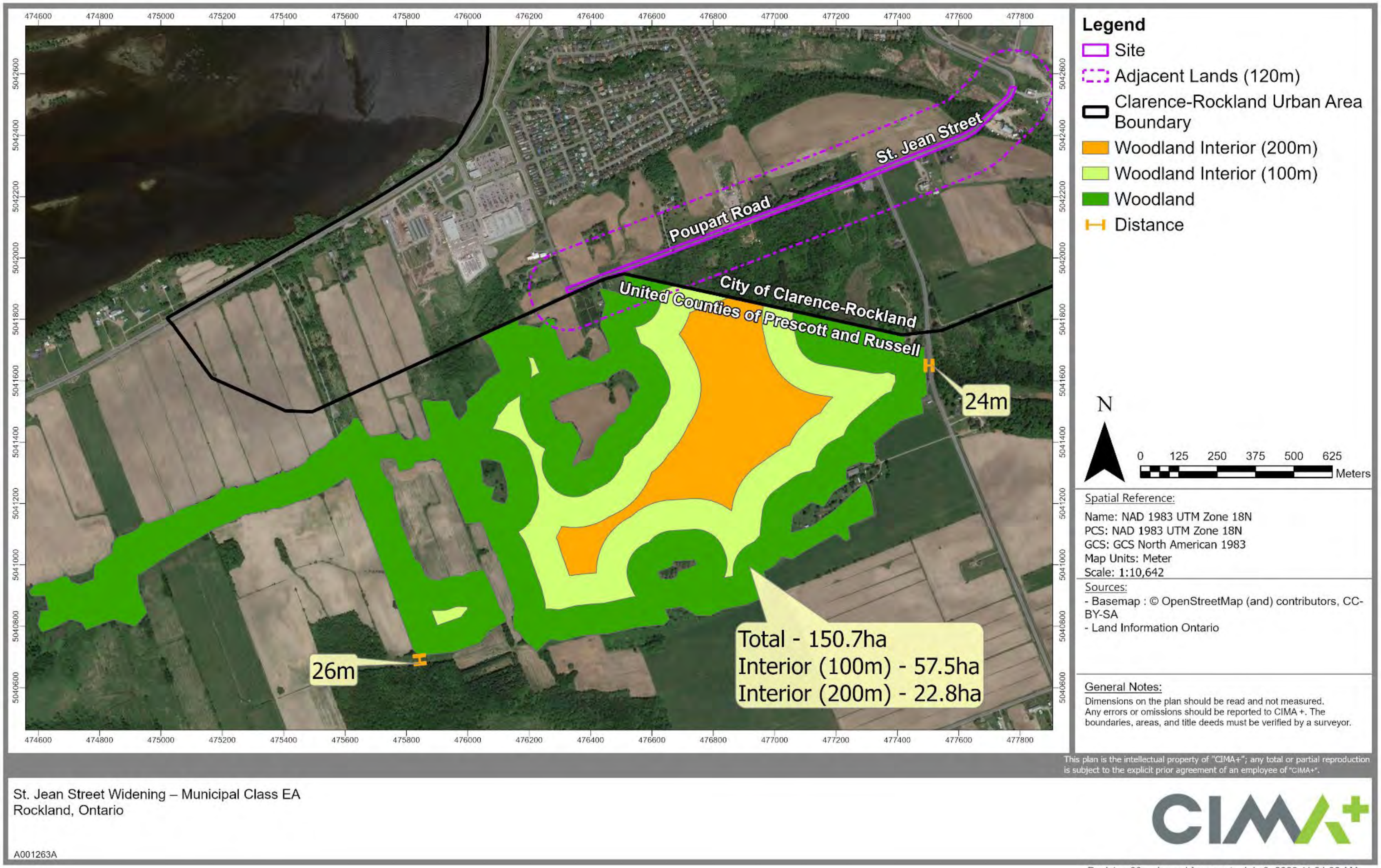
[1] Note that the NHRM does not provide these minimum values, it provides a range to be established by each municipality. The minimum values used here are those from: City of Ottawa *Significant woodlands: Guidelines for Identification, Evaluation, and Impact Assessment* (2021) and *natural Heritage Assessment Guide for renewable Energy Projects* (December 2010)

**Table 11: Summary of Ecological Functions Sub-Criteria**

| Factor | Comments/Rational | Meets Minimum Requirements Current | Meets Minimum Requirements After Widening |
|---|---|---|---|
| **Woodland interior (includes all forest located at least 100 m from the woodland's perimeter)**<br><br>**Minimum size – 2 ha** | 57.5 ha of interior habitat present | Yes | Yes |
| **Proximity to other woodlands or other significant natural heritage features**<br><br>**Minimum size – 10 ha***<br>**Minimum distance: 30m** | The woodland is within 30 m of fish habitat and meets the size threshold | Yes | Yes |
| **Linkages**<br><br>**Minimum size – 5 ha***<br>**No minimum distances.** | The stand meets the minimum size criterion and is between two woodlands listed as significant by LIO. | Yes | Yes |
| **Water protection**<br><br>**Minimum size – 5 ha***<br>**Minimum distance: 30m** | Meets the minimum size criteria and has fish habitat on the eastern and western side. | Yes | Yes |
| **Woodland diversity**<br><br>**Minimum size – 5 ha*** | The stand meets the minimum size criteria and contains woodland species that are in significant decline. It also spans a variety of terrain, occupying the top, slope, and bottom of a steep ridge. | Yes | Yes |

*Note that the NHRM does not provide these minimum values, it provides a range to be established by each municipality. The minimum values used here are those from: City of Ottawa *Significant woodlands: Guidelines for Identification, Evaluation, and Impact Assessment* (2021) and *natural Heritage Assessment Guide for renewable Energy Projects* (December, 2010)

## Figure 12: Potential Significant Woodland

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## 6.4 Significant Wildlife Habitat

The PPS indicates that no development or site alteration is permitted within significant wildlife habitat unless it has been demonstrated that there will be no negative impacts on the natural feature or its ecological functions. It defines wildlife habitat as:

> *"Areas where plants, animals and other organisms live and find adequate amounts of food, water, shelter and space needed to sustain their populations. Specific wildlife habitat of concern may include areas where species concentrate at a vulnerable point in their annual or life cycle; and areas which are important to migratory or non-migratory species"*

The Official Plans for the study area that is within the Urban Area notes that only those Significant Wildlife Habitats identified as present on Schedule A should be considered (City of Clarence-Rockland, OP section 4.13). There were none identified on the background mapping. There are no significant wildlife habitat (SWH) considered.

With respect to the small portion of the study area outside of the Urban Area, there are several policies sections that apply.

+ UCPR OP Section 5.5.4 notes that the only SWH is that on Schedule B2 and consists of deer wintering area or wildlife travel corridor. These are not present in the site or its adjacent lands (background mapping available in Appendix A).
+ Section 5.5.4 (2) that no additional SWH will be considered within settlement areas. Outside of the settlement area, additional wildlife habitat would be considered on a site-by-site basis and when needed, this evaluation is to be completed through the use of the *Significant wildlife Habitat Technical Guide and Addendum* (OMNR, 2000).

At this time, no confirmation from UCPR has been received identifying the need to assess the potential for SWH and the terms of reference do not provide this level of detail. To err on the side of caution, a review of potential SWH has been completed for the area outside of the Urban Boundary. This was completed by comparing the vegetation communities descriptions to the Ministry of Natural Resources and Forestry's (MNRF) SWHECS 6E (2015) and those that were deemed candidate SWH are discussed in Table 12. Avoidance and mitigation measures are provided in the section below. A few items deserve to be highlighted:

+ Candidate bat maternity habitat in woodlands is considered present, for non-Endangered or Threatened bats, when the density of snag trees with a diameter-at-breast-height (dbh) of 25cm or larger exceeds 10 larger snag trees per hectare. There is a potential for snag trees in the work area.
+ Candidate Woodland raptor breeding is present in the UCPR woodland as it meets the minimum size (30ha) and the minimum of interior habitat (10ha after 200m edge is removed). The removal of 25 $m^2$ of woodland edge habitat by the proposed road widening does not affect the portion of the woodland stand that meets this criteria as it is young

forest (not the intermediate-aged to mature required for this function (OMNRF, 2014)). Of the mandatory species to class this woodland as breeding habitat for raptors, none of the key hawk species were heard or observed but one Barred Owl was heard (outside of the breeding bird period). As such, the woodland as a whole is a candidate Woodland Raptor Breeding Area but given that this species prefers trees that are 50cm in dbh or larger (though can be found in ones as small as 34cm in dbh) and is a forest-interior species that may avoid edges (OMNRF, 2014) the portion to be impact did not provide this function at the time of evaluation.

+ The candidate amphibian woodland breeding habitat is present, but surveys were completed and the habitat within this project's site was dry during early spring as such it did not meet the minimum requirements of two or more of the key frog species (no salamander species were observed) and a minimum of 20 individuals or calling code of 3.

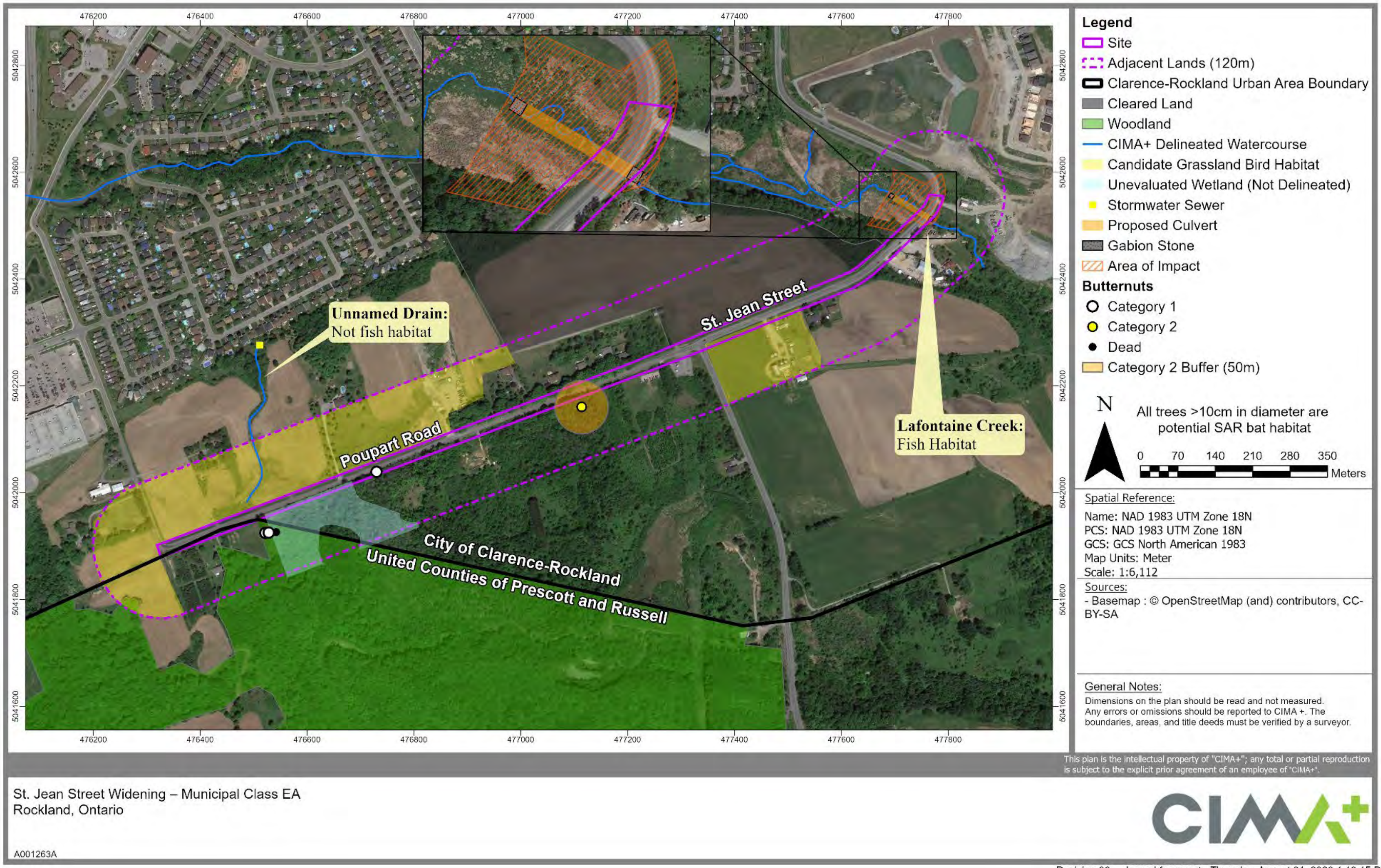
## 6.5 Fish and Fish Habitat

The only fish habitat on site is associated with Lafontaine Creek. The potential impacts to fish and fish habitat as a result of the new culvert have been reviewed by Fisheries and Oceans Canada (DFO) and provided that there are no activities outside of what was presented (footprint of impacts is on the figure below), then no additional review is required. The avoidance and mitigation measures provided to DFO are included herein. If there are any changes to the culvert or to area of impact, DFO will need to be consulted.

## 6.6 Other

As mentioned at the start, in addition to the natural heritage features identified herein, there are other regulations that need to be considered. For this project, this would be for the general protection of birds (under the *Fish and Wildlife Conservation Act*, and the *Migratory Bird Convention Act*) and for turtles (all are protected under the *Fish and Wildlife Conservation Act*). Avoidance and mitigation measures are provided in the section below.

## Figure 13: Natural Heritage Constraints

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# 7. ANALYSIS OF IMPACTS

## 7.1 Review of Project Activities

It is anticipated that the work associated with the proposed alternatives could result in the clearing of vegetation, grading and excavation and backfilling in any area that is within 15 m of the existing centre line. This area of impact is widened as per the figures herein within the Lafontaine River Marsh (an evaluated wetland that is not-provincially significant). Following the evaluation of significance, it was confirmed or assumed that the following was present:

- Confirmed or Potential for Endangered or Threatened Species and/or their Habitat
    - Confirmed presence of Butternuts
    - Potential presence of Bat Maternity Sites or Day-Roosts
    - Presence and potential for grassland species at risk birds, but restricted to what is currently active agricultural lands
- Unevaluated wetland
- Significant Woodlands (south side, outside of the Urban Boundary)
- Potential for Significant Wildlife Habitat (outside of the Urban Boundary)
    - Bat maternity (woodland) habitat – assumed
    - Special Concern species – Black Ash (until full protection under ESA comes into effect)
- Confirmed Fish Habitat

## 7.2 Impact Assessment Methods

The assessment of the potential impacts is completed by analyzing the impact of various activities associated with the project. The significance of the potential impacts is measured using four different criteria:

1. Area affected may be:
    a. local in extent signifying that the impacts will be localized within the project area
    b. regional signifying that the impacts may extend beyond the immediate project area.

2. Nature of Impact:
    a. negative or positive
    b. direct or indirect
    c. Risk (certainty, understanding of impacts)

3. Duration of the impact may be rated as:
    a. short term (construction phase, 1-2 years)

   b. medium term (>2years)
   c. long term (>7 years).
   d. permanent

4. Magnitude of the impact may be:
   a. negligible signifying that the impact is not noticeable
   b. minor signifying that the project's impacts are perceivable and require mitigation
   c. moderate signifying that the project's impacts are perceivable and require mitigation as well as monitoring and/or compensation
   d. major signifying that the project's impacts would destroy the environmental component within the project area.

Where identified, the boundaries of any significant features are noted and the potential for the development to cause negative impacts is assessed. For those features which may be negatively impacted, avoidance and mitigation measures are recommended, as appropriate. The PPS (MMAH, 2020) states that a negative impact signifies:

> "a) in regard to policy 2.2, degradation to the quality and quantity of water, sensitive surface water features and sensitive ground water features, and their related hydrologic functions, due to single, multiple or successive development or site alteration activities;
>
> c) in regard to fish habitat, any permanent alteration to, or destruction of fish habitat, except where, in conjunction with the appropriate authorities, it has been authorized under the Fisheries Act;
>
> d) in regard to other natural heritage features and areas, degradation that threatens the health and integrity of the natural features or ecological functions for which an area is identified due to single, multiple or successive development or site alteration activities." (MMAH, 2020)

## 7.3 Evaluation of Potential Impacts

The potential impacts have been completed with the following assumptions:

- All construction activities will be restricted to the area that is within 15m of the existing centre line or the area shown within Lafontaine River Marsh.
- The existing drainage patters will be respected.
- There will be no changes to the water quantity or quality (pre- to post- will remain comparable).
- There will be no blasting.

## 7.4 Avoidance and Mitigation Measures

The following list of avoidance and mitigation measures follows current best practices, at the time of this report, and are based on the understanding of areas of impacts and construction methods outlined above. The potential to impact Endangered or Threatened species must be discussed with MECP for confirmation. The impact analysis for the culvert and associated works in the wetland was reviewed and approved by DFO. The avoidance and mitigation measures will need to be updated following a review of the detailed design and as per comments from MECP.

### 7.4.1 Species at Risk (Endangered and Threatened)

**General:**

+ The potential to impact species at risk, and the list of species at risk should be re-evaluated at the detailed design phase to ensure that the information provided below remains the most recent advice.
    - Of particular note is the Black Ash which is expected to receive protection in 2024.
+ Contractor is to be made aware that any impacts to areas identified as to be protected can result in penalties under the *Endangered Species Act*.
+ Endangered and threatened species are protected and cannot be harmed, harassed, or killed and in some cases their habitats are also protected. These individuals will only be handled by qualified person and only if the individual is in imminent threat of harm. An authorization under the ESA 2007 would be required to handle individuals that are not in imminent threat of harm.
+ If a SAR enters the work area during the construction period, any work that may harm the individual is to stop immediately and the supervisor will be contacted. No work will continue until the individual has left the area.
+ Should an individual be harmed or killed then work will stop, and the Ministry of Environment, Conservation and Parks (MECP) will be contacted immediately.
+ Mitigation measures listed elsewhere in this report are also applicable to this section.
+ If a SAR is encountered, this information will be provided to the Natural Heritage Information Centre (Report rare species (animals and plants) | Ontario.ca)

**SAR Birds:** It is anticipated that vegetation would be removed from the area of impact (within 15m of the centre line and within the area shown on the figures in the Lafontaine River Marsh). Daytime and, one nighttime breeding bird surveys were completed. SAR birds found were restricted to grassland birds and there is no grassland protected habitat in or within 120m of the works.

+ No impacts to federal SAR bird nests, or their eggs is permitted under the federal *Species at Risk Act*. If a federally listed bird species at risk nest is encountered, then work must stop until the young have fledged. If the nest/young have been harmed, then Environment Canada must be notified immediately for guidance.

- No impacts to provincial SAR bird nests or their eggs is permitted under the provincial *Endangered Species Act*. If a provincially listed bird species at risk is encountered, then work must stop and MECP contacted (sarontario@ontario.ca).
- Should a nest be discovered, stop all work that may disturb the birds (i.e., that cause the adults to fly off the nest) and contact a biologist or MECP or Environment Canada, as appropriate for the species.
- Provided that fields are under active agricultural uses, then there is no protected grassland breeding bird habitat (as per communications with MECP). If fields on-site become fallow (even for one year) during the breeding bird season, then additional monitoring and/or registration of habitat may be required.
  - NOTE: Current guidelines are that impacts to vegetation in Endangered or Threatened bird breeding habitat between April 1 and August 31 and this should be applied to the work area next to the agricultural fields.
  - See bat timing window below.
- The Eastern whip-poor-will survey is valid until 2028 (5 years from the date completed; was completed in 2022 nesting season).

| **Area** | **Nature** | **Duration** | **Magnitude** |
|---|---|---|---|
| Local | Negative<br>Direct | Permanent<br>(removal of vegetation) | Unlikely to occur based on 2022 and 2023 findings. Timing constraint (no clearing between April 1 and August 31 should be adopted (also see bat timing window below). |

**Bats:** The construction of the widening will require the removal of some woody vegetation, including trees that are 10cm in dbh or larger. While SWH for bats considers trees that are 25cm in dbh only, the direction from MECP for SAR bats is to consider trees that are 10cm in dbh and larger. Discussions with MECP have noted the potential for woodland maternity sites in this area.

- Educate contractors by informing them that most bats in Ontario are protected.
- Remove all trees that are 10 cm in diameter at breast height or larger between October 1 and March 31 (Bat active season is currently assumed to be April 1 to September 30 in Southern Ontario as Eastern Small-footed Myotis maternity habitat is not anticipated to be present in this wooded area). If this is not possible, conduct exit survey prior to cutting them down. If the exit survey identifies bats, contact MECP or biologist for additional guidance.

| **Area** | **Nature** | **Duration** | **Magnitude** |
|---|---|---|---|
| Local | Negative<br>Direct | Permanent<br>(removal of trees) | Provided that timing windows are met, then best management practices will have been followed. |

**Plants and Lichens:** Butternuts are present within the property and the Butternut Health Assessment report will be submitted to MECP. Once the 30-day review period has expired, and the online registration process completed then clearing in the areas approved can being.

+ Only clear vegetation where approved. The locations that can be cleared will be adjusted as more information is provided to MECP.
+ If the clearing of vegetation does not occur prior to August 16, 2024, then the Butternut survey would need to be repeated.
+ If a new butternut assessment is required, it must be during the green-leaf period which is typically between mid-May to mid-August).
+ Follow guidance on clearing of vegetation from bats and birds and Other sections.

### 7.4.2 Unevaluated Wetlands

There were no provincially significant wetlands on or near the alignment. The Lafontaine River Marsh is evaluated as non-significant (evaluated as “other”). The portion of the small wetland on the west side of the alignment, within the study area, did not contain any wetland features of significance. However, where possible impacts to unevaluated wetlands should be minimized.

+ Minimize direct impacts to wetland communities to the extent feasible.
+ Indirect impacts could occur as a result of change in water supply or quality, sediment/erosion of the wetland.
    - Maintain the same amount of contributing flow to these areas pre- and post-construction.
    - The potential for erosion and sediment to occur as a result of construction. Ensure that appropriate erosion and sediment control measures are planned, installed and maintained (see under Fish and Fish Habitat).

### 7.4.3 Significant Woodlands

A significant woodland was identified in the UCPR section of the site. The impact to the narrow strip of woodland (result of direct removal of individual trees or impacts to critical root zone of trees to be retained), and their functions must be retained to ensure that they remain significant.

+ Overall stand size must remain >20ha in size.
+ Install Tree Protection Fencing prior to commencement of construction activities, and retain fencing until construction activities have been completed to prevent accidental harm to trees to be retained. This fencing should be placed at a distance to protect the critical root zone (minimum distance from tree is the drip line from the tree’s canopy).
+ Tree protection fencing shall be at least 1.2 metres in height and installed in such a way that the fence cannot be altered.
+ Do not place any material or equipment within the critical root zone of a tree.
+ Do not raise or lower the existing grade within the critical root zone of a tree.

- Equipment and materials should not be stored near trees.
- Ensure that exhaust fumes from all equipment are not directed towards any tree's canopy.
- Do not attach any signs, notices, or posters to trees.
- Ensure that site clearing is carried out only in areas where it is specifically required, and that the areas to be cleared are carefully and clearly delineated.
- Do not damage the root system, trunk, or branches of any tree; if any roots are encountered during excavation while working outside the critical root zone`, they should be cut off cleanly with sharp pruning tools rather than allow them to be torn by large equipment; clean cuts will help to minimize decay and entry points for disease.
- All exposed roots of trees to be retained should be covered in a minimum of 5 cm of firm soil within 24 hours of exposure.
- If root pruning is implemented, the crown of the tree should be reduced proportionately under the direction of a Certified Arborist or Registered Forester, to decrease wind sail. Pruning should be kept to thinning cuts (no major limb removal), and crowns should be monitored, and maintenance carried out for two (2) years after root pruning to remove any dieback under the direction of a Certified Arborist or Registered Forester.
- If branches are likely to hang in the way of passing equipment, the branches should be pruned by a Certified Arborist or Registered Forester to avoid tearing and undue injury to the tree.
- All pruning work must be performed under the supervision and guidance of a qualified tree professional in accordance with the latest ANSI A300 Pruning Standards and best management practices identified by the International Society of Arboriculture.

#### 7.4.4 Significant Wildlife Habitat

There are no significant wildlife habitat identified in the Urban Area. The candidate or confirmed significant wildlife habitat within the UCPR study area is summarized in the table below along with the potential interaction between each and the project. This is followed by avoidance and mitigation measures for SWH as a whole.

**Table 12: Candidate Significant Wildlife Habitat – UCPR Area**

| Candidate SWH | Discussion of Findings | Impact |
|---|---|---|
| Bat Maternity Habitat | Candidate habitat are areas with >10 trees that are 25 cm in diameter-at-breast-height or larger with cavities. There is a preference for snag trees that are in decay classes 1-3. No surveys completed. | + Potential to impact bats during maternity period if they are using a tree in or near the area to be cleared. |
| Woodland Raptor nesting Habitat | This would apply to the woodland in UCPR where the stand is larger than 30ha and the amount of interior habitat (using an edge of 200m; see Figure 12). A Barred Owl was | + Removal of the minor portion of the edge will be removed (25m$^2$) is not anticipated to impact this function for Barred Owl. |

| Candidate SWH | Discussion of Findings | Impact |
|---|---|---|
| | observed outside of the breeding bird survey period for this species. No surveys were completed during the early spring. However as this is usually an interior breeding species that requires larger trees, it is unlikely to be nesting in this area (OMNRF, 2014) | + Potential to impact this function if key hawk species that favor nesting in edge habitat begin using this area. |
| Special Concern Species | Black Ash was identified. This species does not receive protection from ESA at the time of this report. | + Potential to kill or harm Black Ash that are in or whose critical root zones are in the area to be cleared. |

+ Note that the measures listed under all of the other sections cover much of the impacts to SWH and must be reviewed.
+ Ensure that project does not affect the flow patterns, water quantities or water qualities to the habitat (i.e., pre- conditions match post-conditions).
+ Remove vegetation outside of all timing windows. In this instance, remove vegetation between October 1 and March 31.
    - Raptors breed early in the season and could arrive in March. If clearing trees in March ensure that an avian biologist/technician confirms absence of nesting birds.
+ Following detailed design confirm the presence/absence of Black Ash within the area to be cleared or whose critical root zones maybe compromised. Review any new guidance from the province under ESA

| Area | Nature | Duration | Magnitude |
|---|---|---|---|
| Local | Negative Direct | Permanent | Negligible if timing windows for all species are applied and water patterns/quantities and quality is not altered, and if no Black Ash are impacted.<br>Minor to Moderate depending on status and location of Black Ash. |

### 7.4.5 Fish and Fish Habitat

As discussed, the impacts to fish habitat associated with Lafontaine Creek have already been reviewed and approved by DFO. The following is the list of avoidance and mitigation measures associated with that work. Any deviations from this work could result in the need to provide DFO with additional information and opportunity to review.

### Planning

- Follow the DFO guidelines in their Code of Practice for temporary cofferdams and end-of-pipe (https://www.dfo-mpo.gc.ca/pnw-ppe/practice-practique-eng.html);
- Minimize clearing of vegetation within 30 m from the normal high-water mark. Unless required avoid stripping lands and simply drive over vegetation during construction;
- Minimize size of the isolated area and the amount of in-water work;
- Site instruction will be provided to contractor to highlight that the channel provides permanent fish habitat;
- Clearly demarcate work areas within the riparian habitat in the field;
- All in-water works to occur during the in-water work window (July 1 to March 14, inclusive);
- Erosion and sediment control measures will be installed prior to the clearing of vegetation within 30 m of a watercourse;
- Plan the majority of the wetland removal and infilling to occur in isolation of the work in-water and for the backfilling to proceed at the same time as the removal of the wetland soils. This is to minimize the potential for erosion and sediment issues and to reduce the duration of the isolation of the channel;
- The work in the fish habitats is to be completed once the site is fully isolated and the fish out has been completed. Removal of the cofferdam when water inside isolated area is stable and the banks are stabilized;
- Suspend activities that cause muddy environments during periods of heavy rains;
- Minimize clearing of woody vegetation (few woody individuals are present). Where possible, cut trees leaving behind a 60 cm stump or more and cut shrubs down (instead of grubbing).
- Design the culverts to provide passage during the spring and baseflow conditions to mimic or improve upon existing conditions.

### Erosion and Sediment Control

- An erosion and sediment control plan will be developed by contractor and implemented prior to any work within 30 m of the watercourse:
  - Provide regular maintenance to the erosion and sediment control measures during construction. Contractor shall be responsible for ensuring that the erosion and sediment control measures are maintained and will monitor the water clarity downstream of the work site throughout the day and during rain events. Water quality is to meet the *Canadian Water Quality Guidelines for the Protection of Aquatic Life*. Monitoring for visible plumes outside of the work area is to be undertaken;
  - At a minimum, the erosion and sediment control plan will include the installation of sediment fencing along the top of banks where vegetation clearing and/or soil disturbance will occur within 30 m of any channel prior to the removal of vegetation. And the installation of a turbidity curtain downstream;
  - Additional materials (i.e., rip rap, filter cloth and silt fencing) will be readily available in case they are needed promptly for erosion and/or sediment control.

- Construction and removal of cofferdam dams can create a plume. As such, appropriate measures should be put in place such as placing rock for the cofferdam within a turbidity curtain that isolates just the area where the cofferdam is being built. Where possible, consider using steel plate for the cofferdam;
- Note that if meter bags are used, they can often split when being removed as such it is preferred that gravel (washed and free of fines) be used for the metre bags;
- Any stockpiles of soil or fill material will be stored as far as possible from the channel and protected by silt fencing (minimum 30 m);
- The sediment fencing will not be removed until the bank is stabilized (meaning <20% bare soil);
- Where the channel is to remain, any disturbed banks will be returned to pre-construction conditions and contours;
- The work within the channels will be completed in the dry;
- Water from dewatering will be treated prior to returning it to the system (i.e., straw bale settling ponds covered by geotextiles or sediment sock on the end of hose and situated on top of well vegetated slopes);
- Water from bypass will be released in such a way as to prevent erosion or the transportation of suspended sediments downstream;
- Where banks/riparian area (area within 30 m of channel) have been stabilized by seeding and/or planting, monitor the revegetation to ensure that the vegetation becomes fully established;
- Any riprap will consist of clean rock free of fines;
- Where possible, limit clearing of vegetation to trimming and leave the stump and lower 60 cm of the tree trunk in place (for shoreline stabilization).

### Fish and Fish Habitat Protection

- The construction of the cofferdams will be undertaken in the wet. Sheet piles are preferred. If large meter bags, methods to minimize fish within the work area should be considered (i.e., seine nets could be used by the biologist to minimize the number of fish in the immediate area. Seine nets will not provide any mitigation for suspended sediments);
- Fish (and other aquatic fauna) will be salvaged from the isolated channel or any portion of the wetland that is flooded at the time of construction, by a qualified aquatic biologist/technician. The salvage will need to be repeated if the work area becomes flooded;
- Dewatering of water in areas that may contain fish will be completed from hoses placed in fish baskets or covered with clean wash rock or other such method to prevent fish impingement and entrainment. Note that the screens that come on the hoses are not enough to prevent fish from harm. Contractor should refer to DFO’s Standard Code of Practice for End-of-Pipe;
- Monitor the end of pump frequently for ensure that all fish protection measures are functioning;
- Minimize the size of temporary in-water work areas;

- Bypass flow is required. The amount of flow bypass must be sufficient to maintain the habitats downstream of the site (i.e., similar to what would be present, at that time of year, if work was not occurring. A new drain from the end of the bypass pipe to the existing channel is being considered. Details pending but will be assessed by a fisheries biologist to ensure that this does not result in fish kills (or erosion concerns);
- When pumping is used, the DFO Standard Code of Practice for End-of-Pipe should be followed to ensure that fish do not become impinged or entrained;
- Any disturbed bank, along the section to remain, will be returned to pre-construction conditions, including revegetation, as necessary, with native vegetation appropriate for site conditions;
- Placement of any erosion control blankets is to avoid the area that will be wet (i.e., will be placed above the high-water level) as the mesh of the blankets can trap fish.
- All material introduced for the temporary measures will be fully removed from the water at the completion of the work;

### Contaminant and Spill Management

- All equipment working in or near the water should be well maintained, clean and free of leaks. Maintenance on construction equipment such as refueling, oil changes or lubrication would only be permitted in designated area located at a minimum of 30 m from the shoreline 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;
- If concrete pours in-situ are required, then it is noted that concrete particles and pours can affect the pH and temperature of any water that comes into contact with the material. All water outside of work area is to meet the minimum requirements established by CCME for the protection of aquatic life. Monitoring is to be completed by the contractor and records provided to the Owner.
    - The pH outside of the temporary work area is to be keep with the CCME guidelines (between 6.5-9.0 pH units).
- Emergency spill kits will be located on site. The crew will be fully trained on the use of clean-up materials to minimize impacts of any accidental spills. The area would be monitored for leakage and in the unlikely event of a minor spillage the project manager would halt the activity and corrective measures would be implemented;
- If a spill occurs:
    - Stop all work;
    - Spills are to be immediately reported to the MECP Spills Action Centre (1800 268-6060). Note that under the *Fisheries Act* deleterious substance includes sediments;
    - Clean-up measures are to be appropriate and are not to result in further harm to fish/fish habitat;
    - Sediment-laden water will be removed and disposed of appropriately.
- No construction debris will be allowed to enter the watercourse;
- Following the completion of construction, all construction materials will be removed from site.

#### 7.4.6 Other

In addition to the items listed above, it is important to note that there are other acts and regulations which may apply, and the following measures provides additional information on avoidance and mitigation measures which must be adhered to reduce the potential of contravening other legislations.

- Almost all breeding birds are protected under the MBCA and/or FWCA. The only species not protected are: American crow, brown-headed cowbird, common grackle, house sparrow, red-winged blackbird, and starling. It is prohibited to destroy or disturb an active nest of other birds, or to take or handle nests, eggs, or nestlings. In this part of Ontario, the current standard nesting period is between **April 5 to August 28**. Outside of this timing window, it is considered unlikely that birds would be nesting. Note, there are some birds (birds of prey, herons etc.) that do begin nesting earlier in the year. It should also be noted, that if an active nest is present before or after the above dates that it is still protected.
- Work during the daytime hours to prevent light disturbances.
- Ensure that all equipment have the appropriate mufflers to reduce noise disturbances.
- No species at risk turtles are known to occur here however, most turtles are protected under the FWCA. If a turtle nest is suspected, then flag a 10 m buffer to protect the nest. Contact MECP (for SAR) and MNRF (all other species).
- Do not flag bird nests as it attracts predators.
- Machinery should be cleaned prior to arriving on-site to prevent the potential spread of invasive species. Invasive species on site (i.e., Common Reed, buckthorn, honeysuckle) should be removed as appropriate for the species. See Ontario Invasive Species website (https://www.ontario.ca/page/invasive-species-ontario) .

# 8. CONCLUSION

The proposed widening of St. Jean Street will require minor clearing of vegetation within 15m of the existing centre line for almost all of the alignment. There is a wider area of impact in the Lafontaine River Marsh to meet safety requirements of the road. The background review, site investigations, and evaluation/assessment have determined that there is confirmed or assumed natural heritage features within the direct or indirect area of impact. However, pending consultations with MECP with respect to Endangered and / or Threatened species, it is likely that most impacts can be minimized or eliminated by following the timing windows described herein. Of particular importance is:

- Consultation with MECP on Endangered and Threatened species (including with respect to Black Ash)
- Avoidance of alterations to drainage patterns, or changes to the water quantities/qualities reaching wetland and aquatic habitats
- Avoidance of clearing any vegetation between April 1 and September 30

- Confirming absence of raptor nests if clearing in spring.
- Reviewing the advice herein once detailed design is completed to update based on any new findings or guidelines. Ensure that at least one full year is available, prior to construction, should new inventories be required.

I trust that this report will meet your requirements. Should you have any questions or comments, please contact Michelle Lavictoire at Michelle.Lavictoire@cima.ca or (343) 576-3780.

# 9. REFERENCES

Bradley, David. (2007). Southern Ontario Vascular Plant Species List. Prepared by Southern Science and Information Section, Ontario Ministry of Natural Resources, Peterborough, Ontario. 57pp.

Broders, H., Forbes, G., Woodley, S. & Thompson, I. (2006). Range extent and stand selection for roosting and foraging in forest-dwelling northern long eared bats and little brown myotis in the greater Fundy ecosystem, New Brunswick. Journal of Wildlife Management 70: 5.

COSEWIC. (2003). COSEWIC assessment and status report on the Butternut Juglans cinerea in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 32 pp.

COSEWIC. (2006). COSEWIC assessment and status report on the American Eel Anguilla rostrata in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. x + 71 pp.

COSEWIC. (2007). COSEWIC assessment and update status report on the Chimney Swift Chaetura pelagica in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vii + 49 pp.

COSEWIC. (2009). COSEWIC assessment and status report on the Pale-bellied Frost Lichen *Physconia subpallida* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 38 pp.

COSEWIC. (2009). COSEWIC assessment and update status report on the Least Bittern Ixobrychus exilis in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 36 pp.

COSEWIC. (2009). COSEWIC assessment and status report on the Whip-poor-will Caprimulgus vociferus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 28 pp.

COSEWIC. (2010). COSEWIC assessment and status report on the Bobolink Dolichonyx oryzivorus in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 42 pp.

COSEWIC. (2011). COSEWIC assessment and status report on the Eastern Meadowlark Sturnella magna on the Status of Endangered Wildlife in Canada. Ottawa. x + 40 pp.

COSEWIC. (2013). COSEWIC assessment and status report on the Bank Swallow Riparia riparia in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. ix + 48 pp.

COSEWIC. 2016. COSEWIC assessment and status report on the Blanding's Turtle Emydoidea blandingii, Nova Scotia population and Great Lakes/St. Lawrence population, in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xix + 110 pp.

COSEWIC. (2017). COSEWIC assessment and status report on the Lake Sturgeon Acipenser fulvescens, Western Hudson Bay populations, Saskatchewan-Nelson River populations, Southern Hudson BayJames Bay populations and Great Lakes-Upper St. Lawrence populations in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xxx + 153 pp.

Eder, T. (2002). Mammals of Ontario. Lone Pine. Alberta, Canada.

Environment Canada. (2011). Recovery Strategy for the Least Bittern (Ixobrychus exilis) in Canada [Proposed]. Species at Risk Act Recovery Strategy Series. Environment Canada. Ottawa. v + 34 pp.

Environment and Climate Change Canada. (2018). Recovery Strategy for the Eastern Whip-poor-will (Antrostomus vociferus) in Canada. Species at Risk Act Recovery Strategy Series. Environment and Climate Change Canada, Ottawa. vi + 107 pp.

Environment Canada. (2023). National Climate Data and Information Archive – OTTAWA INTL A. Accessed Online June 2, 2023. from: http://climate.weatheroffice.gc.ca.

Humphrey, C. (2017). Recovery Strategy for the Eastern Small-footed Myotis Myotis leibii in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. vii + 76 pp.

Lee, H.T., Bakowsky, W.D., Riley, J., Bowles, J., Puddister, M., Uhlig, P., and McMurray, S. (1998). Ecological Land Classification for Southern Ontario: First Approximation and Its Application. Ontario Ministry of Natural Resources, Southcentral Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

McCracken, J.D., R.A. Reid, R.B. Renfrew, B. Frei, J.V. Jalava, A. Cowie, & A.R. Couturier. (2013). Recovery Strategy for the Bobolink (Dolichonyx oryzivorus) Fourth Biennial Conference on the Conservation of America's Grasslands: Conference Proceedings and Eastern Meadowlark (Sturnella magna) in Ontario. Ontario Recovery Strategy Series. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. viii + 88 pp.

Menzel. M, S. Owen, W. Edwards, P. Wood, B. Chapman & Miller, K. (2002). Roost tree selection by northern long-eared bat (Myotis septentrionalis) maternity colonies in an industrial forest of the central Appalachian Mountains. Forest Ecology and Management 155:107-114.

MMAH - Ministry of Municipal Affairs and Housing. (2020). Ontario Provincial Policy Statement.

MECP. (2013). Chimney Swift General Habitat Description.

MECP. (2019). Recovery Strategy for the Blanding's Turtle (Emydoidea blandingii) in Ontario. Ontario Recovery Strategy Series. Prepared by the Ministry of the Environment, Conservation and Parks, Peterborough, Ontario. iv + 6 pp. + Appendix. Adoption of the Recovery Strategy for Blanding's Turtle (Emydoidea blandingii), Great Lakes / St. Lawrence population, in Canada (Environment and Climate Change Canada 2018).

Ministry of Municipal Affairs and Housing. (2020). Ontario Provincial Policy Statement.

MTO. 2020. Environmental Guide for Fisheries. 155 pp. + appendices.

Newmaster, S.G., A. Lehela, P.W.C Uhlig, S. McMurray and M.J. Oldham. (1998). Ontario plant list. Ontario Ministry of Natural Resources, Ontario Forest Research Institute, Sault Ste. Marie, ON, Forest Research Information Paper No. 123. 550 pp. + appendices.

OMNR (2000). Significant Wildlife Habitat Technical Guide. Fish and Wildlife Branch Wildlife Section. Science Development and Transfer Branch. Southcentral Sciences Section. viii + 384 pp.

OMNR. (2010). Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005. Ontario Ministry of Natural Resources. Second Edition: xi + 233 pp

OMNR. (2011). Bats and Bat Habitat: Guidelines for Wind Power Projects. Second Edition. 24 pp

OMNR. (2022). Ontario Wetland Evaluation System 4th Edition. viii + 239 pp.

OMNRF (2014). Draft Survey Protocol for Eastern Meadowlark (Sturnella magna) in Ontario. Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. ii + 20pp.

OMNRF (2014). Significant Wildlife Habitat Mitigation Support Tool Version 2014. 533pp.

OMNRF. (2015). Significant Wildlife Habitat Criteria Schedules for Ecoregions 6E. Ontario Ministry of Natural Resources and Forestry, Regional Operations Division, Peterborough. i + 38 pp.

OMNRF. (2016). Recovery Strategy for the Least Bittern (Ixobrychus exilis) in Ontario. Ontario Recovery Strategy Series. Prepared by the Ontario Ministry of Natural Resources and Forestry, Peterborough, Ontario. v + 5 pp. + Appendix.

OMNRF. (2018). Bobolink General Habitat Description. Accessed Online January 23, 2019.

OMNRF. (2018). General Habitat Description for the Eastern Meadowlark (Sturnella magna). Accessed Online January 23, 2019.

OMNRF. (2019). Land Information Ontario.

Peterson, R.T. (1980). A field guide to the birds: A completely new guide to all the birds of eastern and central North America. Houghton Mifflin Company, Boston.

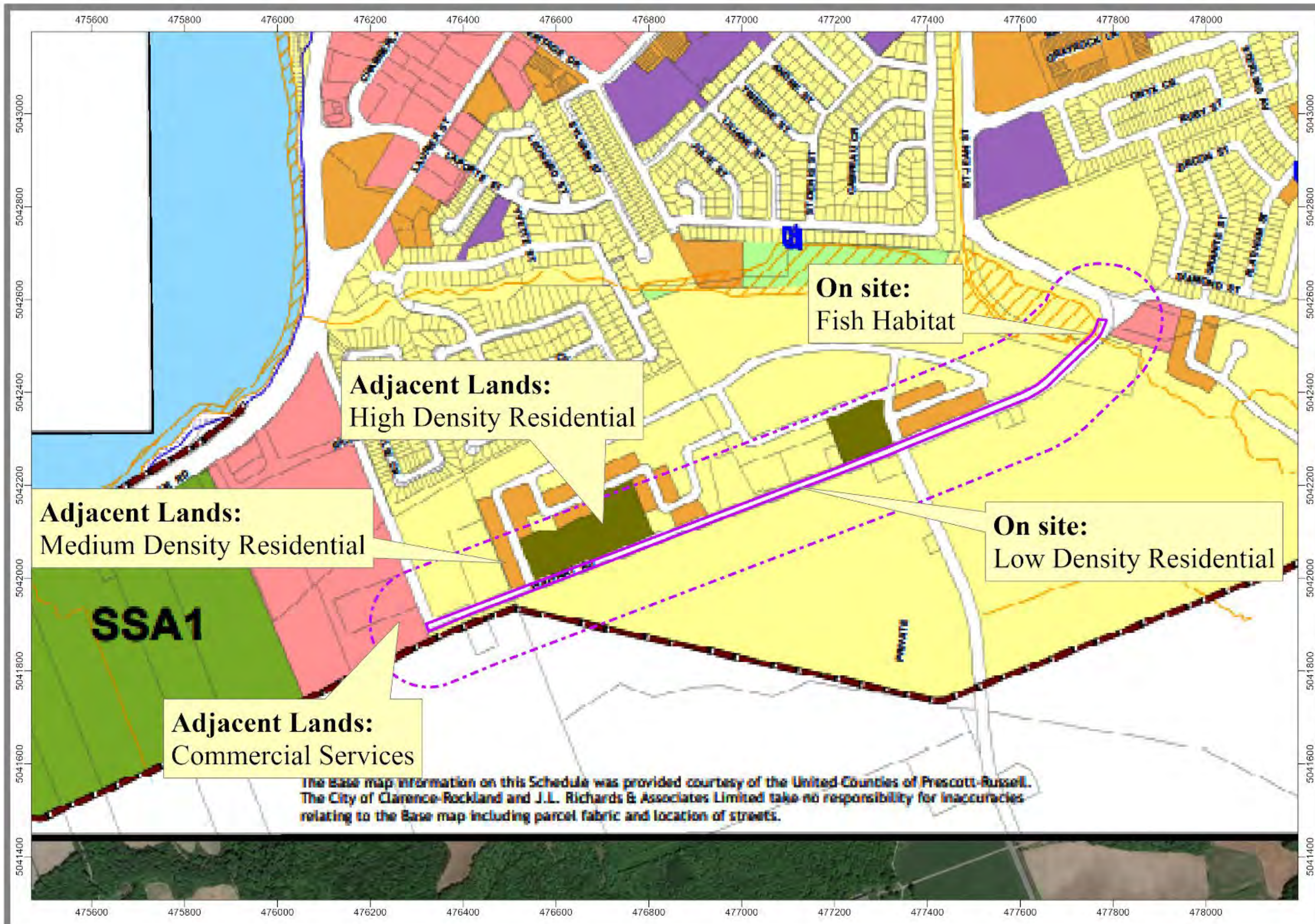
United Counties of Prescott and Russell. (2021). Official Plan – Office Consolidation November 2021. 166 pp + schedules

The Official Plan of the Urban Area of the City of Clarence-Rockland, February 2021.

# A

# Appendix A
# Background Information

## City of Clarence-Rockland Schedule A



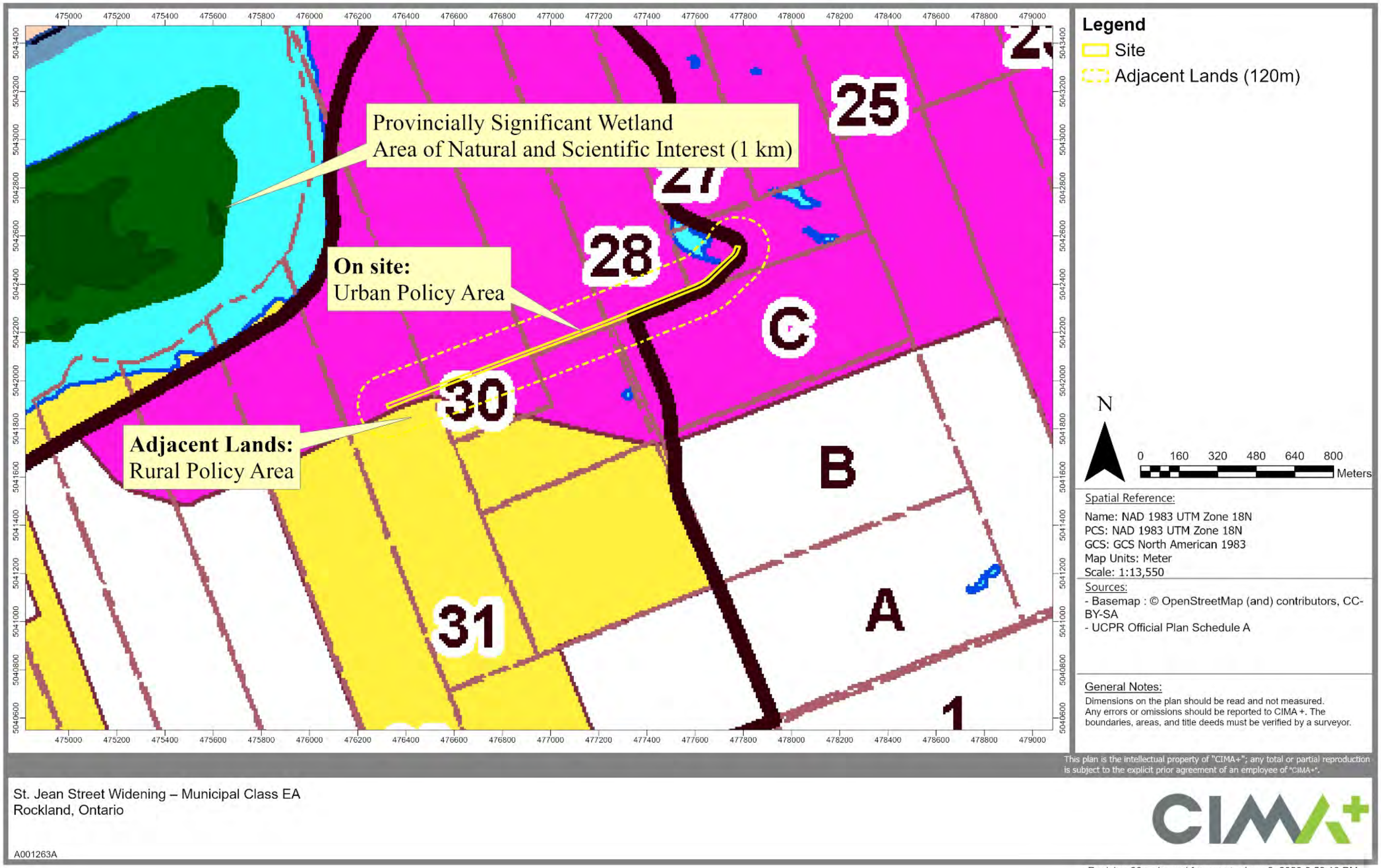



St. Jean Street Widening – Municipal Class EA
Rockland, Ontario

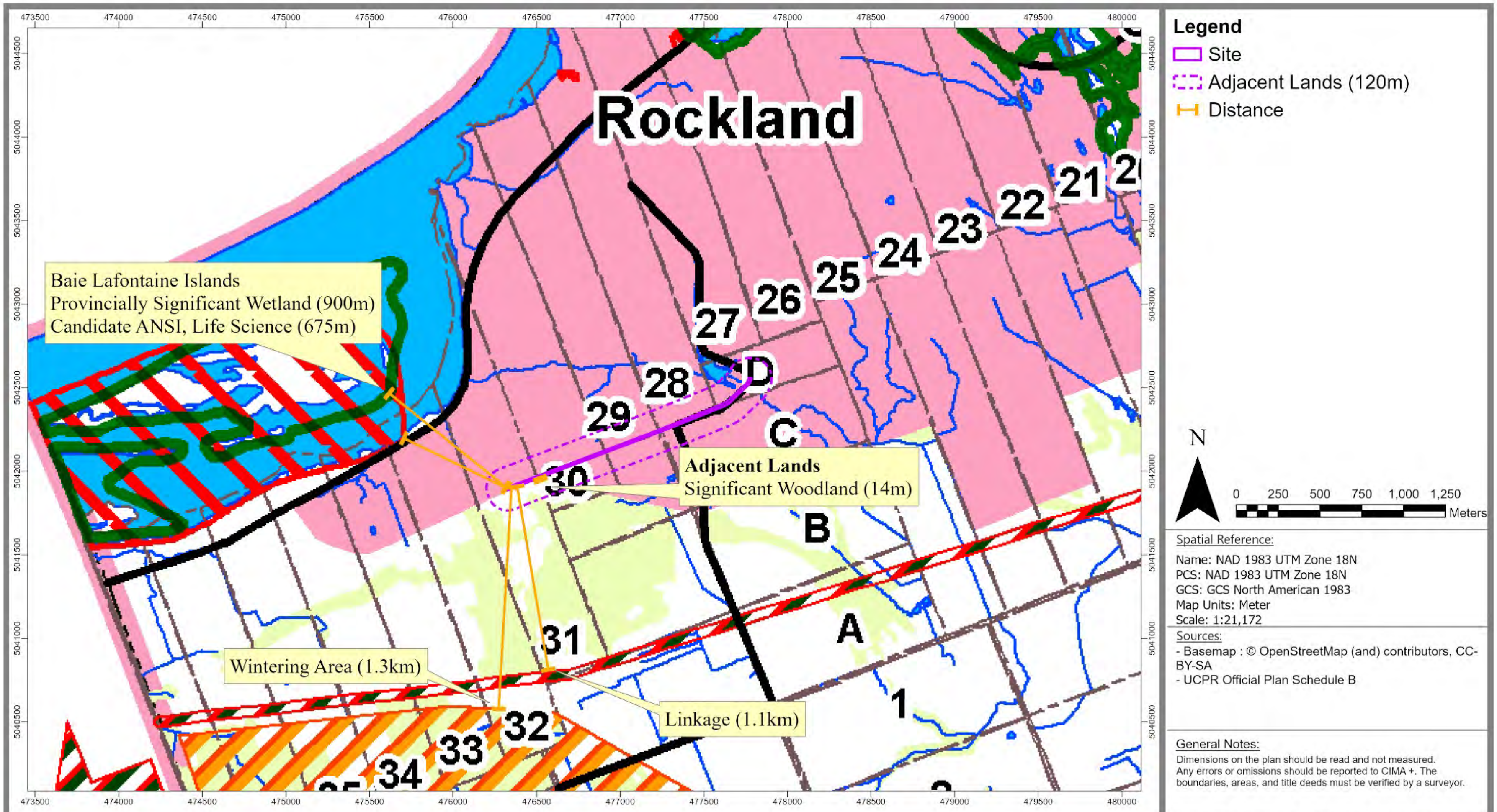
A001263A

Revision 00 - - Issued for report - June 8, 2023 4:11:46 PM

## United Counties of Prescott and Russell A



## United Counties of Prescott and Russell B






St. Jean Street Widening – Municipal Class EA
Rockland, Ontario

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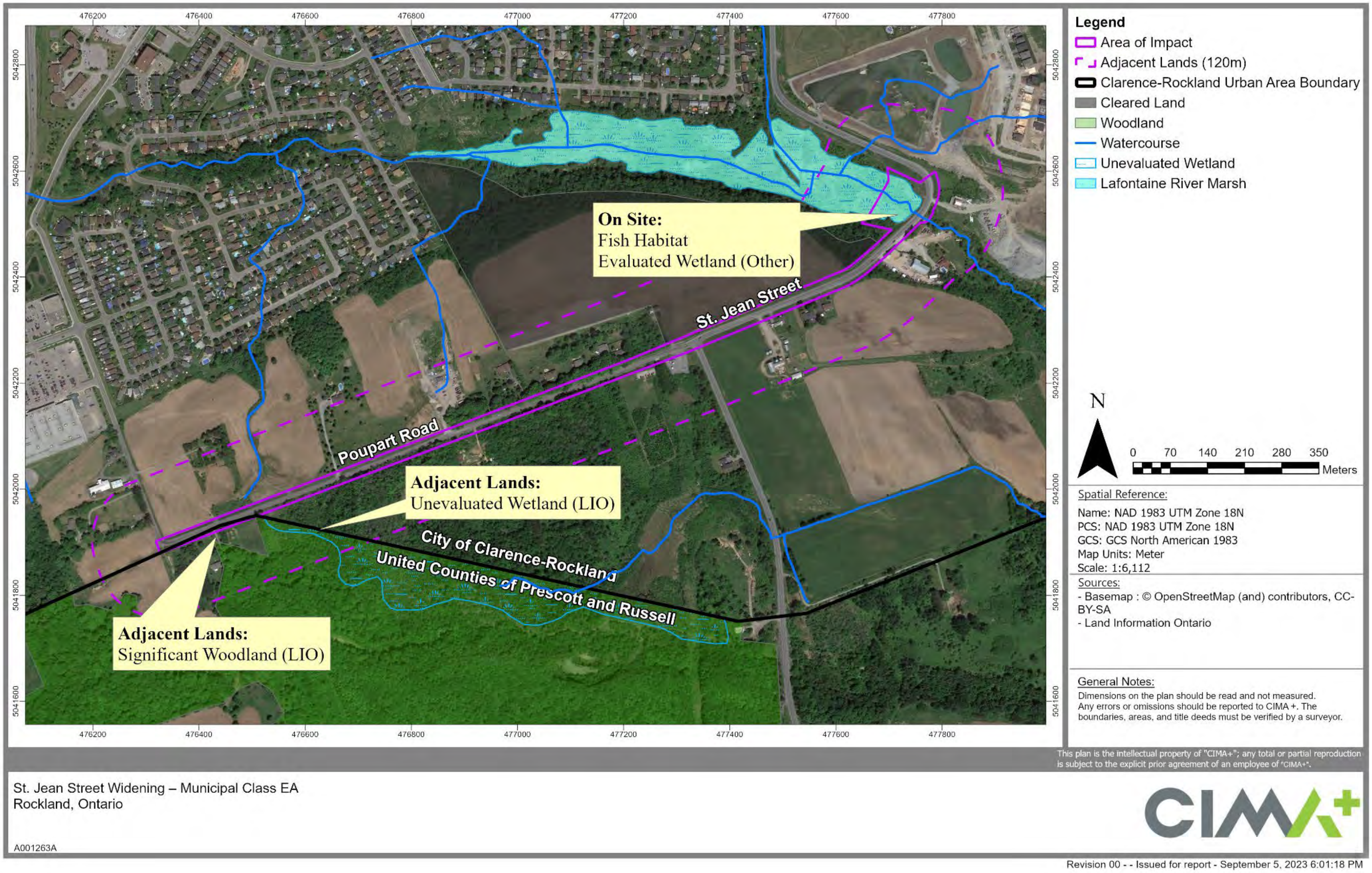
## Background Information Near Site – Land Information Ontario



**ATLAS of Breeding Birds in Ontario**
**Squares 18VR74, 18VR84, 18VR73, 18VR83 (applicable for the St. Jean Street MCEA)**

| Common Name | Scientific Name | ABBO Category | SRANK | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status |
|---|---|---|---|---|---|
| Canada Goose | *Branta canadensis* | Probable | S5 | no status | no status |
| Wood Duck | *Aix sponsa* | Probable | S5 | no status | no status |
| Gadwall | *Anas strepera* | Probable | S4 | no status | no status |
| American Black Duck | *Anas rubripes* | Probable | S4 | no status | no status |
| Mallard | *Anas platyrhynchos* | Confirmed | S5 | no status | no status |
| Northern Pintail | *Anas acuta* | Possible | S5 | no status | no status |
| Green-winged Teal | *Anas crecca* | Probable | S4 | no status | no status |
| Hooded Merganser | *Lophodytes cucullatus* | Possible | S5B,S5N | no status | no status |
| Ruffed Grouse | *Bonasa umbellus* | Confirmed | S4 | no status | no status |
| Wild Turkey | *Meleagris gallopava* | Confirmed | S5 | no status | no status |
| Common Loon | *Gavia immer* | Possible | S5B, S5N | no status | no status |
| Pied-billed Grebe | *Podilymbus podiceps* | Possible | S4B, S4N | no status | no status |
| American Bittern | *Botaurus lentiginosus* | Confirmed | S4B | no status | no status |
| Great Blue Heron | *Ardea herodias* | Possible | S4 | no status | no status |
| Green Heron | *Butorides virescens* | Probable | S4B | no status | no status |
| Turkey Vulture | *Cathartes aura* | Probable | S5B | no status | no status |
| Osprey | *Pandion haliaetus* | Confirmed | S5B | no status | no status |
| Northern Harrier | *Circus cyaneus* | Confirmed | S4B | no status | no status |
| Sharp-shinned Hawk | *Accipiter striatus* | Probable | S5 | no status | no status |
| Cooper's Hawk | *Accipiter cooperii* | Confirmed | S4 | no status | no status |
| Northern Goshawk | *Accipiter gentilis* | Possible | S4 | no status | no status |
| Red-shouldered Hawk | *Buteo lineatus* | Possible | S4B | no status | no status |
| Broad-winged Hawk | *Buteo platypterus* | Confirmed | S5B | no status | no status |
| Red-tailed Hawk | *Buteo jamaicensis* | Confirmed | S5 | no status | no status |
| American Kestrel | *Falco sparverius* | Confirmed | S4 | no status | no status |
| Merlin | *Falco columbarius* | Probable | S5B | no status | no status |
| Virginia Rail | *Rallus limicola* | Confirmed | S5B | no status | no status |
| Sora | *Porzana carolina* | Possible | S4B | no status | no status |
| Sandhill Crane | *Grus canadensis* | Probable | S5B | no status | no status |
| Killdeer | *Charadrius vociferus* | Confirmed | S5B, S5N | no status | no status |
| Spotted Sandpiper | *Actitis macularia* | Confirmed | S5 | no status | no status |
| Upland Sandpiper | *Bartramia longicauda* | Confirmed | S4B | no status | no status |
| Common Snipe | *Gallinago delicata* | Confirmed | S5B | no status | no status |
| American Woodcock | *Scolopax minor* | Confirmed | S4B | no status | no status |
| Rock Pigeon | *Columba livia* | Confirmed | SNA | no status | no status |
| Mourning Dove | *Zenaida macroura* | Confirmed | S5 | no status | no status |
| Black-billed Cuckoo | *Coccyzus erythropthalmus* | Confirmed | S5B | no status | no status |
| Eastern Screech-Owl | *Megascops asio* | Probable | S4 | no status | no status |

| Common Name | Scientific Name | ABBO Category | SRANK | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status |
|---|---|---|---|---|---|
| Great Horned Owl | *Bubo virginianus* | Confirmed | S4 | no status | no status |
| Barred Owl | *Strix varia* | Probable | S5 | no status | no status |
| Northern Saw-whet Owl | *Aegolius acadicus* | Possible | S4 | no status | no status |
| Whip-poor-will | *Caprimulgus vociferus* | Probable | S4B | THR | THR |
| Chimney Swift | *Chaetura pelagica* | Probable | S4B, S4N | THR | THR |
| Ruby-throated Hummingbird | *Archilochus colubris* | Confirmed | S5B | no status | no status |
| Belted Kingfisher | *Ceryle alcyon* | Confirmed | S4B | no status | no status |
| Yellow-bellied Sapsucker | *Sphyrapicus varius* | Confirmed | S5B | no status | no status |
| Downy Woodpecker | *Picoides pubescens* | Confirmed | S5 | no status | no status |
| Hairy Woodpecker | *Picoides villosus* | Confirmed | S5 | no status | no status |
| Northern Flicker | *Colaptes auratus* | Confirmed | S4B | no status | no status |
| Pileated Woodpecker | *Dryocopus pileatus* | Probable | S5 | no status | no status |
| Eastern Wood-Pewee | *Contopus virens* | Probable | S4B | SC | SC |
| Alder Flycatcher | *Empidonax alnorum* | Probable | S5B | no status | no status |
| Willow Flycatcher | *Empidonax traillii* | Probable | S5B | no status | no status |
| Least Flycatcher | *Empidonax minimus* | Probable | S4B | no status | no status |
| Eastern Phoebe | *Sayornis phoebe* | Confirmed | S5B | no status | no status |
| Great Crested Flycatcher | *Myiarchus crinitus* | Confirmed | S4B | no status | no status |
| Eastern Kingbird | *Tyrannus tyrannus* | Confirmed | S4B | no status | no status |
| Blue-headed Vireo | *Vireo solitarius* | Possible | S5B | no status | no status |
| Warbling Vireo | *Vireo gilvus* | Confirmed | S5B | no status | no status |
| Red-eyed Vireo | *Vireo olivaceus* | Probable | S5B | no status | no status |
| Blue Jay | *Cyanocitta cristata* | Confirmed | S5 | no status | no status |
| American Crow | *Corvus brachyrhynchos* | Confirmed | S5B | no status | no status |
| Common Raven | *Corvus corax* | Confirmed | S5 | no status | no status |
| Horned Lark | *Eremophila alpestris* | Probable | S5B | no status | no status |
| Purple Martin | *Progne subis* | Confirmed | S3S4B | no status | no status |
| Tree Swallow | *Tachycineta bicolor* | Confirmed | S4B | no status | no status |
| Northern Rough-winged Swallow | *Stelgidopteryx serripennis* | Confirmed | S4B | no status | no status |
| Bank Swallow | *Riparia riparia* | Confirmed | S4B | THR | THR |
| Cliff Swallow | *Petrochelidon pyrrhonota* | Possible | S4B | no status | no status |
| Barn Swallow | *Hirundo rustica* | Confirmed | S4B | THR | THR |
| Black-capped Chickadee | *Poecile atricapilla* | Confirmed | S5 | no status | no status |
| Red-breasted Nuthatch | *Sitta canadensis* | Confirmed | S5 | no status | no status |
| White-breasted Nuthatch | *Sitta carolinensis* | Confirmed | S5 | no status | no status |
| Brown Creeper | *Certhia familiaris* | Confirmed | S5B | no status | no status |
| House Wren | *Troglodytes aedon* | Confirmed | S5B | no status | no status |
| Winter Wren | *Troglodytes troglodytes* | Possible | S5B | no status | no status |

| Common Name | Scientific Name | ABBO Category | SRANK | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status |
|---|---|---|---|---|---|
| Marsh Wren | *Cistothorus palustris* | Probable | S4B | no status | no status |
| Golden-crowned Kinglet | *Regulus satrapa* | Possible | S5B | no status | no status |
| Ruby-crowned Kinglet | *Regulus calendula* | Possible | S4B | no status | no status |
| Eastern Bluebird | *Sialia sialis* | Confirmed | S5B | no status | no status |
| Veery | *Catharus fuscescens* | Confirmed | S4B | no status | no status |
| Swainson's Thrush | *Catharus ustulatus* | Confirmed | S4B | no status | no status |
| Hermit Thrush | *Catharus guttatus* | Probable | S5B | no status | no status |
| Wood Thrush | *Hylocichla mustelina* | Probable | S4B | SC | THR |
| American Robin | *Turdus migratorius* | Confirmed | S5B | no status | no status |
| Gray Catbird | *Dumetella carolinensis* | Confirmed | S4B | no status | no status |
| Northern Mockingbird | *Mimus polyglottos* | Possible | S4 | no status | no status |
| Brown Thrasher | *Toxostoma rufum* | Confirmed | S4B | no status | no status |
| European Starling | *Sturnus vulgaris* | Confirmed | SNA | no status | no status |
| Cedar Waxwing | *Bombycilla cedrorum* | Confirmed | S5B | no status | no status |
| Nashville Warbler | *Vermivora ruficapilla* | Confirmed | S5B | no status | no status |
| Yellow Warbler | *Dendroica petechia* | Confirmed | S5B | no status | no status |
| Chestnut-sided Warbler | *Dendroica pensylvanica* | Confirmed | S5B | no status | no status |
| Magnolia Warbler | *Dendroica magnolia* | Possible | S5B | no status | no status |
| Black-throated Blue Warbler | *Dendroica caerulescens* | Probable | S5B | no status | no status |
| Yellow-rumped Warbler | *Dendroica coronata* | Confirmed | S5B | no status | no status |
| Black-throated Green Warbler | *Dendroica virens* | Probable | S5B | no status | no status |
| Blackburnian Warbler | *Dendroica fusca* | Possible | S5B | no status | no status |
| Pine Warbler | *Dendroica pinus* | Confirmed | S5B | no status | no status |
| Black-and-white Warbler | *Mniotilta varia* | Probable | S5B | no status | no status |
| American Redstart | *Setophaga ruticilla* | Possible | S5B | no status | no status |
| Ovenbird | *Seiurus aurocapillus* | Confirmed | S4B | no status | no status |
| Northern Waterthrush | *Seiurus noveboracensis* | Possible | S5B | no status | no status |
| Mourning Warbler | *Oporornis philadelphia* | Confirmed | S4B | no status | no status |
| Common Yellowthroat | *Geothlypis trichas* | Confirmed | S5B | no status | no status |
| Canada Warbler | *Wilsonia canadensis* | Probable | S4B | SC | THR |
| Chipping Sparrow | *Spizella passerina* | Confirmed | S5B | no status | no status |
| Clay-colored Sparrow | *Spizella pallida* | Possible | S4B | no status | no status |
| Field Sparrow | *Spizella pusilla* | Probable | S4B | no status | no status |
| Vesper Sparrow | *Pooecetes gramineus* | Possible | S4B | no status | no status |
| Savannah Sparrow | *Passerculus sandwichensis* | Confirmed | S4B | no status | no status |
| Grasshopper Sparrow | *Ammodramus savannarum* | Probable | S4B | SC | no status |
| Song Sparrow | *Melospiza melodia* | Confirmed | S5B | no status | no status |

| Common Name | Scientific Name | ABBO Category | SRANK | ESA Reg. 230/08 SARO List Status | SARA Schedule 1 List of Wildlife SAR Status |
|---|---|---|---|---|---|
| Lincoln's Sparrow | *Melospiza lincolnii* | Probable | S5B | no status | no status |
| Swamp Sparrow | *Melospiza georgiana* | Confirmed | S5B | no status | no status |
| White-throated Sparrow | *Zonotrichia albicollis* | Confirmed | S5B | no status | no status |
| Dark-eyed Junco | *Junco hyemalis* | Possible | S5B | no status | no status |
| Scarlet Tanager | *Piranga olivacea* | Probable | S4B | no status | no status |
| Northern Cardinal | *Cardinalis cardinalis* | Confirmed | S5 | no status | no status |
| Rose-breasted Grosbeak | *Pheucticus ludovicianus* | Confirmed | S4B | no status | no status |
| Indigo Bunting | *Passerina cyanea* | Confirmed | S4B | no status | no status |
| Bobolink | *Dolichonyx oryzivorus* | Confirmed | S4B | THR | THR |
| Red-winged Blackbird | *Agelaius phoeniceus* | Confirmed | S4 | no status | no status |
| Eastern Meadowlark | *Sturnella magna* | Confirmed | S4B | THR | THR |
| Common Grackle | *Quiscalus quiscula* | Confirmed | S5B | no status | no status |
| Brown-headed Cowbird | *Molothrus ater* | Confirmed | S4B | no status | no status |
| Baltimore Oriole | *Icterus galbula* | Confirmed | S4B | no status | no status |
| Purple Finch | *Carpodacus purpureus* | Probable | S4B | no status | no status |
| House Finch | *Carpodacus mexicanus* | Confirmed | SNA | no status | no status |
| Red Crossbill | *Loxia curvirostra* | Possible | S4B | no status | no status |
| White-winged Crossbill | *Loxia leucoptera* | Possible | S5B | no status | no status |
| Pine Siskin | *Carduelis pinus* | Possible | S4B | no status | no status |
| American Goldfinch | *Carduelis tristis* | Confirmed | S5B | no status | no status |
| Evening Grosbeak | *Coccothraustes vespertinus* | Confirmed | S4B | SC | SC |
| House Sparrow | *Passer domesticus* | Confirmed | SNA | no status | no status |

Table Updated: February, 2023

**SRANK DEFINITIONS**

S4 Apparently Secure, Uncommon but not rare; some cause for long-term concern due to declines or other factors.
S5 Secure, Common, widespread, and abundant in the nation or state/province.
SNA Not Applicable, A conservation status rank is not applicable because the species is not a suitable target for conservation activities.
S#S# Range Rank, A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community. Ranges cannot skip more than one nk (e.g., SU is used rather than S1S4).
S#B Breeding
S#N Non-Breeding

**SARO STATUS DEFINITIONS**

THR Threatened: A species that is at risk of becoming endangered in Ontario if limiting factors are not reversed.
SC Special Concern: A species with characteristics that make it sensitive to human activities or natural events.

**SARA STATUS DEFINITIONS**

THR Threatened, a wildlife species that is likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction.

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

# B

# Appendix B
# Bird Survey Results

**Grassland Breeding Bird Results 2023**

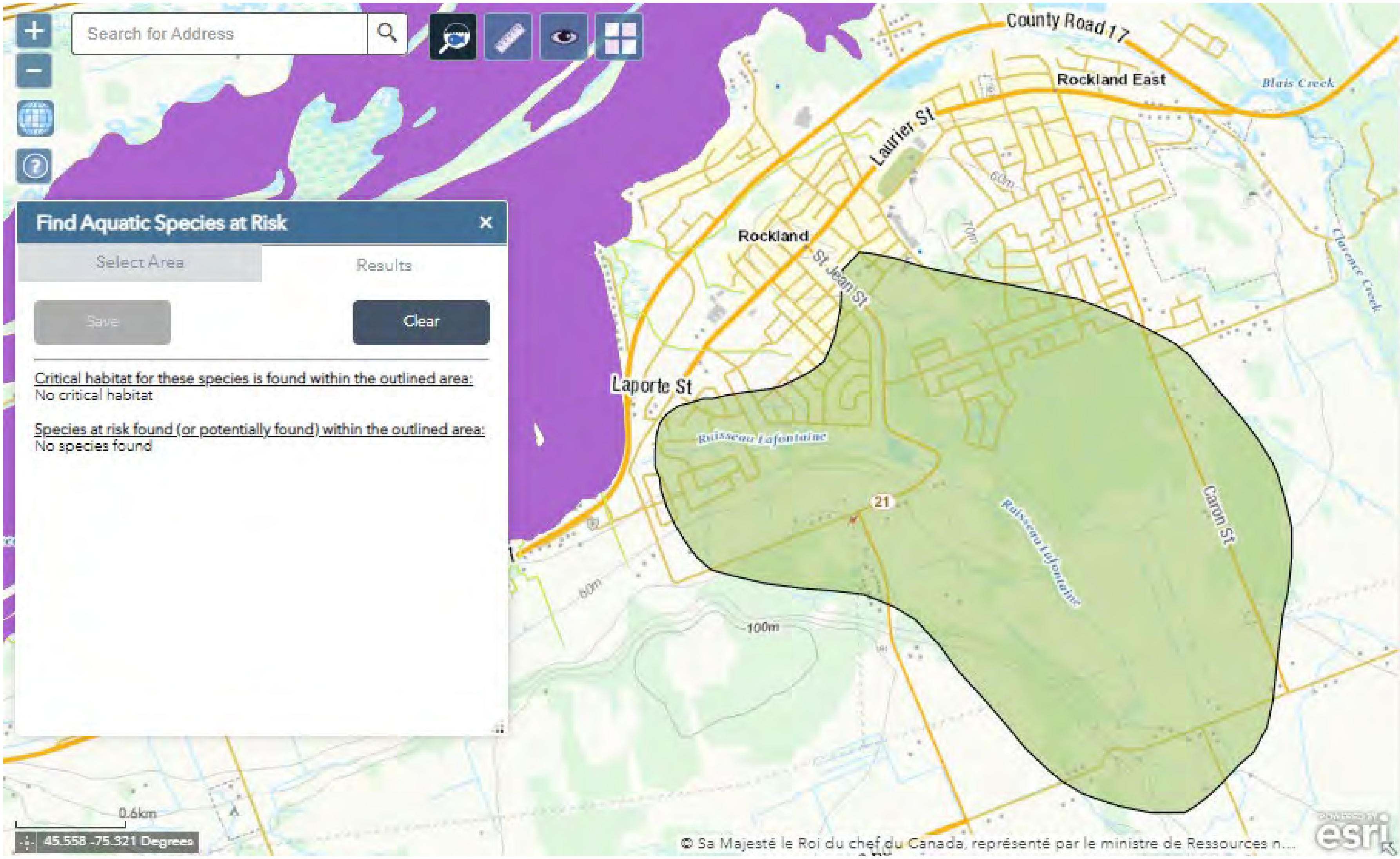
| Station Number | | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | Highest Breeding Evidence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Visit Number | | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | |
| Common Name | Scientific Name | | | | | | | | | | | | | | | | | | | |
| Wild Turkey | *Meleagris gallopava* | | | | | 1 | | | | | | | | | | | | | | H |
| Great Blue Heron | *Ardea herodias* | | | | | | | | | | | | | | | | | 3fly | | X |
| Turkey Vulture | *Cathartes aura* | | | | | | | | | | | 1 | | | | | | | | X |
| Red-tailed Hawk | *Buteo jamaicensis* | | | | | | | | | | | | | | | | | | 1 | H |
| Killdeer | *Charadrius vociferus* | | | 1 | | | | | | | | | | | | | | | | S |
| Rock Dove | *Columba livia* | | | | | 2AE | 3AE | | | | | | | | | | | | | AE |
| Mourning Dove | *Zenaida macroura* | | | | 1 | | 1 | | | | | | | | | 1 | | | | H |
| Yellow-bellied Sapsucker | *Sphyrapicus varius* | | | | | | | | | | | | 2 | | | | | | | H |
| Downy Woodpecker | *Picoides pubescens* | | | | | | | | | | | | | | | 1 | | | | H |
| Northern Flicker | *Colaptes auratus* | | | | | | | 2 | | | | | | | | 1 | | | | H |
| Eastern Wood-Pewee | *Contopus virens* | | | 1 | | | | | | | | | | | | | | | | S |
| Eastern Phoebe | *Sayornis phoebe* | | | | | | | | | | | | | | | | 1 | 1 | 1 | T |
| Great Crested Flycatcher | *Myiarchus crinitus* | | | | | | | 1 | | | | | | | | | | | | S |
| Warbling Vireo | *Vireo gilvus* | | | | | 1 | | | | | | | | | | | | | | S |
| Red-eyed Vireo | *Vireo olivaceus* | 1 | 1 | | | | | 1 | 1 | 1 | | 1 | | 1 | 1 | 1 | 1 | 1 | 1 | T |
| Blue Jay | *Cyanocitta cristata* | | | | | | | 1 | | | | 1 | 1 | 1 | 1 | 2 | | | | T |

| Station Number | | 1 | 1 | 1 | 2 | 2 | 2 | 3 | 3 | 3 | 4 | 4 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | Highest Breeding Evidence |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Visit Number** | | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | |
| **Common Name** | **Scientific Name** | | | | | | | | | | | | | | | | | | | |
| American Crow | *Corvus brachyrhynchos* | 1 | 1 | 1 | 1 | 1 | | 2 | | | | | 1 | | 1 | | 1 | 2 | 1 | H |
| Common Raven | *Corvus corax* | | | | | 1 | | | | | | | | | 1 | | | | | H |
| Barn Swallow | *Hirundo rustica* | | | | | | | | | | | | | | | | | 1 | | H |
| Black-capped Chickadee | *Poecile atricapilla* | | | | | 1 | | | 1 | | | | | | 1 | 1 | | | 1 | T |
| White-breasted Nuthatch | *Sitta carolinensis* | | | | | | | | | 1 | | | | | | | | | 2 | P |
| American Robin | *Turdus migratorius* | 1 | 2 | 1 | 29 | 4 | 1 | 1 | 1 | | 1 | 4 | 1 | | | 1 | | | 1 | T |
| Gray Catbird | *Dumetella carolinensis* | | | | | | 1 | 1 | | | | | | | | | | | | S |
| European Starling | *Sturnus vulgaris* | | 1 | | 7 | 1 | | | | | | 3 | | | | | | | | H |
| Cedar Waxwing | *Bombycilla cedrorum* | | | | 1 | | 1 | | | | | | | | 4 | 1 | | | | H |
| Yellow Warbler | *Dendroica petechia* | | | | | | | | | | | | 1 | | | | 1 | | | S |
| Chestnut-sided Warbler | *Dendroica pensylvanica* | | | | | 1 | | | | | | 1 | | | | | | | | S |
| American Redstart | *Setophaga ruticilla* | 1 | 1 | 2 | 1 | 1 | | 1 | 1 | 1 | | 1 | | 1 | 1 | 1 | | | | T |
| Mourning Warbler | *Oporornis philadelphia* | | | | | | | | | | | | | | | 1 | | | | S |
| Common Yellowthroat | *Geothlypis trichas* | | 1 | | 1 | | | | | | | | | 1 | 1 | 1 | | | 1 | T |
| Chipping Sparrow | *Spizella passerina* | | 1 | | 1 | 1 | | 2 | | 1 | | 2 | | | | | 1 | | 1 | T |

| **Station Number** | | ***1*** | ***1*** | ***1*** | ***2*** | **2** | **2** | ***3*** | ***3*** | ***3*** | ***4*** | ***4*** | ***4*** | ***5*** | ***5*** | ***5*** | ***6*** | **6** | **6** | **Highest Breeding Evidence** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Visit Number** | | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | **1** | **2** | **3** | |
| **Common Name** | **Scientific Name** | | | | | | | | | | | | | | | | | | | |
| Savannah Sparrow | *Passerculus sandwichensis* | | | | | 1 | 1 | | | | 1 | 1 | 1 | | 1 | | | | | T |
| Song Sparrow | *Melospiza melodia* | | | 2 | 2 | | 4 | 3 | | 2 | | | 2 | | | 3 | | | 1 | T |
| Northern Cardinal | *Cardinalis cardinalis* | | | 1 | 1 | | | 1 | | | 1 | 2 | 1 | | | 1 | 1 | 1 | 1 | T |
| Rose-breasted Grosbeak | *Pheucticus ludovicianus* | | | | | | | | | | | | | | | 1 | | | | S |
| Indigo Bunting | *Passerina cyanea* | | | | | | | | 1 | 1 | | | 1 | 1 | | 1 | 1 | 1 | 2 | T |
| Bobolink | *Dolichonyx oryzivorus* | | | | | | 1 | | | | | | | | | | | | | S |
| Red-winged Blackbird | *Agelaius phoeniceus* | 1 | 1 | 1 | 5 | 3 | 1 | 2 | 1 | | 2 | 1 | 2 | 2 | 1 | 2 | 1 | 3P | 1 | T |
| Common Grackle | *Quiscalus quiscula* | | | 1 | 10 | | | 1 | | | | | | 1 | 2 | | | | | H |
| Purple Finch | *Carpodacus purpureus* | | | | | | | | | | | | | | 1 | | | | | S |
| American Goldfinch | *Carduelis tristis* | | | 2 | 3 | 1 | 1 | 2 | | 1 | | | | | | | 2 | 1 | | T |

# C

## Appendix C
## National Aquatic Species at Risk Map




NASAR Accessed February 6, 2023

# APPENDIX “P”

## Noise Control Feasibility Report

## Atrel

## September, 28, 2023

# POUPART ROAD / ST-JEAN STREET

# NOISE CONTROL
# FEASIBILITY STUDY

## PROJECT No: 180801-3

## CITY OF OF CLARENCE-ROCKLAND

**SEPTEMBER 28, 2023**

**REVISION 1**

**NOISE CONTROL FEASIBILITY STUDY**

**POUPART ROAD / ST-JEAN STREET**

**CITY OF CLARENCE-ROCKLAND**

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**POUPART ROAD / ST-JEAN STREET**

**CITY OF CLARENCE-ROCKLAND**

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| **APPENDIX 'B'** | Table 1 - Forecast Traffic Volume |
| **APPENDIX 'C'** | Drawing 180801-3-N1 Projected Setback Overall<br>Drawing 180801-3-N2 Projected Setback<br>Drawing 180801-3-N3 Projected Setback<br>Drawing 180801-3-N4 Projected Setback |
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# 1.0 INTRODUCTION

Atrel Engineering has been retained by the City of Clarence-Rockland to conduct a Noise Control Feasibility Study to determine the noise impact on the proposed residential development resulting from roadway traffic along Poupart Road / St-Jean Street.

The existing and proposed development are located north and south of Poupart Road and west of St-Jean Street, as illustrated on Figure 1 below. The proposed site, known as Stewart Village is located in the city of Rockland and part of the City of Clarence-Rockland. A more detailed sketch is provided in Appendix 'A' – SK-1 which shows the streets to which the development will be connected.


Figure 1 – Location Map

# 2.0 CRITERIA

The criteria used in the current Noise Control Feasibility Study are outlined in the Ministry of Environment, Conservation and Parks (MOECP). The guidelines offer traffic and road parameters as well as noise level limits for outdoor and indoor living areas.

A summary of the noise level criteria from the guidelines is described in the subsections.

## 2.1 Noise Level Criterion for Outdoor Living Areas

As outlined in the MOECP and the City of Ottawa Noise Control Guidelines, the recommended outdoor area noise level limit from 7:00 to 23:00 is 55dBA Leq. The measuring unit "Leq" is defined as the energy equivalent sound level during an hour. The point of assessment for outdoor living area is at 3m from the building façade, 1.5m above grade and aligned with the midpoint of the subject façade.

When the calculated sound level is under the prescribed limits, no further action is required from the developer. If the sound levels exceed the abovementioned limits, noise mitigation measure shall be evaluated as well as the addition of warning clauses on the deeds of the concerned lots.

## 2.2 Indoor Sound Level Criteria

The recommended indoors sound level limits for dwellings given by the MOECP are summarized in the following table:

| **Type of Space** | **Equivalent Sound Level (Leq), dBA** |
|---|---|
| General offices, reception areas, retails stores, etc.<br>(Time period: 16 hr, 07:00 – 23:00) | 50 |
| Living/dining areas of residences, hospitals, schools, nursing/retirement homes, day-care centres, theatres, places of worship, libraries, individual or semi-private offices, conference rooms, reading rooms, etc.<br>(Time period: 16 hr, 07:00 – 23:00) | 45 |
| Sleeping quarters of hotels/motels (Time period: 8 hr, 23:00 – 07:00) | 45 |
| Sleeping quarters of residences, hospitals, nursing/retirement homes, etc.<br>(Time period: 8 hr, 23:00 – 07:00) | 40 |

The point of assessment for an indoor living area is at the center of the exposed window with a height of 1.5m minimum for a one-storey dwelling, 4.5m for a two-storey dwelling and 7.5m for a three-storey dwelling. The typical dwelling's first storey center of window is located at 2.5m above the ground for the purpose of this study.

## 2.3 Outdoor, Ventilation and Warning Clause Requirements

As per the MOECP Noise Control Guidelines, if the noise levels exceeds the prescribed noise level limits and noise mitigation measures doesn't attenuate the noise level within the permissible limits, the purchaser or tenant should be advised, with a warning clause, that sound levels may occasionally interfere with outdoor activities.

The following table describes the warning clause requirements for Outdoor living condition, Indoor living daytime and also Indoor living nighttime condition.

| Assessment Location | $L_{eq}$ (8 or 16 hrs as noted) (dBA) | Ventilation Requirements | Outdoor Control Measures | Warning Clause |
|---|---|---|---|---|
| OUTDOOR LIVING AREA (OLA) | Leq $_{16\ hr}$ Less than or equal to 55 dBA | N/A | None required | Not required |
| | Leq $_{16\ hr}$ Greater than 55 dBA to less than or equal to 60 dBA | N/A | Control measures (barriers) may not be required but should be considered | Required if resultant $L_{eq}$ exceeds 55 dBA Type A |
| | Leq $_{16\ hr}$ Greater than 60 dBA | N/A | Control measures (barriers) required to reduce the $L_{eq}$ to below 60 dBA and as close to 55 dBA as technically, economically and administratively feasible | Required if resultant $L_{eq}$ exceeds 55 dBA Type B |
| PLANE OF LIVING ROOM WINDOW | Leq $_{16\ hr}$ Less than or equal to 55 dBA | None required | N/A | Not required |
| | Leq $_{16\ hr}$ Greater than 55 dBA to less than or equal to 65 dBA | Forced air heating with provision for central air conditioning | N/A | Required Type C |
| | Leq $_{16\ hr}$ Greater than 65 dBA | Central air Conditioning | N/A | Required Type D |
| PLANE OF BEDROOM WINDOW | Leq $_{8\ hr}$ Greater than 50 dBA to less than or equal to 60 dBA | Forced air heating with provision for central air conditioning | N/A | Required Type C |
| | Leq $_{8\ hr}$ Greater than 60 dBA | Central air conditioning | N/A | Required Type D |

## 2.4 Relevant Warning Clauses

The MOECP and City of Ottawa Noise Control Guidelines offers warning clauses samples for each scenario which are summarized in the following table:

| TYPE | WARNING CLAUSE |
|---|---|
| Type A | "Purchasers/tenants are advised that sound levels due to increasing (road) (Transitway) (rail) (air) traffic may occasionally interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria." |
| Type B | "Purchasers/tenants are advised that despite the inclusion of noise control features in the development and within the building units, sound levels due to increasing (road) (Transitway) (rail) (air) traffic may on occasions interfere with some activities of the dwelling occupants as the sound levels exceed the City's and the Ministry of the Environment's noise criteria." |
| Type C | "This dwelling unit has been fitted with a forced air heating system and the ducting, etc. was sized to accommodate central air conditioning. Installation of central air conditioning by the occupant will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of the Environment's noise criteria. (Note: The location and installation of the outdoor air conditioning device should be done so as to comply with noise criteria of MOE Publication NPC-216, Residential Air Conditioning Devices and thus minimize the noise impacts both on and in the immediate vicinity of the subject property." |
| Type D | "This dwelling unit has been supplied with a central air conditioning system which will allow windows and exterior doors to remain closed, thereby ensuring that the indoor sound levels are within the City's and the Ministry of the Environment's noise criteria." |

## 3.0 ANALYSIS

The known significant noise sources in the proximity of the subject site results from the surface transportation. The noise source parameters are taken from the Transportation Impact Study prepared by Atrel Engineering Ltd. And Castleglenn Consultants Inc. and the following table summarizes the noise source parameters used in this study:

| Noise Source | AADT | Speed Limit (km/h) | Gradient (%) | Pavement Type | Day/Night (%) |
|---|---|---|---|---|---|
| Poupart Road | 22,818 | 50 | 3.2 | 1 | 92/8 |

| Noise Source | AADT | Speed Limit (km/h) | Gradient (%) | Pavement Type | Day/Night (%) |
|---|---|---|---|---|---|
| St-Jean Street | 19,000 | 50 | 8.0 | 1 | 92/8 |

The noise analysis was undertaken using the Stamson (version 5.03) program as supplied by the MOECP. As a Noise Control Feasibility Study, the subject site was studied using the projected noise level setback which returns a distance for a desired noise level in dBA. A summary of the projected setbacks for the three different conditions is shown in the following tables:

Living – Day condition

| **Noise Source** | **Living daytime condition – Noise level setbacks (m)** | | | | |
|---|---|---|---|---|---|
| | **<45 dBA** | **50 dBA** | **55 dBA** | **60 dBA** | **65 dBA** |
| Poupart Road | 479.16 | 236.42 | 116.71 | 57.63 | 28.41 |
| St-Jean Street | >500 | 260.10 | 128.44 | 63.31 | 23.23 |

Living – Night condition

| **Noise Source** | **Living night condition – Noise level setbacks (m)** | | | | |
|---|---|---|---|---|---|
| | **<45 dBA** | **50 dBA** | **55 dBA** | **60 dBA** | **65 dBA** |
| Poupart Road | 182.96 | 87.47 | 42.00 | 20.18 | <15 |
| St-Jean Street | 201.14 | 96.70 | 46.44 | 22.31 | <15 |

Outside condition

| **Noise Source** | **Outside condition – Noise level setbacks (m)** | | | | |
|---|---|---|---|---|---|
| | **<45 dBA** | **50 dBA** | **55 dBA** | **60 dBA** | **65 dBA** |
| Poupart Road | 446.95 | 223.40 | 111.62 | 55.85 | 27.91 |
| St-Jean Street | 491.00 | 245.42 | 122.63 | 61.30 | 30.63 |

Drawings 180801-3-N1 to 180801-3-N4 in appendix “C” illustrate the projected setback distance for each noise sources and scenarios.

## 4.0 NOISE MITIGATION MEASURES

The results show that part of the existing dwellings along Poupart Road and St-Jean Street may be subject to noise levels exceeding the prescribed MOECP noise level limits. As described in the MOECC Guidelines, the noise mitigation measure includes: distance setbacks, insertion of noise insensitive land, orientation of building, berms and acoustic barriers. It is to be noted that the proposed Stewart Village and Morris Village development will conduct their own respective noise studies and mitigation measures.

Even though we have determined the projected setback for outdoor living area, we have calculated a sample point at 3.0m from the center of 1259 St-Jean Street and determined that the noise level is indeed below 55 dBA. It was also determined that the outdoor living area sound level of all existing dwelling along Poupart Road and St-Jean Street were below 55 dBA, therefore no mitigation measures, such as a noise fences, is necessary.

We have also calculated two sample points along St-Jean Street and have determined that the noise level were actually below 65 dBA. It was also determined that living day sound level of all existing dwellings along Poupart Road and St-Jean Street were below 65 dBA. As the dwellings along Poupart Road and St-Jean Street are existing, on-site observation were made to determine if each dwelling were fitted with an air conditioning unit to keep the windows closed in the event the noise level would exceed the MOECC guidelines. It was determined that all dwelling were fitted with an air conditioning unit except for 1253 St-Jean. It was also noted that the windows were closed during the on-site observation at 1253 St-Jean on a hot summer day.

## 5.0 RECOMMENDATION AND CONCLUSION

The projected noise level for the daytime building face area and nighttime building face area are projected to be above the MOECC guideline limits at various locations. The projected noise level is expected to be between 55dBA and 65dBA during the day and between 50dBA and 60dBA during the night for all dwelling along St-Jean Street and Poupart Road except for 698 and 714 Poupart.

It was determined through this noise study that no mitigation measures for the outdoor living areas will be necessary due to the proposed road widening and associated traffic volume along Poupart Road and St-Jean Street. All the dwellings along St-Jean Street and Poupart Road except for 698 and 714 Poupart falls within a warning Clause Type C, but as the dwellings are existing we cannot install a force air heating with provision for a central air conditioning. It was determined through on-site observation that all dwelling were fitted with an air conditioning system except for 1253 St-Jean Street but that the windows were closed during a hot summer day.

It is therefore determined that no mitigation measures are necessary and that the existing home owners along Poupart Road and St-Jean Street shall be advised that “sound level due to increasing road traffic may occasionally interfere with some activities of the dwelling occupants as sound levels exceed the Ministry of Environment’s noise criteria”.

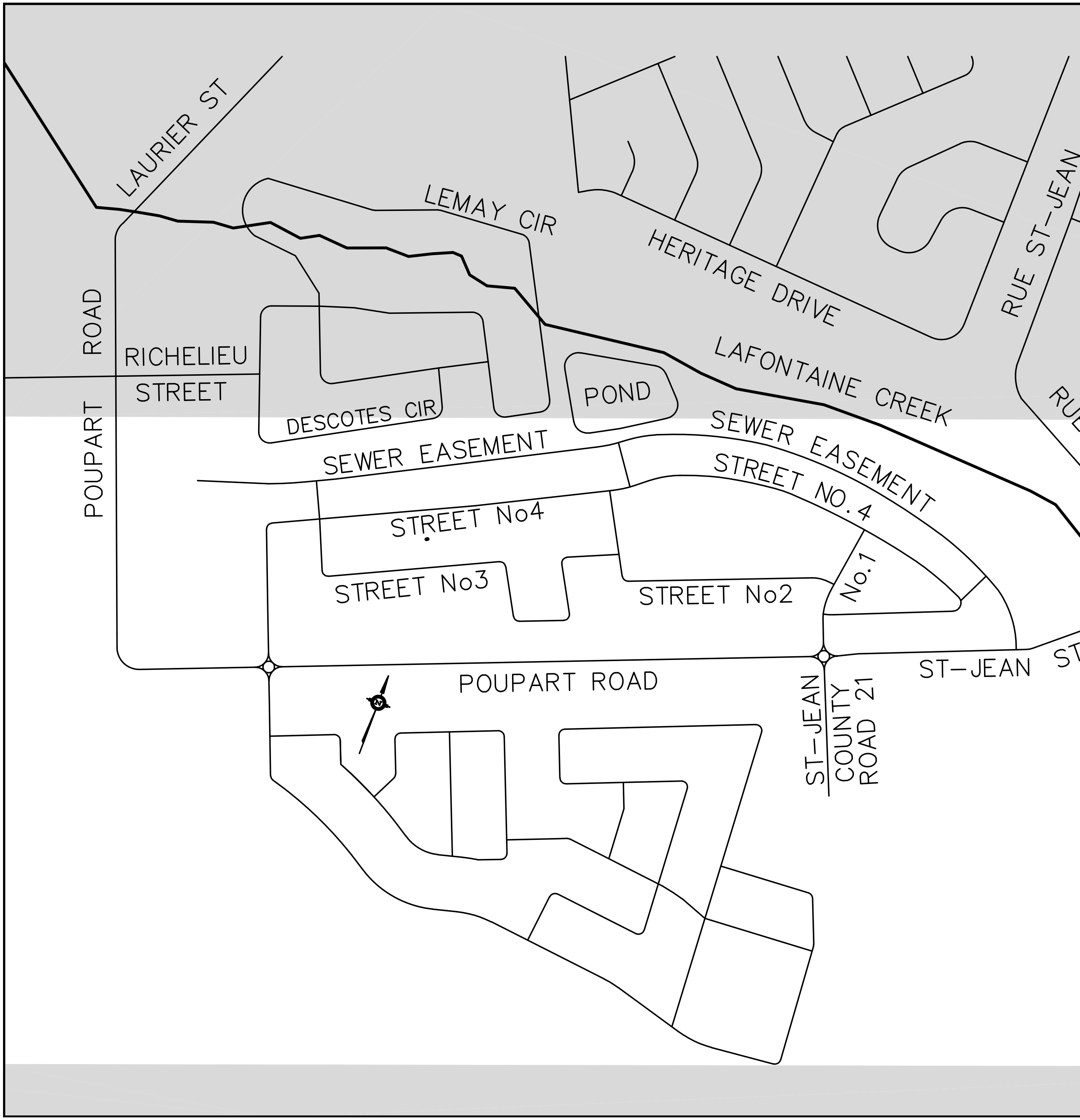
The Noise Control Feasibility Study shall be updated at the detailed design stage in which the mitigation measures will be re-evaluated and designed accordingly.

Respectfully submitted by:

**ATREL ENGINEERING LTD**

**APPENDIX 'A'**

Location Map – SK1

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180801-3-STEWART VILAGE

| SCALE: | LOCATION MAP | |
|---|---|---|
| N.T.S | AUG. 2023 | SK-1 |

## APPENDIX 'B'

Table 1 – Poupart Road Forecast Traffic Volume

Table 2 – St-Jean Street Forecast Traffic Volume

## Forecast Traffic Volume

**TABLE 1**

$$F_{ULTIMATE} = \frac{(1520 + 990)}{0.11} = 22818$$

**ROAD : Poupart Road**
**TOTAL AADT : 22,818**

**CALCULATION OF AADT (DAY / NIGHT)**

| | DAY | | NIGHT |
|---|---|---|---|
| TOTAL TRAFFIC: | **20993** | TOTAL TRAFFIC: | **1825** |
| CAR: | **18474** | CAR: | **1606** |
| MEDIUM TRUCK: | **1470** | MEDIUM TRUCK: | **128** |
| HEAVY TRUCK: | **1050** | HEAVY TRUCK: | **91** |
| Total | 20994 | | 1825 |

## Forecast Traffic Volume

**TABLE 2**

$$F_{ULTIMATE} = \frac{(1250 + 840)}{0.11} = 19000$$

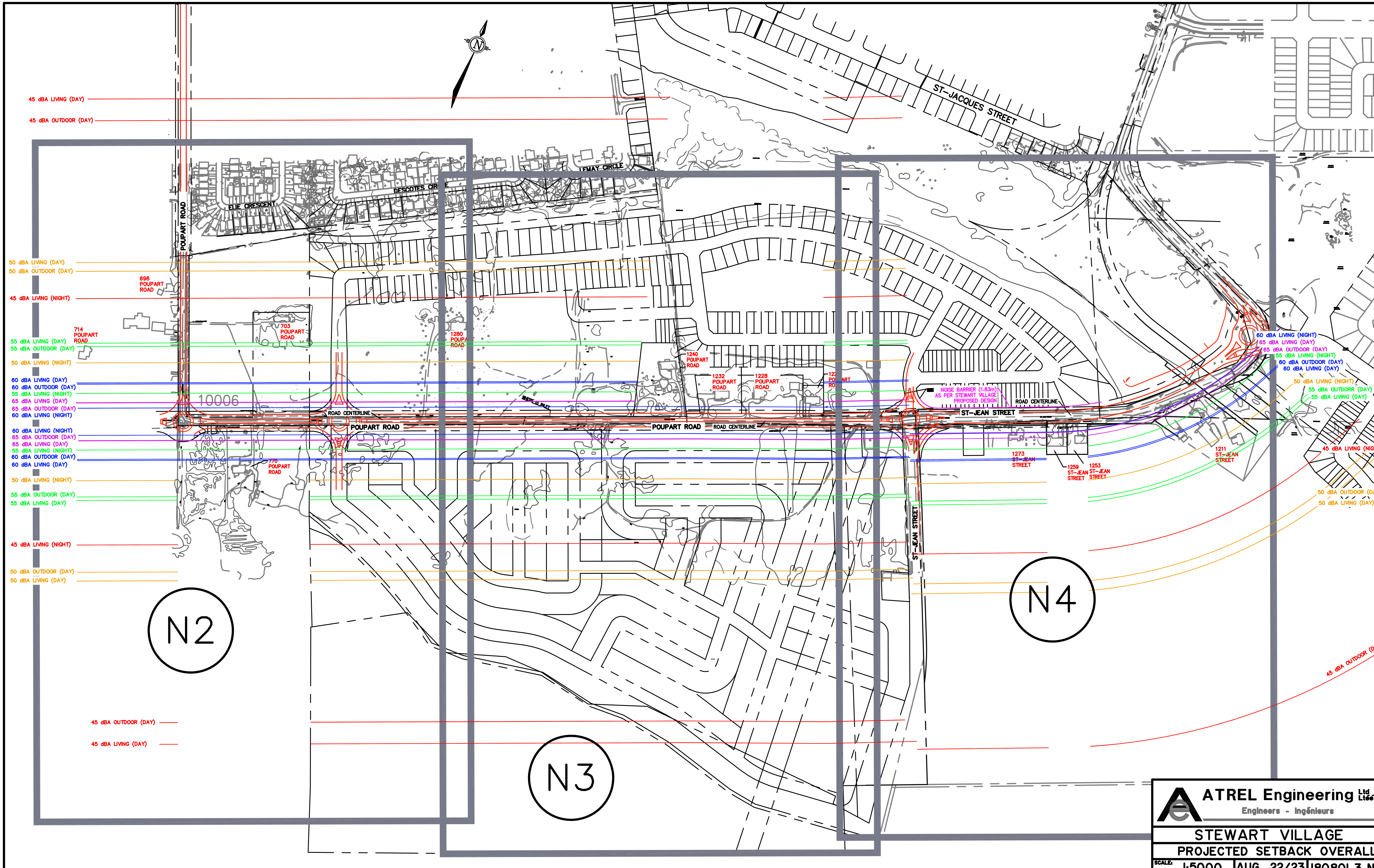
**ROAD : St-Jean Street**
**TOTAL AADT : 19,000**

**CALCULATION OF AADT (DAY / NIGHT)**

| | DAY | | NIGHT |
|---|---|---|---|
| TOTAL TRAFFIC: | **17480** | TOTAL TRAFFIC: | **1520** |
| CAR: | **15382** | CAR: | **1338** |
| MEDIUM TRUCK: | **1224** | MEDIUM TRUCK: | **106** |
| HEAVY TRUCK: | **874** | HEAVY TRUCK: | **76** |
| Total | 17480 | | 1520 |

**APPENDIX 'C'**

Drawing 180801-3-N1 Projected Setback Overall
Drawing 180801-3-N2 Projected Setback
Drawing 180801-3-N3 Projected Setback
Drawing 180801-3-N4 Projected Setback

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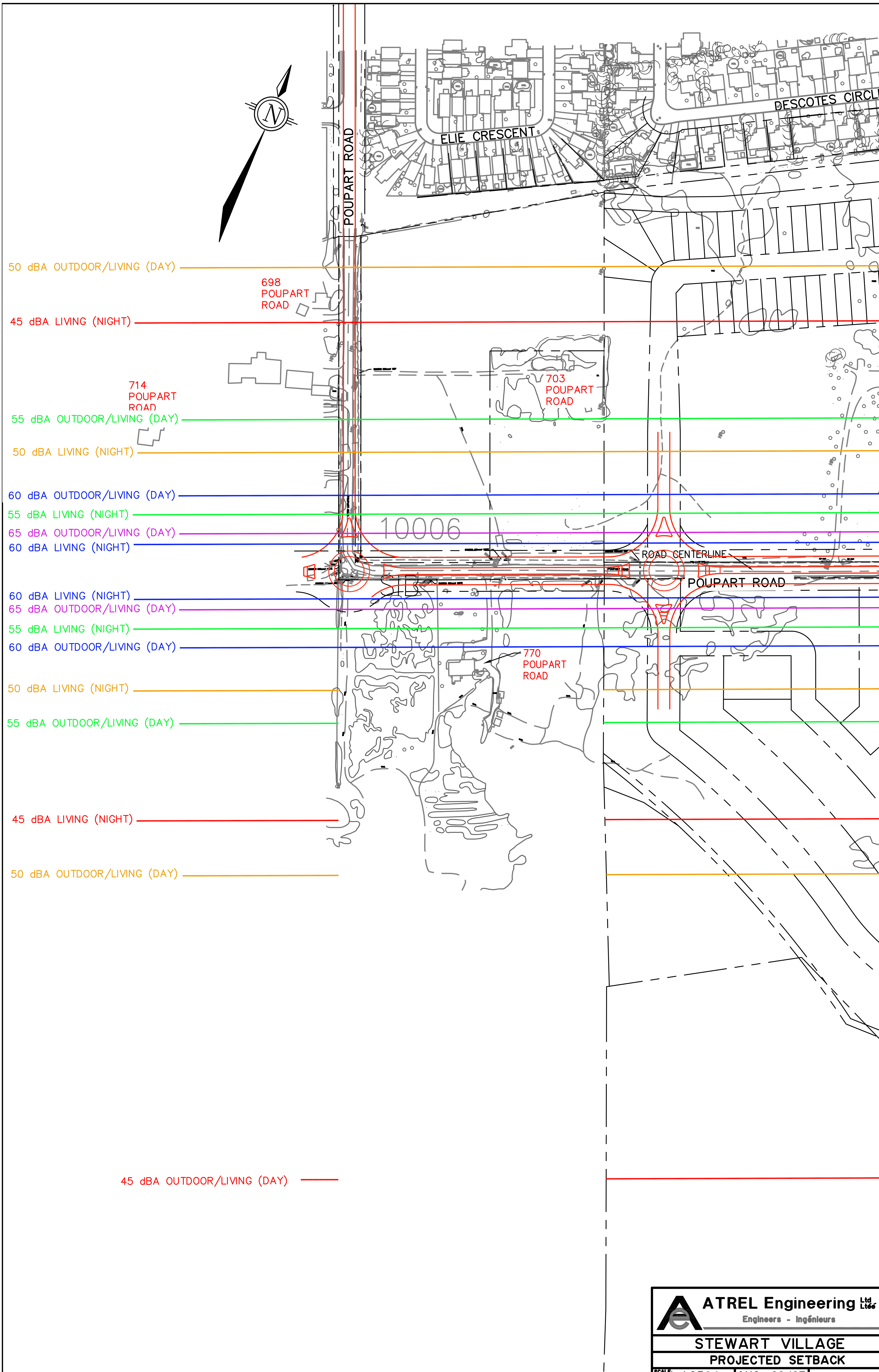
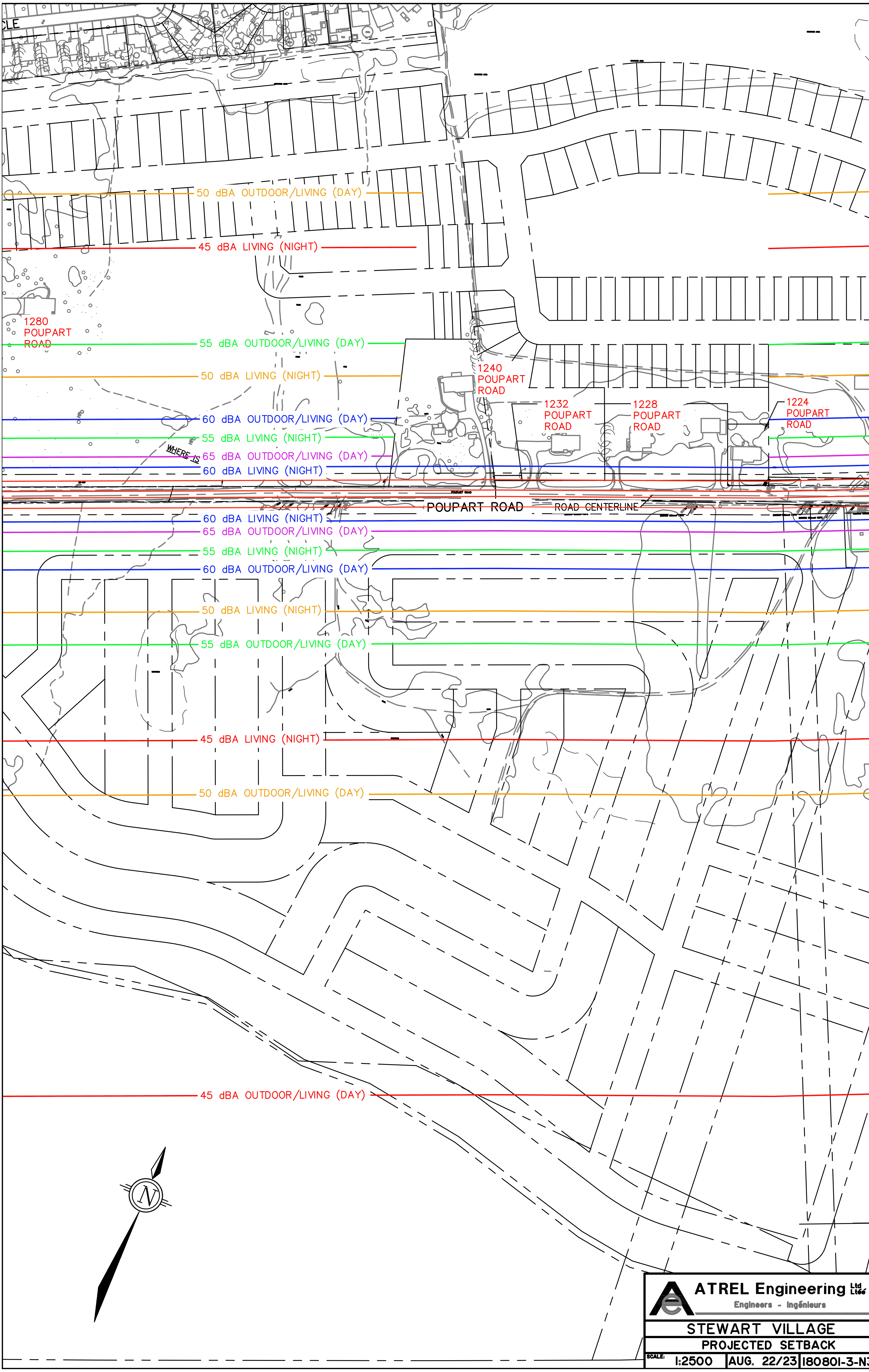
STEWART VILLAGE
PROJECTED SETBACK OVERALL

| SCALE: 1:5000 | AUG. 22/23 | 180801-3-NI |
|---|---|---|


N
POUPART ROAD
ELIE CRESCENT
DESCOTES CIRCLE
50 dBA OUTDOOR/LIVING (DAY)
698 POUPART ROAD
45 dBA LIVING (NIGHT)
714 POUPART ROAD
703 POUPART ROAD
55 dBA OUTDOOR/LIVING (DAY)
50 dBA LIVING (NIGHT)
60 dBA OUTDOOR/LIVING (DAY)
55 dBA LIVING (NIGHT)
65 dBA OUTDOOR/LIVING (DAY)
60 dBA LIVING (NIGHT)
10006
ROAD CENTERLINE
POUPART ROAD
60 dBA LIVING (NIGHT)
65 dBA OUTDOOR/LIVING (DAY)
55 dBA LIVING (NIGHT)
60 dBA OUTDOOR/LIVING (DAY)
770 POUPART ROAD
50 dBA LIVING (NIGHT)
55 dBA OUTDOOR/LIVING (DAY)
45 dBA LIVING (NIGHT)
50 dBA OUTDOOR/LIVING (DAY)
45 dBA OUTDOOR/LIVING (DAY)
ATREL Engineering Ltd Ltée
Engineers - Ingénieurs
STEWART VILLAGE
PROJECTED SETBACK
SCALE: 1:2500
AUG. 22/23
180801-3-N2

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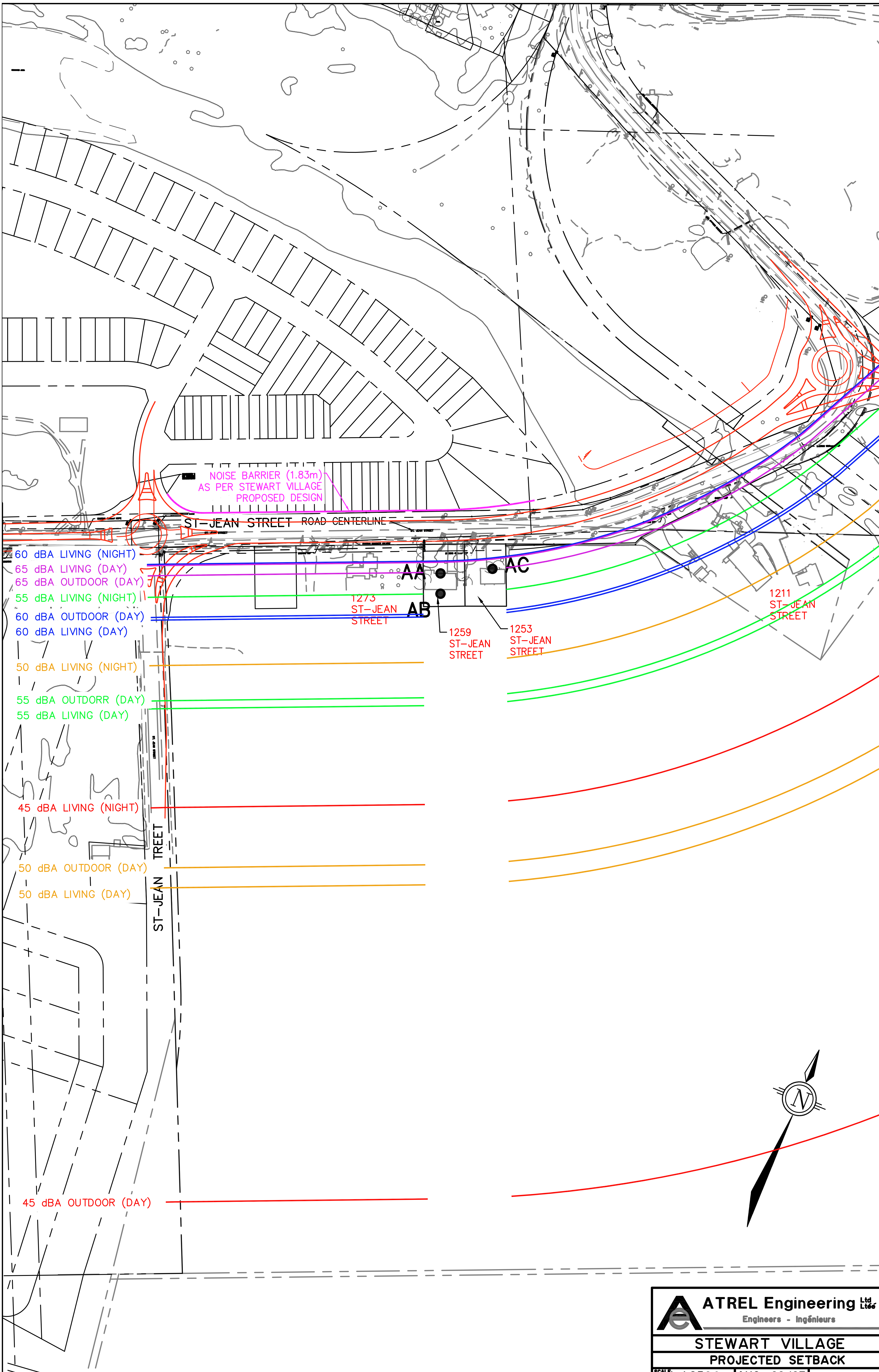
STEWART VILLAGE
PROJECTED SETBACK

| SCALE: 1:2500 | AUG. 22/23 | 180801-3-N3 |
|---|---|---|


NOISE BARRIER (1.83m)
AS PER STEWART VILLAGE
PROPOSED DESIGN
ST-JEAN STREET
ROAD CENTERLINE
60 dBA LIVING (NIGHT)
65 dBA LIVING (DAY)
65 dBA OUTDOOR (DAY)
55 dBA LIVING (NIGHT)
60 dBA OUTDOOR (DAY)
60 dBA LIVING (DAY)
50 dBA LIVING (NIGHT)
55 dBA OUTDORR (DAY)
55 dBA LIVING (DAY)
45 dBA LIVING (NIGHT)
50 dBA OUTDOOR (DAY)
50 dBA LIVING (DAY)
45 dBA OUTDOOR (DAY)
ST-JEAN STREET
AA
AB
AC
1273
ST-JEAN
STREET
1259
ST-JEAN
STREET
1253
ST-JEAN
STREET
1211
ST-JEAN
STREET
N
ATREL Engineering Ltd. Ltée
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STEWART VILLAGE
PROJECTED SETBACK
SCALE: 1:2500
AUG. 22/23
180801-3-N4

**APPENDIX 'D'**

Sample Calculations

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:32:07
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: aa.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: St-Jean (day/night)
-------------------------------------------
Car traffic volume  : 15382/1338  veh/TimePeriod
Medium truck volume :  1224/106   veh/TimePeriod
Heavy truck volume  :   874/76    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: St-Jean (day/night)
-----------------------------------------
Angle1   Angle2           : -81.00 deg   68.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  31.50 / 31.50  m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: St-Jean (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 64.63 + 0.00) = 64.63 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -81     68   0.63  71.61   0.00  -5.25  -1.72   0.00   0.00   0.00  64.63
----------------------------------------------------------------------------

Segment Leq : 64.63 dBA

Total Leq All Segments: 64.63 dBA

Results segment # 1: St-Jean (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.30 + 0.00) = 57.30 dBA
```

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -81 | 68 | 0.57 | 64.01 | 0.00 | -5.06 | -1.64 | 0.00 | 0.00 | 0.00 | 57.30 |

Segment Leq : 57.30 dBA

Total Leq All Segments: 57.30 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 64.63
(NIGHT): 57.30

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:33:01
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ab.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: St-Jean (day/~~night~~)
-------------------------------------------
Car traffic volume  : 15382/~~1338~~  veh/TimePeriod
Medium truck volume :  1224/~~106~~   veh/TimePeriod
Heavy truck volume  :   874/~~76~~    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: St-Jean (day/night)
-----------------------------------------
Angle1   Angle2            : -90.00 deg   -75.00 deg
Wood depth                 :      0       (No woods.)
No of house rows           :      0 / 0
Surface                    :      1       (Absorptive ground surface)
Receiver source distance   :  46.50 / ~~46.50~~  m
Receiver height            :   1.50 / ~~4.50~~   m
Topography                 :      1       (Flat/gentle slope; no barrier)
Reference angle            :   0.00


Results segment # 1: St-Jean (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 46.60 + 0.00) = 46.60 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90    -75   0.66  71.61   0.00  -8.16 -16.85   0.00   0.00   0.00  46.60
----------------------------------------------------------------------------

Segment Leq : 46.60 dBA

Total Leq All Segments: 46.60 dBA


~~Results segment # 1: St-Jean (night)~~
~~------------------------------------~~

~~Source height = 1.50 m~~

~~ROAD (0.00 + 40.21 + 0.00) = 40.21 dBA~~
```

| ~~Angle1~~ | ~~Angle2~~ | ~~Alpha~~ | ~~RefLeq~~ | ~~P.Adj~~ | ~~D.Adj~~ | ~~F.Adj~~ | ~~W.Adj~~ | ~~H.Adj~~ | ~~B.Adj~~ | ~~SubLeq~~ |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~-90~~ | ~~-75~~ | ~~0.57~~ | ~~64.01~~ | ~~0.00~~ | ~~-7.72~~ | ~~-16.08~~ | ~~0.00~~ | ~~0.00~~ | ~~0.00~~ | ~~40.21~~ |

~~Segment Leq : 40.21 dBA~~

~~Total Leq All Segments: 40.21 dBA~~

↑

TOTAL Leq FROM ALL SOURCES (DAY): 46.60
~~(NIGHT): 40.21~~

↑
↑

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:33:36
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: ac.te                Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: St-Jean (day/night)
-------------------------------------------
Car traffic volume  : 15382/1338  veh/TimePeriod
Medium truck volume :  1224/106   veh/TimePeriod
Heavy truck volume  :   874/76    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: St-Jean (day/night)
-----------------------------------------
Angle1   Angle2           : -78.00 deg   69.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  30.50 / 30.50  m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: St-Jean (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 64.84 + 0.00) = 64.84 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -78     69   0.63  71.61   0.00  -5.02  -1.74   0.00   0.00   0.00  64.84
----------------------------------------------------------------------------

Segment Leq : 64.84 dBA

Total Leq All Segments: 64.84 dBA

Results segment # 1: St-Jean (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 57.50 + 0.00) = 57.50 dBA
```

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -78 | 69 | 0.57 | 64.01 | 0.00 | -4.84 | -1.66 | 0.00 | 0.00 | 0.00 | 57.50 |

Segment Leq : 57.50 dBA

Total Leq All Segments: 57.50 dBA

↑

TOTAL Leq FROM ALL SOURCES (DAY): 64.84
(NIGHT): 57.50

↑
↑

```
STAMSON 5.0        NORMAL REPORT        Date: 23-08-2023 10:18:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: l45poup.te           Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Poupart (day/night)
-------------------------------------------
Car traffic volume  : 18474/1606  veh/TimePeriod
Medium truck volume :  1470/128   veh/TimePeriod
Heavy truck volume  :  1050/91    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Poupart (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 479.16 / 181.96 m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

^
Results segment # 1: Poupart (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 45.00 + 0.00) = 45.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.63  70.93   0.00 -24.52  -1.41   0.00   0.00   0.00  45.00
----------------------------------------------------------------------------

Segment Leq : 45.00 dBA

Total Leq All Segments: 45.00 dBA

^
Results segment # 1: Poupart (night)
------------------------------------

Source height = 1.49 m

ROAD (0.00 + 45.00 + 0.00) = 45.00 dBA
```

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 63.32 | 0.00 | -17.02 | -1.30 | 0.00 | 0.00 | 0.00 | 45.00 |

Segment Leq : 45.00 dBA

Total Leq All Segments: 45.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 45.00
(NIGHT): 45.00

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:41:04
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: l45stjea.te          Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: St-Jean (day/night)
-------------------------------------------
Car traffic volume  : 15382/1338  veh/TimePeriod
Medium truck volume :  1224/106   veh/TimePeriod
Heavy truck volume  :   874/76    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: St-Jean (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 500.00 / 201.14 m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

↑
Results segment # 1: St-Jean (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 45.37 + 0.00) = 45.37 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------
   -90     90   0.63  71.61   0.00 -24.83  -1.41   0.00   0.00   0.00  45.37
--------------------------------------------------------------------------

Segment Leq : 45.37 dBA

Total Leq All Segments: 45.37 dBA

↑
Results segment # 1: St-Jean (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 45.00 + 0.00) = 45.00 dBA
```

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 64.01 | 0.00 | -17.70 | -1.30 | 0.00 | 0.00 | 0.00 | 45.00 |

Segment Leq : 45.00 dBA

Total Leq All Segments: 45.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 45.37
(NIGHT): 45.00

```
STAMSON 5.0        NORMAL REPORT        Date: 23-08-2023 10:20:07
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: l50poup.te           Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Poupart (day/night)
-------------------------------------------
Car traffic volume  : 18474/1606  veh/TimePeriod
Medium truck volume :  1470/128   veh/TimePeriod
Heavy truck volume  :  1050/91    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Poupart (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 236.42 / 87.47  m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Poupart (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.00 + 0.00) = 50.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.63  70.93   0.00 -19.52  -1.41   0.00   0.00   0.00  50.00
----------------------------------------------------------------------------

Segment Leq : 50.00 dBA

Total Leq All Segments: 50.00 dBA


Results segment # 1: Poupart (night)
------------------------------------

Source height = 1.49 m

ROAD (0.00 + 50.00 + 0.00) = 50.00 dBA
```

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 63.32 | 0.00 | -12.02 | -1.30 | 0.00 | 0.00 | 0.00 | 50.00 |

Segment Leq : 50.00 dBA

Total Leq All Segments: 50.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 50.00
(NIGHT): 50.00

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:41:21
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: l50stjea.te          Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: St-Jean (day/night)
-------------------------------------------
Car traffic volume  : 15382/1338  veh/TimePeriod
Medium truck volume :  1224/106   veh/TimePeriod
Heavy truck volume  :   874/76    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: St-Jean (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 260.10 / 96.70  m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: St-Jean (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.00 + 0.00) = 50.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.63  71.61   0.00 -20.20  -1.41   0.00   0.00   0.00  50.00
----------------------------------------------------------------------------

Segment Leq : 50.00 dBA

Total Leq All Segments: 50.00 dBA

Results segment # 1: St-Jean (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.00 + 0.00) = 50.00 dBA
```

```
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.57  64.01   0.00 -12.71  -1.30   0.00   0.00   0.00  50.00
----------------------------------------------------------------------------

Segment Leq : 50.00 dBA

Total Leq All Segments: 50.00 dBA

↑



TOTAL Leq FROM ALL SOURCES (DAY): 50.00
                         (NIGHT): 50.00
↑
↑
```

```
STAMSON 5.0        NORMAL REPORT        Date: 23-08-2023 10:21:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: l55poup.te           Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Poupart (day/night)
-------------------------------------------
Car traffic volume  : 18474/1606  veh/TimePeriod
Medium truck volume :  1470/128   veh/TimePeriod
Heavy truck volume  :  1050/91    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Poupart (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 116.71 / 42.00  m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Poupart (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.00 + 0.00) = 55.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.63  70.93   0.00 -14.52  -1.41   0.00   0.00   0.00  55.00
----------------------------------------------------------------------------

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

Results segment # 1: Poupart (night)
------------------------------------

Source height = 1.49 m

ROAD (0.00 + 55.00 + 0.00) = 55.00 dBA
```

```
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.57  63.32   0.00  -7.02  -1.30   0.00   0.00   0.00  55.00
----------------------------------------------------------------------------

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

↑



TOTAL Leq FROM ALL SOURCES (DAY): 55.00
                         (NIGHT): 55.00
↑
↑
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:41:38
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: l55stjea.te          Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: St-Jean (day/night)
-------------------------------------------
Car traffic volume  : 15382/1338  veh/TimePeriod
Medium truck volume :  1224/106   veh/TimePeriod
Heavy truck volume  :   874/76    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: St-Jean (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 128.44 / 46.44  m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

^
Results segment # 1: St-Jean (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.00 + 0.00) = 55.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------
   -90     90   0.63  71.61   0.00 -15.20  -1.41   0.00   0.00   0.00  55.00
--------------------------------------------------------------------------

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

^
Results segment # 1: St-Jean (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.00 + 0.00) = 55.00 dBA
```

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 64.01 | 0.00 | -7.71 | -1.30 | 0.00 | 0.00 | 0.00 | 55.00 |

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 55.00
(NIGHT): 55.00

```
STAMSON 5.0        NORMAL REPORT        Date: 23-08-2023 10:21:57
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: l60poup.te           Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Poupart (day/night)
-------------------------------------------
Car traffic volume  : 18474/1606  veh/TimePeriod
Medium truck volume :  1470/128   veh/TimePeriod
Heavy truck volume  :  1050/91    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Poupart (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  57.63 / 20.18  m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

↑
Results segment # 1: Poupart (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 59.99 + 0.00) = 59.99 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.63  70.93   0.00  -9.53  -1.41   0.00   0.00   0.00  59.99
----------------------------------------------------------------------------

Segment Leq : 59.99 dBA

Total Leq All Segments: 59.99 dBA

↑
Results segment # 1: Poupart (night)
------------------------------------

Source height = 1.49 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
```

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 63.32 | 0.00 | -2.02 | -1.30 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 59.99
(NIGHT): 60.00

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:41:55
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: l60stjea.te          Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: St-Jean (day/night)
-------------------------------------------
Car traffic volume  : 15382/1338  veh/TimePeriod
Medium truck volume :  1224/106   veh/TimePeriod
Heavy truck volume  :   874/76    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: St-Jean (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  63.31 / 22.31  m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: St-Jean (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
--------------------------------------------------------------------------------
   -90     90   0.63  71.61   0.00 -10.19  -1.41   0.00   0.00   0.00  60.00
--------------------------------------------------------------------------------

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: St-Jean (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
```

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 64.01 | 0.00 | -2.71 | -1.30 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
(NIGHT): 60.00

```
STAMSON 5.0        NORMAL REPORT        Date: 23-08-2023 10:23:03
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: l65poup.te           Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Poupart (day/night)
-------------------------------------------
Car traffic volume  : 18474/1606  veh/TimePeriod
Medium truck volume :  1470/128   veh/TimePeriod
Heavy truck volume  :  1050/91    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Poupart (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  27.91 / 15.00  m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

↑
Results segment # 1: Poupart (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 65.13 + 0.00) = 65.13 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.63  70.93   0.00  -4.40  -1.41   0.00   0.00   0.00  65.13
----------------------------------------------------------------------------

Segment Leq : 65.13 dBA

Total Leq All Segments: 65.13 dBA

↑
Results segment # 1: Poupart (night)
------------------------------------

Source height = 1.49 m

ROAD (0.00 + 62.02 + 0.00) = 62.02 dBA
```

```
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.57  63.32   0.00   0.00  -1.30   0.00   0.00   0.00  62.02
----------------------------------------------------------------------------

Segment Leq : 62.02 dBA

Total Leq All Segments: 62.02 dBA

↑



TOTAL Leq FROM ALL SOURCES (DAY): 65.13
                         (NIGHT): 62.02
↑
↑
```

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:42:25
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: l65stjea.te          Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: St-Jean (day/night)
-------------------------------------------
Car traffic volume  : 15382/1338  veh/TimePeriod
Medium truck volume :  1224/106   veh/TimePeriod
Heavy truck volume  :   874/76    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: St-Jean (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  31.28 / 15.00  m
Receiver height           :   2.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

↑
Results segment # 1: St-Jean (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.63  71.61   0.00  -5.20  -1.41   0.00   0.00   0.00  65.00
----------------------------------------------------------------------------

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

↑
Results segment # 1: St-Jean (night)
------------------------------------

Source height = 1.50 m

ROAD (0.00 + 62.70 + 0.00) = 62.70 dBA
```

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.57 | 64.01 | 0.00 | 0.00 | -1.30 | 0.00 | 0.00 | 0.00 | 62.70 |

Segment Leq : 62.70 dBA

Total Leq All Segments: 62.70 dBA

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
(NIGHT): 62.70

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:43:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: o45poup.te           Time Period: Day/~~Night~~ 16/8 hours
Description:


Road data, segment # 1: Poupart (day/~~night~~)
-------------------------------------------
Car traffic volume  : 18474/~~1606~~  veh/TimePeriod
Medium truck volume :  1470/~~128~~   veh/TimePeriod
Heavy truck volume  :  1050/~~91~~    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Poupart (day/~~night~~)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 446.95 / ~~15.00  m~~
Receiver height           :   1.50 / ~~4.50~~   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Poupart (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 45.00 + 0.00) = 45.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.66  70.93   0.00 -24.47  -1.46   0.00   0.00   0.00  45.00
----------------------------------------------------------------------------

Segment Leq : 45.00 dBA

Total Leq All Segments: 45.00 dBA


~~Results segment # 1: Poupart (night)~~
~~------------------------------------~~

~~Source height = 1.49 m~~

~~ROAD (0.00 + 62.02 + 0.00) = 62.02 dBA~~
```

| ~~Angle1~~ | ~~Angle2~~ | ~~Alpha~~ | ~~RefLeq~~ | ~~P.Adj~~ | ~~D.Adj~~ | ~~F.Adj~~ | ~~W.Adj~~ | ~~H.Adj~~ | ~~B.Adj~~ | ~~SubLeq~~ |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~-90~~ | ~~90~~ | ~~0.57~~ | ~~63.32~~ | ~~0.00~~ | ~~0.00~~ | ~~-1.30~~ | ~~0.00~~ | ~~0.00~~ | ~~0.00~~ | ~~62.02~~ |

~~Segment Leq : 62.02 dBA~~

~~Total Leq All Segments: 62.02 dBA~~

TOTAL Leq FROM ALL SOURCES (DAY): 45.00
~~(NIGHT): 62.02~~

STAMSON 5.0 NORMAL REPORT Date: 22-08-2023 11:45:30
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: o45stjea.te Time Period: Day/~~Night~~ 16/8 hours
Description:

Road data, segment # 1: St-Jean (day/~~night~~)

| | | |
|---|---|---|
| Car traffic volume | : | 15382/~~1338~~ veh/TimePeriod |
| Medium truck volume | : | 1224/~~106~~ veh/TimePeriod |
| Heavy truck volume | : | 874/~~76~~ veh/TimePeriod |
| Posted speed limit | : | 50 km/h |
| Road gradient | : | 8 % |
| Road pavement | : | 1 (Typical asphalt or concrete) |

Data for Segment # 1: St-Jean (day/~~night~~)

| | | |
|---|---|---|
| Angle1 Angle2 | : | -90.00 deg 90.00 deg |
| Wood depth | : | 0 (No woods.) |
| No of house rows | : | 0 / 0 |
| Surface | : | 1 (Absorptive ground surface) |
| Receiver source distance | : | 491.00 / ~~15.00~~ m |
| Receiver height | : | 1.50 / ~~4.50~~ m |
| Topography | : | 1 (Flat/gentle slope; no barrier) |
| Reference angle | : | 0.00 |

Results segment # 1: St-Jean (day)

Source height = 1.50 m

ROAD (0.00 + 45.00 + 0.00) = 45.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 71.61 | 0.00 | -25.15 | -1.46 | 0.00 | 0.00 | 0.00 | 45.00 |

Segment Leq : 45.00 dBA

Total Leq All Segments: 45.00 dBA

~~Results segment # 1: St-Jean (night)~~

~~Source height = 1.50 m~~

~~ROAD (0.00 + 62.70 + 0.00) = 62.70 dBA~~

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~-90~~ | ~~90~~ | ~~0.57~~ | ~~64.01~~ | ~~0.00~~ | ~~0.00~~ | ~~-1.30~~ | ~~0.00~~ | ~~0.00~~ | ~~0.00~~ | ~~62.70~~ |

~~Segment Leq : 62.70 dBA~~

~~Total Leq All Segments: 62.70 dBA~~

TOTAL Leq FROM ALL SOURCES (DAY): 45.00
~~(NIGHT): 62.70~~

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:43:42
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: o50poup.te           Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Poupart (day/night)
-------------------------------------------
Car traffic volume  : 18474/1606  veh/TimePeriod
Medium truck volume :  1470/128   veh/TimePeriod
Heavy truck volume  :  1050/91    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Poupart (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 223.40 / 15.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Poupart (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 50.00 + 0.00) = 50.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.66  70.93   0.00 -19.47  -1.46   0.00   0.00   0.00  50.00
----------------------------------------------------------------------------

Segment Leq : 50.00 dBA

Total Leq All Segments: 50.00 dBA


Results segment # 1: Poupart (night)
------------------------------------

Source height = 1.49 m

ROAD (0.00 + 62.02 + 0.00) = 62.02 dBA
```

| ~~Angle1~~ | ~~Angle2~~ | ~~Alpha~~ | ~~RefLeq~~ | ~~P.Adj~~ | ~~D.Adj~~ | ~~F.Adj~~ | ~~W.Adj~~ | ~~H.Adj~~ | ~~B.Adj~~ | ~~SubLeq~~ |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~-90~~ | ~~90~~ | ~~0.57~~ | ~~63.32~~ | ~~0.00~~ | ~~0.00~~ | ~~-1.30~~ | ~~0.00~~ | ~~0.00~~ | ~~0.00~~ | ~~62.02~~ |

~~Segment Leq : 62.02 dBA~~

~~Total Leq All Segments: 62.02 dBA~~

TOTAL Leq FROM ALL SOURCES (DAY): 50.00
~~(NIGHT): 62.02~~

STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:45:46
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: o50stjea.te          Time Period: Day/~~Night~~ 16/8 hours
Description:

Road data, segment # 1: St-Jean (day/~~night~~)

| | |
|---|---|
| Car traffic volume | : 15382/~~1338~~ veh/TimePeriod |
| Medium truck volume | : 1224/~~106~~ veh/TimePeriod |
| Heavy truck volume | : 874/~~76~~ veh/TimePeriod |
| Posted speed limit | : 50 km/h |
| Road gradient | : 8 % |
| Road pavement | : 1 (Typical asphalt or concrete) |

Data for Segment # 1: St-Jean (day/~~night~~)

| | |
|---|---|
| Angle1 Angle2 | : -90.00 deg 90.00 deg |
| Wood depth | : 0 (No woods.) |
| No of house rows | : 0 / 0 |
| Surface | : 1 (Absorptive ground surface) |
| Receiver source distance | : 245.42 / ~~15.00~~ m |
| Receiver height | : 1.50 / ~~4.50~~ m |
| Topography | : 1 (Flat/gentle slope; no barrier) |
| Reference angle | : 0.00 |

Results segment # 1: St-Jean (day)

Source height = 1.50 m

ROAD (0.00 + 50.00 + 0.00) = 50.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 71.61 | 0.00 | -20.15 | -1.46 | 0.00 | 0.00 | 0.00 | 50.00 |

Segment Leq : 50.00 dBA

Total Leq All Segments: 50.00 dBA

~~Results segment # 1: St-Jean (night)~~

~~Source height = 1.50 m~~

~~ROAD (0.00 + 62.70 + 0.00) = 62.70 dBA~~

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~-90~~ | ~~90~~ | ~~0.57~~ | ~~64.01~~ | ~~0.00~~ | ~~0.00~~ | ~~-1.30~~ | ~~0.00~~ | ~~0.00~~ | ~~0.00~~ | ~~62.70~~ |

~~Segment Leq : 62.70 dBA~~

~~Total Leq All Segments: 62.70 dBA~~

TOTAL Leq FROM ALL SOURCES (DAY): 50.00
~~(NIGHT): 62.70~~

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:44:05
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: o55poup.te           Time Period: Day/~~Night~~ 16/8 hours
Description:


Road data, segment # 1: Poupart (day/~~night~~)
-------------------------------------------
Car traffic volume  : 18474/~~1606~~  veh/TimePeriod
Medium truck volume :  1470/~~128~~   veh/TimePeriod
Heavy truck volume  :  1050/~~91~~    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Poupart (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 111.62 / ~~15.00~~  m
Receiver height           :   1.50 / ~~4.50~~   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00


Results segment # 1: Poupart (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.00 + 0.00) = 55.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.66  70.93   0.00 -14.47  -1.46   0.00   0.00   0.00  55.00
----------------------------------------------------------------------------

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA


~~Results segment # 1: Poupart (night)~~
~~------------------------------------~~

~~Source height = 1.49 m~~

~~ROAD (0.00 + 62.02 + 0.00) = 62.02 dBA~~
```

| ~~Angle1~~ | ~~Angle2~~ | ~~Alpha~~ | ~~RefLeq~~ | ~~P.Adj~~ | ~~D.Adj~~ | ~~F.Adj~~ | ~~W.Adj~~ | ~~H.Adj~~ | ~~B.Adj~~ | ~~SubLeq~~ |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~-90~~ | ~~90~~ | ~~0.57~~ | ~~63.32~~ | ~~0.00~~ | ~~0.00~~ | ~~-1.30~~ | ~~0.00~~ | ~~0.00~~ | ~~0.00~~ | ~~62.02~~ |

~~Segment Leq : 62.02 dBA~~

~~Total Leq All Segments: 62.02 dBA~~

TOTAL Leq FROM ALL SOURCES (DAY): 55.00
~~(NIGHT): 62.02~~

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:46:09
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: o55stjea.te          Time Period: Day/~~Night~~ 16/8 hours
Description:


Road data, segment # 1: St-Jean (day/~~night~~)
-------------------------------------------
Car traffic volume  : 15382/~~1338~~  veh/TimePeriod
Medium truck volume :  1224/~~106~~   veh/TimePeriod
Heavy truck volume  :   874/~~76~~    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: St-Jean (day/~~night~~)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  : 122.63 / ~~15.00~~  m
Receiver height           :   1.50 / ~~4.50~~   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

↑
Results segment # 1: St-Jean (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 55.00 + 0.00) = 55.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.66  71.61   0.00 -15.15  -1.46   0.00   0.00   0.00  55.00
----------------------------------------------------------------------------

Segment Leq : 55.00 dBA

Total Leq All Segments: 55.00 dBA

↑
~~Results segment # 1: St-Jean (night)~~
~~------------------------------------~~

~~Source height = 1.50 m~~

~~ROAD (0.00 + 62.70 + 0.00) = 62.70 dBA~~
```

| ~~Angle1~~ | ~~Angle2~~ | ~~Alpha~~ | ~~RefLeq~~ | ~~P.Adj~~ | ~~D.Adj~~ | ~~F.Adj~~ | ~~W.Adj~~ | ~~H.Adj~~ | ~~B.Adj~~ | ~~SubLeq~~ |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~-90~~ | ~~90~~ | ~~0.57~~ | ~~64.01~~ | ~~0.00~~ | ~~0.00~~ | ~~-1.30~~ | ~~0.00~~ | ~~0.00~~ | ~~0.00~~ | ~~62.70~~ |

~~Segment Leq : 62.70 dBA~~

~~Total Leq All Segments: 62.70 dBA~~

↑

TOTAL Leq FROM ALL SOURCES (DAY): 55.00
~~(NIGHT): 62.70~~

↑

↑

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:44:33
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: o60poup.te           Time Period: Day/Night 16/8 hours
Description:


Road data, segment # 1: Poupart (day/night)
-------------------------------------------
Car traffic volume  : 18474/1606  veh/TimePeriod
Medium truck volume :  1470/128   veh/TimePeriod
Heavy truck volume  :  1050/91    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Poupart (day/night)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  55.85 / 15.00  m
Receiver height           :   1.50 / 4.50   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Poupart (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.66  70.93   0.00  -9.48  -1.46   0.00   0.00   0.00  60.00
----------------------------------------------------------------------------

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

Results segment # 1: Poupart (night)
------------------------------------

Source height = 1.49 m

ROAD (0.00 + 62.02 + 0.00) = 62.02 dBA
```

| ~~Angle1~~ | ~~Angle2~~ | ~~Alpha~~ | ~~RefLeq~~ | ~~P.Adj~~ | ~~D.Adj~~ | ~~F.Adj~~ | ~~W.Adj~~ | ~~H.Adj~~ | ~~B.Adj~~ | ~~SubLeq~~ |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~-90~~ | ~~90~~ | ~~0.57~~ | ~~63.32~~ | ~~0.00~~ | ~~0.00~~ | ~~-1.30~~ | ~~0.00~~ | ~~0.00~~ | ~~0.00~~ | ~~62.02~~ |

~~Segment Leq : 62.02 dBA~~

~~Total Leq All Segments: 62.02 dBA~~

↑

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
~~(NIGHT): 62.02~~

↑

↑

STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:46:32
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: o60stjea.te          Time Period: Day/~~Night~~ 16/8 hours
Description:

Road data, segment # 1: St-Jean (day/~~night~~)

| | | |
|---|---|---|
| Car traffic volume | : | 15382/~~1338~~ veh/TimePeriod |
| Medium truck volume | : | 1224/~~106~~ veh/TimePeriod |
| Heavy truck volume | : | 874/~~76~~ veh/TimePeriod |
| Posted speed limit | : | 50 km/h |
| Road gradient | : | 8 % |
| Road pavement | : | 1 (Typical asphalt or concrete) |

Data for Segment # 1: St-Jean (day/~~night~~)

| | | |
|---|---|---|
| Angle1 Angle2 | : | -90.00 deg 90.00 deg |
| Wood depth | : | 0 (No woods.) |
| No of house rows | : | 0 / 0 |
| Surface | : | 1 (Absorptive ground surface) |
| Receiver source distance | : | 61.30 / ~~15.00~~ m |
| Receiver height | : | 1.50 / ~~4.50~~ m |
| Topography | : | 1 (Flat/gentle slope; no barrier) |
| Reference angle | : | 0.00 |

Results segment # 1: St-Jean (day)

Source height = 1.50 m

ROAD (0.00 + 60.00 + 0.00) = 60.00 dBA

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| -90 | 90 | 0.66 | 71.61 | 0.00 | -10.15 | -1.46 | 0.00 | 0.00 | 0.00 | 60.00 |

Segment Leq : 60.00 dBA

Total Leq All Segments: 60.00 dBA

~~Results segment # 1: St-Jean (night)~~

~~Source height = 1.50 m~~

~~ROAD (0.00 + 62.70 + 0.00) = 62.70 dBA~~

| ~~Angle1~~ | ~~Angle2~~ | ~~Alpha~~ | ~~RefLeq~~ | ~~P.Adj~~ | ~~D.Adj~~ | ~~F.Adj~~ | ~~W.Adj~~ | ~~H.Adj~~ | ~~B.Adj~~ | ~~SubLeq~~ |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~-90~~ | ~~90~~ | ~~0.57~~ | ~~64.01~~ | ~~0.00~~ | ~~0.00~~ | ~~-1.30~~ | ~~0.00~~ | ~~0.00~~ | ~~0.00~~ | ~~62.70~~ |

~~Segment Leq : 62.70 dBA~~

~~Total Leq All Segments: 62.70 dBA~~

TOTAL Leq FROM ALL SOURCES (DAY): 60.00
~~(NIGHT): 62.70~~

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:44:50
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: o65poup.te            Time Period: Day/~~Night~~ 16/8 hours
Description:


Road data, segment # 1: Poupart (day/~~night~~)
-------------------------------------------
Car traffic volume  : 18474/~~1606~~  veh/TimePeriod
Medium truck volume :  1470/~~128~~   veh/TimePeriod
Heavy truck volume  :  1050/~~91~~    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     3 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: Poupart (day/~~night~~)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  27.91 / ~~15.00~~  m
Receiver height           :   1.50 / ~~4.50~~   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: Poupart (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.66  70.93   0.00  -4.48  -1.46   0.00   0.00   0.00  65.00
----------------------------------------------------------------------------

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

~~Results segment # 1: Poupart (night)~~
~~------------------------------------~~

~~Source height = 1.49 m~~

~~ROAD (0.00 + 62.02 + 0.00) = 62.02 dBA~~
```

| ~~Angle1~~ | ~~Angle2~~ | ~~Alpha~~ | ~~RefLeq~~ | ~~P.Adj~~ | ~~D.Adj~~ | ~~F.Adj~~ | ~~W.Adj~~ | ~~H.Adj~~ | ~~B.Adj~~ | ~~SubLeq~~ |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~-90~~ | ~~90~~ | ~~0.57~~ | ~~63.32~~ | ~~0.00~~ | ~~0.00~~ | ~~-1.30~~ | ~~0.00~~ | ~~0.00~~ | ~~0.00~~ | ~~62.02~~ |

~~Segment Leq : 62.02 dBA~~

~~Total Leq All Segments: 62.02 dBA~~

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
~~(NIGHT): 62.02~~

```
STAMSON 5.0        NORMAL REPORT        Date: 22-08-2023 11:46:52
MINISTRY OF ENVIRONMENT AND ENERGY / NOISE ASSESSMENT

Filename: o65stjea.te          Time Period: Day/~~Night~~ 16/8 hours
Description:


Road data, segment # 1: St-Jean (day/~~night~~)
-------------------------------------------
Car traffic volume  : 15382/~~1338~~  veh/TimePeriod
Medium truck volume :  1224/~~106~~   veh/TimePeriod
Heavy truck volume  :   874/~~76~~    veh/TimePeriod
Posted speed limit  :    50 km/h
Road gradient       :     8 %
Road pavement       :     1 (Typical asphalt or concrete)

Data for Segment # 1: St-Jean (day/~~night~~)
-----------------------------------------
Angle1   Angle2           : -90.00 deg   90.00 deg
Wood depth                :      0       (No woods.)
No of house rows          :      0 / 0
Surface                   :      1       (Absorptive ground surface)
Receiver source distance  :  30.63 / ~~15.00~~  m
Receiver height           :   1.50 / ~~4.50~~   m
Topography                :      1       (Flat/gentle slope; no barrier)
Reference angle           :   0.00

Results segment # 1: St-Jean (day)
----------------------------------

Source height = 1.50 m

ROAD (0.00 + 65.00 + 0.00) = 65.00 dBA
Angle1 Angle2  Alpha RefLeq  P.Adj  D.Adj  F.Adj  W.Adj  H.Adj  B.Adj SubLeq
----------------------------------------------------------------------------
   -90     90   0.66  71.61   0.00  -5.15  -1.46   0.00   0.00   0.00  65.00
----------------------------------------------------------------------------

Segment Leq : 65.00 dBA

Total Leq All Segments: 65.00 dBA

~~Results segment # 1: St-Jean (night)~~
~~------------------------------------~~

~~Source height = 1.50 m~~

~~ROAD (0.00 + 62.70 + 0.00) = 62.70 dBA~~
```

| Angle1 | Angle2 | Alpha | RefLeq | P.Adj | D.Adj | F.Adj | W.Adj | H.Adj | B.Adj | SubLeq |
|---|---|---|---|---|---|---|---|---|---|---|
| ~~-90~~ | ~~90~~ | ~~0.57~~ | ~~64.01~~ | ~~0.00~~ | ~~0.00~~ | ~~-1.30~~ | ~~0.00~~ | ~~0.00~~ | ~~0.00~~ | ~~62.70~~ |

~~Segment Leq : 62.70 dBA~~

~~Total Leq All Segments: 62.70 dBA~~

TOTAL Leq FROM ALL SOURCES (DAY): 65.00
~~(NIGHT): 62.70~~

# APPENDIX "Q"

## Stage 1 and 2 Archeological Assessment,

## Matrix Heritage

**December 23, 2022**

Matrix Heritage

**ORIGINAL REPORT**

**Stage 1 and 2 Archaeological Assessment:**
Poupart / St-Jean Street
Part Lots 27, 28, 29, 30, and 31, Concession 1, Old Survey; Part Lot C, Concession 9; Part Lots C and D, Concession 8
Geographic Township of Clarence,
Municipality of Clarence-Rockland
United Counties of Prescott-Russell
Rockland, Ontario

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December 2022
Submitted for review December 23, 2022

PIF: P369-0289-2022

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Report: MH1125-REP.01

## 1.0 Executive Summary

Matrix Heritage, on behalf of Space Builders, undertook a Stage 1 and 2 archaeological assessment of the study area along the right of way of Poupart / St. Jean Street located on Part Lots 27, 28, 29, 30 and 31, Concession 1 Old Survey, Part Lot C, Concession 9, and Part Lots C and D, Concession 8 in the Geographic Township of Clarence, Municipality of Clarence-Rockland, United Counties of Prescott-Russell, Ontario (Map 1). This archaeological assessment is in support of the Environmental Assessment process for the rehabilitation of Poupart / St-Jean Street in Rockland from point B to J on the attached plan (Map 2). This assessment was completed in accordance with the Ministry of Citizenship and Multiculturalism's *Standards and Guidelines for Consultant Archaeologists* (2011).

The Stage 1 assessment included a review of the updated MCM archaeological site databases, a review of relevant environmental, historical, and archaeological literature, as well as primary historical research including: historical maps, land registry, and census records.

The Stage 1 background assessment concluded that, based on criteria outlined in the MCM's *Standards and Guidelines for Consultant Archaeologists* (Section 1.3, (2011)), the study area has both pre-contact Indigenous as well as historic Euro-Canadian archaeological potential. This includes factors such as the well-drained soils, the proximity to Lafontaine Creek, and the early patent date and settlement of the lands by the McCaul and Edwards families.

The Stage 2 Archaeological Assessment identified that the entire study area was exempt from subsurface testing due to permanently wet conditions, steep slopes, and extensive and deep land alterations through ditches, driveways, fill, and buried utilities as per Section 2.1. Standard 2.a.i, iii., and b. (MCM 2011).

Field work took place on October 31 and November 14, 2022. Weather conditions were partially cloudy and breezy with temperatures around 5° to 10° Celsius. Permission to access the property was provided by Space Builders. No archaeological resources were encountered during the assessment.

Based on the results of this investigation it is recommended that:

1. No further archaeological study is required for the study area as delineated in Map 1.

## 2.0 Table of Contents

## 3.0 Project Personnel

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|---|---|
| Licensee | Ben Mortimer, MA (P369) |
| Field Director | Ben Mortimer, MA (P369) |
| Field Crew | Andrea Jackson, MLitt (P1032) |
| Report Preparation | Andrea Jackson, MLitt (P1032) |
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# 4.0 Project Context

## 4.1 Development Context

Matrix Heritage, on behalf of Space Builders, undertook a Stage 1 and 2 archaeological assessment of the study area along the right of way of Poupart / St. Jean Street located on Part Lots 27, 28, 29, 30 and 31, Concession 1 Old Survey, Part Lot C, Concession 9, and Part Lots C and D, Concession 8 in the Geographic Township of Clarence, Municipality of Clarence-Rockland, United Counties of Prescott-Russell, Ontario (Map 1). This archaeological assessment is in support of the Environmental Assessment process for the rehabilitation of Poupart / St-Jean Street in Rockland from point B to J on the attached plan (Map 2). The rehabilitation includes road widening to a 26 m corridor from point B to G, a 30 m corridor from G to J, and round-abouts, at points C, G, H, I, and J. This assessment was completed in accordance with the Ministry of Citizenship and Multiculturalism's *Standards and Guidelines for Consultant Archaeologists*(2011).

At the time of the archaeological assessment, the study area was the right of way owned by the Municipality of Clarence-Rockland. Permission to access the study property was granted by the via the proponent prior to the commencement of any field work; no limits were placed on this access.

## 4.2 Historical Context

### 4.2.1 Historic Documentation

Notable histories of the Algonquins include: *Algonquin Traditional Culture* (Whiteduck 1995) and *Executive Summary: Algonquins of Golden Lake Claim* (Holmes and Associates 1993a).

The subject property is in the former Township of Clarence (now the City of Clarence-Rockland), in the former County of Russell (now the United Counties of Prescott and Russell). There are a limited number of published resources on the history and development of Clarence-Rockland, the township, and the county in general. These include: *La Petite Histoire de Rockland* (Laporte and Beland 1982); *Un peuple autour d'une croix: Centenaire de la paroisse Sainte-Euphemie de Casselman, 1886-1986* (Perrault 1986); *Histoire des Comtes Unis de Prescott et de Russell* (Brault 1965); and *Casselman* (Sylvestre 1984). Another useful resource is the *Prescott and Russell Supplement to the Illustrated Atlas of the Dominion of Canada* (Belden 1881).

### 4.2.2 Pre-Contact Period

#### Algonquin Territory

Archaeological information suggests that ancestral Algonquin people lived in the Ottawa Valley for at least 8,000 years before the Europeans arrived in North America. This traditional territory is generally considered to encompass the Ottawa Valley on both sides of the river, in Ontario and Quebec, from the rideau lakes to the headwaters of the Ottawa River. The Ottawa Valley is dominated by the Canadian Shield which is characterized by low rolling land of Boreal Forest, rock outcrops and muskeg with innumerable lakes, ponds, and rivers. This environment dictated much of the traditional culture and lifestyle of the Algonquin peoples. At the time of European contact, the Algonquin territory was bounded on the east by the Montagnais people, to the west by the Nipissing and Ojibwa, to the north by the Cree, and to the south by the lands of the Iroquois.

### Naming

The Algonquins' name for themselves is Anishinabeg, which means "human being." The word Algonquin supposedly came from the Malecite word meaning "they are our relatives", which French explorer Samuel de Champlain recorded as “Algoumequin” in 1603. The name stuck and the term “Algonquin” refers to those groups that have their traditional lands around the Ottawa Valley. Some confusion can arise regarding the term “Algonquian” which refers to the broader language family, of which the dialect of the Algonquin is one. The Algonquian linguistic group stretches across a significant part of North America and comprises scores of Nations related by language and customs.

### Early Human Occupation

The earliest human occupation of the Americas has been documented to predate 14,000 years ago, however at this time much of eastern Canada was covered by thick and expansive glaciers. The Laurentide Ice Sheet of the Wisconsinian glacier blanketed the Ottawa area until about 11,000 B.P. when then the glacial terminus receded north of the Ottawa Valley, and water from the Atlantic Ocean flooded the region to create the Champlain Sea. This sea encompassed the lowlands of Quebec on the north shore of the Ottawa River and most of Ontario east of Petawawa, including the Ottawa Valley and Rideau Lakes. By 10,000 B.P. the Champlain Sea was receding and within 1,000 years has drained from Eastern Ontario (Watson 1990:9).

The northern regions of eastern Canada were still under sheets of glacial ice as small groups of hunters first moved into the southern areas following the receding ice and water. By circa 11,000 B.P., when the Ottawa area was emerging from glaciations and being flooded by the Champlain Sea, northeastern North America was home to what are commonly referred to as the Paleo people. For Ontario the Paleo period is divided into the Early Paleo period (11,000 - 10,400 B.P.) and the Late Paleo period (10,500-9,400 B.P.), based on changes in tool technology (Ellis and Deller 1990). The Paleo people, who had moved into hospitable areas of southwest Ontario, likely consisted of small groups of exogamous hunter-gatherers relying on a variety of plants and animals who ranged over large territories (Jamieson 1999). The few possible Paleo period artifacts found, as surface finds or poorly documented finds, in the broader Eastern Ontario region are from the Rideau Lakes area (Watson 1990) and Thompson's Island near Cornwall (Ritchie 1969:18). In comparison, little evidence exists for Paleo occupations in the immediate Ottawa Valley, as can be expected given the environmental changes the region underwent, and the recent exposure of the area from glaciations and sea. As Watson suggests (Watson 1999:38), it is possible Paleo-Indian people followed the changing shoreline of the Champlain Sea, moving into the Ottawa Valley in the late Paleo Period, although archaeological evidence is absent.

### Archaic period

As the climate continued to warm, the glacial ice sheet receded further northwards allowing areas of the Ottawa Valley to be travelled and occupied in what is known as the Archaic Period (9,500 – 2,900 B.P.). In the Boreal forests of the Canadian Shield this cultural period is referred to as the “Shield Archaic”. The Archaic period is generally characterized by increasing populations, developments in lithic technology (e.g., ground stone tools), and emerging trade networks.

Archaic populations remained hunter-gatherers with an increasing emphasis on fishing. People began to organise themselves into small family groups operating in a seasonal migration, congregating annually at resource-rich locations for social, religious, political, and economic activities. Sites from this period in the Ottawa Valley region include Morrison's Island-2 (BkGg-10), Morrison's Island-6 (BkGg-12) and Allumette Island-1 (BkGg-11) near Pembroke, and the Lamoureaux site (BiFs-2) in the floodplain of the South Nation River (Clermont 1999). Often sites from this time are located on islands, waterways, and at narrows on lakes and rives where caribou and deer would cross, suggesting a common widespread use of the birchbark canoe that was so prominent in later history (McMillan 1995). It is suggested that the Algonquin peoples in the Ottawa Valley area developed out of this Shield Archaic culture.

### Woodland / Pre-European Contact Period

Generally, the introduction of the use of ceramics marks the transition from the Archaic Period into the Woodland period. Populations continued to participate in extensive trade networks that extended across much of North America. Social structure appears to have become increasingly complex with some status differentiation recognized in burials. Towards the end of this period domesticated plants were gradually introduced to the Ottawa Valley region. This coincided with other changes including the development of semi-permanent villages. The Woodland period is commonly divided into the Early Woodland (1000 – 300 B.C.), Middle Woodland (400 B.C. to A.D. 1000), and the Late Woodland (A.D. 900 – European Contact) periods.

The Early Woodland is typically noted via lithic point styles (i.e., Meadowood bifaces) and pottery types (i.e., Vinette I). Early Woodland sites in the Ottawa Valley region include Deep River (CaGi-1) (Mitchell 1963), Constance Bay I (BiGa-2) (Watson 1972), and Wyght (BfGa-11) (Watson 1980). The Middle Woodland period is identified primarily via changes in pottery style (e.g., the addition of decoration). Some of the best documented Middle Woodland Period sites from the region are from Leamy Lake Park (BiFw-6, BiFw-16) (Laliberté 1999).

The identification of pottery traditions or complexes (Laurel, Point Peninsula, Saugeen) within the Northeast Middle Woodland, the identifiers for the temporal and social organizational changes signifying the Late Woodland Period, subsequent phases within in the Late Woodland, and the overall 'simple' culture history model assumed for Ontario at this time (e.g. Ritchie 1969; Wright 1966; Wright 2004) are much debated in light of newer evidence and improved interpretive models (Engelbrecht 1999; Ferris 1999; Hart 2011; Hart and Brumbach 2003; Hart and Brumbach 2005; Hart and Brumbach 2009; Hart and Englebrecht 2011; Martin 2008; Mortimer 2012). Thus, the shift into the period held as the Late Woodland is not well defined. There are general trends for increasingly sedentary populations, the gradual introduction of agriculture, and changing pottery and lithic styles. However, nearing the time of contact, Ontario was populated with somewhat distinct regional populations that broadly shared many traits. In the southwest, in good cropland areas, groups were practicing corn-bean-squash agriculture in semi-permanent, often palisaded villages which are commonly assigned to Iroquoian peoples (Wright 2004:1297–1304). On the shield and in other non-arable environments, including portions of the Ottawa Valley, there seems to remain a less sedentary lifestyle often associated with the Algonquin groups noted in the region at contact (Wright 2004:1485–1486).

The Woodland Period Algonquin peoples of the Ottawa Valley area had a social and economic rhythm of life following an annual cyclical pattern of seasonal movements. Subsistence was based on small independent extended family bands operating an annual round of hunting, fishing, and plant collecting. Families returned from their winter hunting camps to rejoin with other groups at major fishing sites for the summer. The movements of the people were connected with the rhythm of the natural world around them allowing for efficient and generally sustainable subsistence (Ardoch Algonquin First Nation 2015). Their annual congregations facilitated essential social, political, and cultural exchange.

The Woodland Period Algonquin peoples also established significant trade networks and a dominance of the Ottawa River (in Algonquian the “Kitchissippi”) and its tributaries. The trade networks following the Ottawa River connected the Algonquins to an interior eastern waterway via Lake Timiskaming and the Rivière des Outaouais to the St. Maurice and Saguenay as well as the upper Great Lakes and interior via Lake Nipissing and Georgian Bay. From there their Huron allies would distribute goods to the south and west. The Iroquois and their allies along the St. Lawrence River and the lower Great Lakes dominated the trade routes on those waterways to the south thus leading to a rivalry that would escalate with European influence (Moreau et al. 2016).

### European Contact

The addition of European trade goods to artifacts of native manufacture in archaeological material culture assemblages’ ushers in a new period of history. Archaeological data shows that European goods penetrated the Canadian Shield as early as 1590 and the trade was well entrenched by 1600 through the trade routes established by the Algonquin peoples along the Ottawa River (Moreau et al. 2016).

The first recorded meeting between Europeans and Algonquins occurred at the first permanent French settlement on the St. Lawrence at Tadoussac in the summer of 1603. Samuel de Champlain came upon a party of Algonquins, the Kitchissippirini under Chief Tessouat, who were celebrating a recent victory over the Iroquois with their allies the Montagnais and Malecite (Hessel 1993). Champlain made note of the “Algoumequins” and his encounter with them, yet the initial contact between Champlain and the Algonquin people within their own territory in the Ottawa Valley was during his travels of exploration in 1613.

By the time of Champlain’s 1613 journey, the Algonquin people along the Ottawa River Valley were important middlemen in the rapidly expanding fur-trade industry. Champlain knew this and wanted to form and strengthen alliances with the Algonquins to further grow the fur-trade, and to secure guidance and protection for future explorations inland and north towards a potential northwest passage. Further, involving the Algonquins deeper in the fur trade promised more furs filling French ships and more Indigenous dependence on European goods. For their part, the French offered the promise of safety and support against the Iroquois to the south.

Early historical accounts note many different Algonquian speaking groups in the region at the time. Of note for the lower Ottawa Valley area were the Kichesipirini (focused around Morrison Island); Matouweskarini (upstream from Ottawa, along the Madawaska River); Weskarini (around the Petite Nation, Lièvre, and Rouge rivers west of Montreal), Kinounchepirini (in the Bonnechere River drainage); and the Onontchataronon, (along the South Nation River) (Holmes and Associates 1993a; Morrison 2005; Pilon 2005). However, little archaeological work has been undertaken regarding Algonquins at the time of contact with Europeans (Pilon 2005).

### Fur Trade, Early Contact with the French

Champlain understood that the Algonquins would be vital to his eventual success in making his way inland, exploring, and expanding the fur trade. This was partially due to their language being the key to communication with many other groups, as well as their dominance over trade routes surrounding the Ottawa River and the connection with the Huron in the west.

When the French arrived there was already a vast trade network in place linking the Huron and the Algonquins extending from the Saguenay to Huronia. This route existed at least from the very early beginnings of agricultural societies in Ontario around A.D. 1000 (Moreau et al. 2016). This trade increased rapidly after the arrival of the Europeans with the introduction of European goods and the demand for furs. The Huron held a highly strategic commercial location controlling the trade to the south and the west, and the Algonquin were their critical connection to goods from the east, including European products.

By the mid-17th century the demands of the fur trade had caused major impacts to the traditional way of life including a change in tools, weapons, and a shift in diet to more European as hunting was more for furs and not for food. This dependence on European food, ammunition, and protection tied people to European settlements (McMillan 1995). The summer gathering sites shifted from prominent fishing areas to trading posts. This further spurred social changes in community structure and traditional land distribution and use.

The well-situated Algonquin, particularly the Kitchesipirini who controlled passage around Allumette Island, were originally reluctant to cede any of their dominance in fear of being cut out of their lucrative middleman role in the trade economy. However, an alliance with the French meant protection and assistance against the Iroquois. The French, as well as other Europeans like the Dutch and English, were able to align their own political and economic rivalries with those of the native populations. The competitive greed and obsession with expanding the fur trade entrenched the rivalries that were already in place, and these were intensified by European weapons and economic ambition.

### Iroquois Wars

Little information exists about inter-tribal warfare prior to European contact, however, there was existing animosity between the Iroquois and the Algonquins when Champlain first arrived in the Ottawa Valley. Like his fellow Europeans, Champlain was able to use this existing rivalry to make a case for an alliance, thus gaining crucial access to the established trade networks and economic power of the Algonquin. Prior to European contact, the hostilities had been mainly skirmishes and raids, but everything changed as European reinforcement provided deadlier weapons and higher economic stakes with the introduction of the fur trade.

Along with the French, the Algonquin were allied against the Iroquois with their trade partners to the west, the Huron and the Nippissing. French records suggest that at the end of the sixteenth century the Algonquins were the dominant force and were proud to have weakened and diminished the Iroquois. The first Algonquin campaign the French took part in was a 1609 attack against the Mohawk. The use of firearms in this fight marked the beginning of the escalation of brutality between these old enemies. The Iroquois corn stalk shields could stop arrows but not bullets or French swords (Hessel 1993).

Eventually the tide changed and as the Iroquois exhausted the beaver population in their own territory they became the aggressors, pushing into the lands of the Algonquin and Huron, with the added strength of Dutch weaponry. Through the 1630s and 40s constant and increased raiding into Algonquin territory by the Iroquois nations had forced most of the Algonquin people to leave their lands in the Ottawa Valley and seek protection from their French allies in places like Trois Rivieres and Sillery while others fled to the north. By 1650 Huronia, the home of the long-time allies of the Algonquin, had been destroyed by the Iroquois Nation. The once powerful Algonquins of the Ottawa Valley had largely been scattered or displaced, reduced through war and disease to small family groups under the protection of the French missions only fifty years after the first Europeans had travelled the Ottawa River (Morrison 2005:26).

There is some evidence that Algonquins did not completely abandon the Ottawa valley but withdrew from the Ottawa River to the headwaters of its tributaries and remained in those interior locations until the end of the century. Taking advantage of the Algonquin absence, the Ottawa people, originally from the area of Manitoulin Island, used the river for trade during this time and their name became historically applied to the river.

### Aftermath of War

As the Iroquois raiding continued and the Algonquin sought refuge amongst their French allies, other factors came into play that significantly contributed to their displacement and near destruction. The introduction of European diseases, the devastating influence of alcohol, and the increasing pressure to convert to Christianity massively contributed to the weakening of the Algonquin people and their traditional culture.

The Algonquins thought of themselves as part of the natural world with which they must live in harmony. The traditional stories of Algonquin folklore contained lessons and guides to behaviour. The French missionaries regarded them as “heathens” and dismissed their religion as superstition (Day 2005). The missionaries believed it was their duty to convert these people to Christianity to save them from evil. Algonquin chief Tessouat had seen his Huron neighbours become ill and die after interactions with the European missionaries and had thus originally warned his people about abandoning their old beliefs and the dangers of conversion (Hessel 1993). Eventually the French imposed laws allowing only those converted to Christianity to remain within the missions and under French protection. This created divisions amongst the Algonquin themselves which weakened the social structure as some settled into a new religion and new territory.

Starting in the 1630s and continuing into the 1700s, European disease spread among the Algonquin groups along the Ottawa River, bringing widespread death (Trigger 1986:230). As disease spread through the French mission settlements the priests remained certain that the suffering was punishment for resisting Christianity. An additional threat lurking amongst the French settlements was alcohol. This type of distraction had not been part of the Algonquin world prior to the arrival of the Europeans and greatly disrupted the lives of many. There were historic reports of people remaining intoxicated for months on end, unable to hunt or look after their family. Those affected would sell all they had for liquor; there were fights, assaults, and murders. The Algonquin thought they were seeking refuge and protection amongst their French allies, but other dangers were waiting for them amongst the Europeans.

### The Long Way Back

After the Iroquois Wars, the remaining Algonquin people were generally settled around various French trading posts and missions from the north end of the Ottawa Valley to Montreal. A large settlement at Oka was the first mission established on Algonquin lands in 1720. This settlement included peoples from many groups who had been collected and moved around from various locations. It became a type of base camp; occupied during the summer while the winters were spent at their traditional hunting territories in the upper Ottawa Valley. This arrangement served the French well, since the Algonquin converts at Oka maintained close ties with the northern bands and could call upon the inland warriors to join them in case of war with the British or Iroquois League.

As the British gained control of Canada from the French in 1758-1760 they included in the Articles of Capitulation a guarantee that the Indian allies of the French would be maintained in the lands they inhabited. Many of the Algonquin and other native groups that had been living on French mission settlements were shuffled around to new reserves while others began to migrate back to their traditional territories. Those who had remained on the land and continued to be active in the fur trade, now did so with the English through companies in Montreal like the North West Company, and in the north with the Hudson Bay Company.

Some Algonquin people began to return to their traditional territory to join those groups who had remained in the lower Ottawa Valley and continued their traditional lifeway through to the influx of European settlement in the late 1700s and early 1800s. This included bands noted to be living along the Gatineau River and other rivers flowing into the Ottawa. These traditional bands maintained a seasonal round focused on harvesting activities into the 1800s when development pressures and assimilation policies implemented by the colonial government saw Indigenous lands taken up, albeit under increasing protest and without consideration for Indigenous claims, for settlement and industry. Algonquin lands began to be encroached upon by white settlers involved in the booming lucrative logging industry or having been granted the land as Loyalist soldiers or through other settler groups.

As some Algonquins had been redistributed to lands in Quebec, their traditional territory within the Ottawa Valley was included in multiple land transfer deals, agreements, and sales with the British Crown beginning in the 1780s and continuing till the 1840s. The Algonquin were not included in these transactions and numerous petitions and inquiries on behalf of their interests were often overruled or ignored (Holmes and Associates 1993a; Holmes and Associates 1993b; Sarazin). The Constitution Act of 1791 divided Quebec into the Provinces of Upper and Lower Canada with Ottawa River as the division line, thus the lands claimed by the Algonquins fell under two separate administrations creating more confusion, exclusion, and oversight.

Two “protectorate” communities were eventually established in the nineteenth century for the Algonquin people at Golden Lake in Ontario and River Desert (Maniwaki) in Quebec. One of the last accounts of the Algonquins living traditionally was from 1865. The White Duck family was living just west of Arnprior when they were forced to leave their wigwams as surveyors arrived to tell them the railway was being expanded through their land (Hessel 1993).

Algonquin people continue to live in the Ottawa Valley and there are still many speakers of several Algonquian dialects. Outside of the officially recognized bands there are an unspecified number of people of Algonquin decent throughout the Ottawa Valley unaffiliated with any reserve. Today there are ten Algonquin communities that comprise the Algonquins of Ontario: The Algonquins of Pikwakanagan First Nation, Antoine, Kijicho Manito Madagouskarini, Bonnechere, Greater Golden Lake, Mattawa/North Bay, Ottawa, Shabot Obaadjiwan, Snimikobi, and Whitney and area.

Struggles to officially secure title to their traditional land, as well as fight for hunting and fishing rights have continued into modern times. The Algonquins of Ontario (AOO) and the Governments of both Canada and Ontario are working together to resolve this land claim through a negotiated settlement. The claim includes an area of 9 million acres of unceded territory within the watersheds of the Ottawa and Mattawa Rivers in Ontario including the city of Ottawa and most of Algonquin Park. The signing of the Agreement-in-Principle in 2016 by the AOO and the provincial and federal governments, signifying a mutual intention for a lasting partnership, was a key step towards a final agreement to clarify the rights and nurture new economic and development opportunities in the area.

### 4.2.3 Post-Contact Period

On January 1, 1800, the townships of Cambridge, Clarence, Gloucester, Osgoode, and Russell were joined to form the County of Russell, which later merged with Prescott County to form Prescott and Russell United Counties.

In the following years, the area expanded modestly, closely tied to the lumber industry and a growing agricultural sector that expanded as the land was cleared. The northern portion of the county, along the Ottawa River, flourished with the development of the L'Orignal-Bytown road in 1840. Most of the early settlers were English, until 1849 when Joseph-Bruno Guigues, the first bishop of the diocese of Bytown, founded the Société de colonisation to encourage Catholic settlement between Ottawa and Montreal. Irish emigrants were directed to the counties of Glengarry and Stormont, while French Canadians were encouraged to settle in Prescott and Russell Counties (Perrault 1986:4). The majority of the French Canadians emigrated from the counties of Vaudreuil, Soulanges, and Deux Montagnes near Montreal as these areas were becoming very populated (Sylvestre 1984:4).

William Cameron Edwards, born in 1844 in Clarence Township, would become an important figure in both the timber industry and in Canadian politics. As a young entrepreneur he built a sawmill in Rockland in 1868, which contributed significantly to the growth and economic development of the area. He established the W. C. Edwards & Company which consisted of his large sawmill in Rockland, as well as others in Ottawa and Quebec. Edwards served as a liberal Member of Parliament representing Russell County, and later was appointed to the senate.

As the community grew, the first school was opened in 1875. In the nearby cross-roads community of Clarence Creek, a French one-room school (S.S. No. 16) was built in 1881 and was one of the first brick schools in Ontario. The school was demolished in 1962. The railroad extended to the area in 1888, opening the communities to the shipment of wood, hay, merchandise, and materials. The construction of a second railroad in 1908, linking Ottawa and Hawkesbury, had a great impact on the population.

As a result of economic stagnation that prevailed after the First World War, the W. C Edwards sawmill closed its doors in 1926. Following this, a large part of the population left for the province of Quebec to find employment in the Hull and Gatineau sawmills. Economic recovery began after 1939 with the beginning of the Second World War and continued as returning soldiers led to an increase in the population. Home building experienced a boom resulting in the expansion of services like water and electricity and the establishment of a first sewer system in 1964.

### 4.2.4 Study Area Specific History

The lots of the study area all have a relatively early original patent date, ranging from 1802 to 1839 (Table 1). The earliest patents went to John McKindlay who received Lot 31 in 1801 and Lots 28 and 29 in 1802 (OLR, (50)). The main families to hold these properties were the McCauls and the Edwards. The Edwards family was connected to the large lumber company depicted on the historic mapping from 1881 (Belden 1881) (Map 3).

| Lot | Concession | Patent Date | Grantee |
|---|---|---|---|
| 27 | 1 OS | 1839 | Hiram Marston |
| 28 | 1 OS | 1802 | John McKindlay |
| 29 | 1 OS | 1802 | John McKindlay |
| 30 | 1 OS | 1841 | Peter Tompkins |
| 31 | 1 OS | 1801 | John McKindlay |
| C | 8 | 1826 | Montague Griffin |
| D | 8 | N/A | N/A |
| C | 9 | 1826 | Stephen Yarwood |

**Table 1: Crown patents for lots within the study area.**

### Lot 27, Concession 1 Old Survey

The historic mapping from 1863 shows the owner of Lot 27 as J. McCaul and depicts a schoolhouse on the property in the central portion of the lot, just south of the L'Original-Bytown Road and to the north of the northern extent of the study area (Walling 1862) (Map 3). The land registry records show the original land grantee, Hiram Marston, sold the property to James McCaul soon after his acquisition of the lot in 1840. McCaul, and eventually his wife Ronalda, held the property until the early 1880s (OLR, (50)).

James McCaul was born in Scotland around 1806. The census records from 1861 show James, aged 54, living with his wife Ronalda, aged 31, and four children in a one and a half story stone house. Based on the age difference, it can be assumed that Ronalda was the second wife of James, and the two older children in the house, Alexander aged 18 and Catherine aged 15, were from his first marriage. James is listed as a "lumberer" and the owner of a "squared timber" business (Statistics Canada 1861). By the time of the 1871 census, the older children had moved out and the household consisted of James, Ronalda, their five children, and Alexander McCaul, aged 62, presumably James's brother (Statistics Canada 1871).

### Lot 28, Concession 1 Old Survey

The historic mapping from 1863 shows the owner of Lot 28 as John McCaul but does not depict a structure (Walling 1862) (Map 3). The main L'Original-Bytown Road cuts across the central portion of the lot and the Lafontaine Creek is depicted cutting across the southern portion. The land registry records show the early original patent to John McKindlay who sold the land to John Gray in 1829. The land was then passed to Hiram Marston, George Marston, and then, as with Lot 27, to James McCaul in 1840 who passed it to John McCaul in the same year (OLR, (50)). It is unclear in the records if John was a son, a brother, or another relation of James.

### Lot 29, Concession 1 Old Survey

The historic mapping from 1863 shows two owners on Lot 29, A. McCaul and J. Edwards (Walling 1862) (Map 3). The map depicts the main L'Original-Bytown Road in the central portion of the lot, as well as Lafontaine Creek and another road, just north of the study area, connecting to what is today Poupart Road. Similar to Lot 28, the early crown patent was to John McKindlay who sold the property to John Gray in 1829. The land was then sold to Thomas Anderson and then to James McCaul in 1839. James passed the land to Alexander McCaul in 1840 (OLR, (50)). It is unclear in the records what relation Alexander was to James, however, an Alexander McCaul of similar age is listed in the 1871 census as living with James, suggesting the two were brothers (Statistics Canada 1871). Whether the Alexander listed in the census is the same as the one in the land registry is not clear.

### Lot 30, Concession 1 Old Survey

The historic mapping from 1863 does not depict an owner or a structure on Lot 30. However, the intersection of the main L'Original-Bytown Road and the road that eventually becomes Poupart Road is depicted in the central portion of the lot, just south of Lafontaine Creek where it enters from the Ottawa River, and just north of the study area (Walling 1862) (Map 3). The original crown patent was to Peter Tompkins in 1841. The land registry records show Tompkins holding the land until the late 1850s; the Campbell family held it during the 1860s, and the Edwards family owned the property during the 1870s and 1880s (OLR, (50)). As there are no structures depicted in the mapping, it could be possible that this property was held for financial investment rather than the owners living on the land.

### Lot 31, Concession 1 Old Survey

The historic 1863 mapping shows the owner of Lot 31 as M. Lacofs and depicts a house south of the main road in the northern portion of the lot (Walling 1862) (Map 3). As with other lots in this study area, the original crown patent was to John McKindlay in 1801, who sold the land to John Gray in 1829. As with neighbouring properties, Gray passed the land to Thomas Anderson, who then sold the lot to James Edwards in 1866. The land registry records show the Edwards family, specifically James and his brother Alexander, owning the land until at least the 1920s (OLR, (50)). The name depicted on the historic mapping, M. Lacofs, is not present in the land registry records.

The 1871 census records list William Edwards, aged 60, living with his wife Ann and six of their children, ages 11 to 24. While William is recorded as a farmer, his son Charles is listed as a photographer, Oliver as a medical student, and Alexander a clerk. Another son, James, is recorded in his own household in the census living nearby with his wife Sarah and their four young children (Statistics Canada 1871). As mentioned above, William Cameron Edwards, another son of William and Ann, was an important figure in the lumber industry and a member of the Canadian parliament. Through the 1881 and 1891 census the family of James and Sarah continued to grow and the couple had at least eleven children including twins, Adam and Eve, who died in infancy (Statistics Canada 1881; Statistics Canada 1891).

### Lot C, Concession 8

The historic mapping from 1863 shows the owner of Lot C as A. Sheriff and depicts a house along a road that is the southern portion of what is today, St. Jean Street (Walling 1862) (Map 3). The original crown patent for this lot was in 1826 to Montague Griffin. The land registry shows the property exchanged hands a few times before being purchased by Andrew Sheriff in 1849. The Sheriff family held the property until at least 1900 (OLR, (50)).

Andrew Sheriff was born around 1823 in Aberdeen, Scotland. He died from smallpox in Clarence Township in 1871 at the age of 48 (Ancestry.com 2010). The property was passed through his family including Andrew Junior, Benjamin, Walter, John, and James, presumably his sons and grandsons. The 1891 census records list Andrew Jr, aged 35, as head of the household containing his brother James, aged 37, sister Christina, aged 28, and his widowed mother Mary, aged 57 (Statistics Canada 1891).

### Lot D, Concession 8

The small parcel of Lot D is not defined on the historic mapping, rather the area appears to be an extension of Lot C. The historic mapping of this portion of the study area depicts Lafontaine Creek cutting across the study area (Walling 1862) (Map 3). Land registry records are unavailable for this lot until the late 1900s suggesting Lot D may have been created later by separating part of Lot C.

### Lot C, Concession 9

The historic mapping from 1863 shows the owner of Lot C as J. S. Edwards and there is a house depicted at the eastern end of the lot on the west side of what is today the southern portion of St. Jean Street (Walling 1862) (Map 3). The original patent for this lot was to Stephen Yarwood in 1826. Yarwood sold the land to John S. Edwards in 1840. The Edwards family held the land until at least the early 1900s (OLR, (50)).

John S. Edwards was born around 1841 to parents John Edwards and Helen Lamb (Ancestry.com 2010). The surname Lamb is present in the land registry records of this lot around the 1880s suggesting family connections in those transactions (OLR, (50)). Although the specific connection to the family of William Sr. and Ann Edwards mentioned above is not clear, it can be assumed based on age that John S. was likely a nephew to the elder William. The 1871 census records list John, aged 30, living in a household with three of his siblings, aged 17 to 27, and his widowed mother Helen, aged 57 (Statistics Canada 1871).

## 4.3 Archaeological Context

### 4.3.1 Current Conditions

The study area is a 1.4 km long, 26 to 30 m wide (7.8 ha) corridor following the east-west portion of Poupart Road and most of the northern section of St. Jean Street, in the Town of Rockland. The study area is on part Lots 27, 28, 29, 30, and 31 of Concession 1 Old Survey, part Lots C and D, Concession 8, and part Lot C of Concession 9 in the Geographic Township of Clarence, now within the Municipality of Clarence-Rockland, in the United Counties of Prescott-Russell, Ontario. Current conditions are shown in satellite imagery of the area in Maps 4 to 7.

The east-west section of Poupart Road is generally residential with houses on either side. There is a dog park, hydro station, and a new subdivision in the early stages of development (Figure 1 to Figure 3). The study area along this portion of the road is mainly roadway with excavated ditches (most are wet) (Figure 4 to Figure 7), with gravel shoulders (Figure 8 to Figure 10), banked soils (Figure 11 and Figure 12), residential driveways (Figure 13 and Figure 14), and multiple buried utility lines (Figure 15 and Figure 16). This half of the study area is on a higher bedrock ridge (Figure 17 and Figure 18).

The north-south section of the study area steeply slopes down from the bedrock ridge (Figure 19) and includes a large marshland (Figure 20 and Figure 21), new subdivisions (Figure 22 to Figure 24), a school (Figure 25), is surrounded by residential properties (Figure 26), and there is a creek running along the western side (Figure 27 to Figure 29), emptying into the marshland. The study area along this portion of the road is mainly ditches (the western side has a creek) (Figure 30 and Figure 31), banked soils (Figure 32 to Figure 34), concrete sidewalks (Figure 35), and multiple buried utility lines (Figure 36 and Figure 37).

### 4.3.2 Physiography

The study area lies within two Physiographic Regions, the Ottawa Valley Clay Plains, and the Russell and Prescott Sand Plains (Map 5). The Ottawa Valley Clay Plains region is characterized by poorly drained topography of clay plains interrupted by ridges of rock or sand that offer moderately better drainage. This topography was influenced by the post glacial sequence Champlain Sea (*ca*. 10,500 to 8,000 B.C.) that deposited these clay soils and were subsequently covered by sand deposits from the emerging freshwater drainage. Some of these sands were eroded to the underlying clay deposits by later channels of the developing Ottawa River. The sections to the north and south of the Ottawa River are characteristically different. On the Ontario side there is a gradual slope, although there are also some steep scarps (Chapman and Putnam 2007:205–208).

The Russell and Prescott Sand Plains consist of a large continuous belt, 65 miles in length, that stretches from Ottawa to Hawkesbury. Except for the higher sands south of Ottawa, the entire area was originally a continuous delta built up by the Ottawa River and the tributaries into the Champlain Sea. The sand plains have a level surface, and depth that varies from 20 to 30 feet.

The texture of the sand is also variable, coarser towards the north and fine sand and silt south of the Castor River. The sands are underlain with stratified red and grey clay. Most of the area lies within the drainage of the South Nation River. Drainage is good near the escarpments, but increasingly worse towards the core of the region. As most of the ground water drains into the sand, there are few streams. The South Nation River cuts a canyon 20-25 m deep across the plain from Casselman to Lemieux (Chapman and Putnam 2007:209).

The study area consists of Achigan soils with a small portion of Wendover soils (Map 5). The northern section of the study area falls within an urban area and the soil type is not mapped. Achigan soils are imperfectly drained and subject to water saturation for short periods during the growing season. They have a near level to very gently sloping or undulating topography. These soils occur on the fine sand deposits distributed throughout the central and northern portions of Prescott and Russell Counties. There are some dune-like hills that occur that are small both in height and length and are joined by smoother stretches of imperfect or poorly drained sands. These soils can be poor for agriculture as they have little fertility and have low moisture holding capacity (Schut and Wilson 1987; Matthews and Richards 1954). Wendover soils occur adjacent to the Ottawa River and occupy the rolling divides between the eroded banks of stream channels. The topography can be quite variable depending on the frequency of the stream channels. Agriculturally, most of these soils are used as pastureland as there are many drawbacks for growing crops (Wicklund and Richards 1962).

The surficial geology of the study area is varied (Map 5). This includes Quaternary (Champlain Sea) offshore marine deposits consisting of clay and silt underlying erosional terraces. The upper part of marine deposits removed to variable depths by fluvial erosion so in places clay is uniform blue-grey. These deposits include lenses, bars and channel fills to sand and pockets of nonmarine silt that were formed during terrace (or channel) cutting. There are sections of Quaternary (Champlain Sea) diamicton of shield-derived silty to sandy till. This sandy and silty compact diamicton is grey at depth but brown where oxidized, calcareous where derived from sedimentary rocks and not leached, and consists dominantly of lodgment till. In areas that lie below marine limit (198 m a.s.l.) it is overlain by a discontinuous lag consisting of gravel, sand, and boulders. The northern portion of the study area crosses a pocket of sand. This sand is recent alluvial deposits of medium grained stratified sand with some silt in the form of fluvial terraces and channels cut in marine clay and as bars and spits within abandoned channels. The bedrock is limestone, dolomite, sandstone, and locally shale. It is relatively flat lying and mainly occurring as bare, tabular outcrops. This includes areas thinly veneered by unconsolidated Quaternary sediments up to 1 m thick.

Lafontaine Creek, a tributary creek of the Ottawa River, flows just north of the study area and crosses the eastern section. Additionally, the study area is about a kilometre from the southern shore of the Ottawa River.

### 4.3.3 Previous Archaeological Assessments

No previous assessment of the study area or neighbouring parcels has been completed.

### 4.3.4 Registered Archaeological Sites and Commemorative Plaques

A search of the Ontario Archaeological Sites Database indicated that there were no registered archaeological sites located within 1 km of the study area. However, an expanded search identified a registered archaeological site within 5 km of the study area. The registered site is the Pago Point Site (BjFt-5), a late archaic indigenous site (Paterson Group 2015).

There are no historical plaques in the vicinity of the study area.

### 4.4 Archaeological Potential

Potential for pre-contact Indigenous sites is based on physiographic variables that include distance from the nearest source of water, the nature of the nearest source/body of water, distinguishing features in the landscape (e. g. ridges, knolls, eskers, wetlands), the types of soils found within the area of assessment and resource availability. The study area has potential for pre-contact Indigenous archaeological sites as it falls in an area of sandy soils, is crossed by Lafontaine Creek near where it meets the Ottawa River, and there is a registered site within 5 km of the study area.

Potential for historical Euro-Canadian sites is based on proximity to historical transportation routes, community buildings such as schools, churches, and businesses, and any known archaeological or culturally significant sites. The study area has potential for historical period Euro-Canadian archaeological sites due to the relatively early patent dates of all the properties, the early occupation and ownership of the lots by the McCaul family and the prominent Edwards family, and through the historical transportation route of Poupart Road.

The study area demonstrates potential for both pre-contact Indigenous and historical Euro-Canadian archaeological resources.

## 5.0 Field Methods

The Stage 1 background review found the study area to have archaeological potential according to the 2011 standards set out for consultant archaeologists by the MCM. The study area was mapped using the criteria of the approval authority provided by proponent as detailed project mapping had not been completed at the time of assessment. The study area was defined as a corridor 26 m wide (13 m either side of the centreline of the existing road) from point to B to G, a 30 m corridor (15 m either side of the from G to J centreline of the existing road), and 20 m radius buffers at round-abouts, at points C, G, H, I, and J (Map 2).

The Stage 2 Archaeological Assessment involved only visual inspection of all areas of the 7.8 ha study area (Figure 38 to Figure 55) as the entire study area was determined to be exempt from subsurface testing (Map 4 to 7) as per Section 2.1. Standard 2.a.i, iii., and b. (MCM 2011) due to:

- permanently wet conditions ( ha, %)
- steep slopes ( ha, %),
- extensive and deep land alterations through the exiting road, ditches, driveways, fill, and buried utilities ( ha, %) found throughout the corridor

All field activity and areas were mapped (Maps 4-7) using a BadElf Survey GPS with WAAS and DGPS enabled, paired to an iPhone with ArcGIS Field Maps. Average accuracy at the time of survey was approximately 2 m horizontal. Study area boundaries were determined in the field using the digitized study area boundaries overlaid in ArcGIS Field Maps on an iPhone.

Field notes and photographs were taken during fieldwork and site inspection to document the current land conditions (see Maps 4-7 for photo locations by figure number) as per Standard 1.a., Section 7.8.6 (MCM 2011). Photo catalogue, map inventory, and daily field notes are listed in Appendix A, B, C, and D.

Field work took place on October 31 and November 14, 2022. Weather conditions were partially cloudy and breezy with temperatures around 5° to 10° Celsius. Ground conditions were excellent with no saturation or other undue ground cover to impede visual assessment as per Section 2.1. Standard 3 (MCM 2011). Permission to access the property was provided by the landowner prior to the commencement of any field work; no limits were placed on this access.

## 6.0 Record of Finds

Despite having archaeological potential, no areas of archaeological potential were encountered during the Stage 2 investigations of the study area. The entire study area is disturbed (roads, diches, buried utilities, driveways, etc.), permanently wet, steeply sloped, or a combination thereof.

## 7.0 Analysis and Conclusions

The Stage 1 portion of the assessment determine the study area had archaeological potential according to the 2011 standards set out for consultant archaeologists by the MCM and was thus recommended for Stage 2 assessment. The Stage 2 assessment identified that the entire study area was exempt from subsurface testing due to permanently wet conditions, steep slopes, and extensive and deep land alterations through ditches, driveways, fill, and buried utilities as per Section 2.1. Standard 2.a.i, iii., and b. (MCM 2011). The assessment resulted in no evidence of archaeological or cultural heritage interest or value. Given the negative results of the assessment, it is therefore concluded that no further archaeological investigation is warranted.

## 8.0 Recommendations

Based on the results of this investigation it is recommended that:

1. No further archaeological study is required for the study area as delineated in Map 1.

## 9.0 Advice on Compliance with Legislation

a. This report is submitted to the *Minister of Citizenship and Multiculturalism* as a condition of licencing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Citizenship and Multiculturalism, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

b. It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licenced archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest , and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

c. Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licenced consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.

d. The *Cemeteries Act*, R.S.O. 1990 c. C.4 and the *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 (when proclaimed in force) require that any person discovering human remains must notify the police or coroner and the Registrar of Cemeteries at the Ministry of Consumer Services.

## 10.0 Closure

Matrix Heritage has prepared this report in a manner consistent with the time limits and physical constraints applicable to this report. No other warranty, expressed or implied is made. The sampling strategies incorporated in this study comply with those identified in the Ministry of Citizenship and Multiculturalism's *Standards and Guidelines for Consultant Archaeologists* (2011) however; archaeological assessments may fail to identify all archaeological resources.

The present report applies only to the project described in the document. Use of this report for purposes other than those described herein or by person(s) other than Space Builders or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.



This report is pending Ministry approval.

We trust that this report meets your current needs. If you have any questions or we may be of further assistance, please contact the undersigned.

Matrix Heritage Inc.

Ben Mortimer, M.A., A.P.A.
Senior Archaeologist

## 11.0 Bibliography and Sources

Ancestry.com
2010 Ontario, Canada, Deaths and Deaths Overseas, 1869-1947 [Database on-Line].

Ardoch Algonquin First Nation
2015 Re-Storying Omamiwinini History. http://www.aafna.ca/overview-ofomamiwinini-history.

Belden, H. & Co
1881 Segment of Prescott and Russell Supplement to the Illustrated Atlas of the Dominion of Canada. Toronto.

Brault, Lucien
1965 *Histoire Des Comtés Unis De Prescott et De Russell*. Conseil De Comtés Unis, L'Orignal, ON.

Chapman, L. J., and D. F. Putnam
2007 *The Physiography of Southern Ontario*. Vol. Miscellaneous Release Data 228. Ontario Geological Survey, Toronto.

Clermont, N.
1999 The Archaic Occupation of the Ottawa Valley. In *Ottawa Valley Prehistory*, J.-L. Pilon, editor, pp. 43–53. Imprimerie Gauvin, Hull.

Day, Gordon
2005 The Indians of the Ottawa Valley. Canadian Museum of Civilization Corporation. http://www.lynngehl.com/uploads/5/0/0/4/5004954/23.pdf.

Ellis, C. J., and B. D. Deller
1990 Paleo-Indians. In *The Archaeology of Southern Ontario to A.D.1650*, C. J. Ellis and N. Ferris, editors, 5:pp. 37–63. Occasional Publications of the London Chapter, OAS, London.

Engelbrecht, W.
1999 Iroquoian Ethnicity and Archaeological Taxa. In *Taming the Taxonomy: Toward a New Understanding of Great Lakes Archaeology*, R. F. Williamson and Christopher M. Watts, editors, pp. 51–60. eastendbooks, Toronto.

Ferris, Neal
1999 Telling Tales: Interpretive Trends in Southern Ontario Late Woodland Archaeology. *Ontario Archaeology* 68:1–62.

Hart, John P.
2011 The Effects of Geographical Distances on Pottery Assemblages and Similarities: A Case Study from Northern Iroquoia. *Journal of Archaeological Science*.

Hart, John P., and Hetty Jo Brumbach
2003 The Death of Owasco. *American Antiquity* 68(4):737–752.

2005 Cooking Residues, AMS Dates, and the Middle-to-Late Woodland Transition in Central New York. *Northeast Anthropology* 69(Spring):1–34.

2009 On Pottery Change and Northern Iroquoian Origins: An Assessment from the Finger Lakes Region of Central New York. *Journal of Anthropological Archaeology* 28:367–381.

Hart, John P., and W. Englebrecht
2011 Northern Iroquoian Ethnic Evolution: A Social Network Analysis. *Journal of Archaeological Method and Theory*.

Hessel, P.D.K
1993 *The Algonkins of the Ottawa Valley: An Historical Outline*. Kichesippi Books, Arnprior.

Holmes, J, and Associates
1993a Executive Summary. In *Algonquins of Golden Lake Claim*. Ontario Native Affairs Secretariat.

1993b Aboriginal Use and Occupation of the Ottawa River Watershed. In *Algonquins of Golden Lake Claim*, 2:. Ontario Native Affairs Secretariat.

Jamieson, S.
1999 A Brief History of Aboriginal Social Interactions in Southern Ontario and Their Taxonomic Implications. In *Taming the Taxonomy: Toward a New Understanding of Great Lakes Archaeology*, R. F. Williamson and Christopher M. Watts, editors, pp. 175–192. eastendbooks, Toronto.

Laliberté, Marcel
1999 The Middle Woodland in the Ottawa Valley. In *Ottawa Valley Prehistory*, J.-L. Pilon, editor, pp. 69–81. Imprimerie Gauvin, Hull.

Laporte, Vianney, and Serge Beland
1982 *La Petite Histoire de Rockland. Une Siecle de Developpement 1868-1968.* Municipality de Rockland, Rockland, ON.

Martin, Scott W. J.
2008 Languages Past and Present: Archaeological Approaches to the Appearance of Northern Iroquoian Speakers in the Lower Great Lakes Region of North America. *American Antiquity* 73(3):441–463.

Matthews, B. C., and N. R. Richards
1954 *Soil Survey of Stormont County*. Ontario Agricultural College, Guelph, ON.

McMillan, Alan, D
1995 *Native Peoples and Cultures of Canada*. Douglas and McIntyre, Vancouver.

Ministry of Citizenship and Multiculturalism, [MCM]
2011 Standards and Guidelines for Consultant Archaeologists.

Mitchell, B. M.
1963 Occurrence of Overall Corded Pottery in the Upper Ottawa Valley, Canada. *American Antiquity* 29(1):114–115.

Moreau, Jean-Francois, F. Guindon, and E. Langevin
2016 The Northern Route, between the Saguenay and Georgian Bay: Contruction of a Hypothesis. In

*Contact in the 16th Century*. Mercury Series Archaeology Paper 176. Canadian Museum of History and the University of Ottawa Press, Ottawa.

Morrison, James
2005 Algonquin History in the Ottawa River Watershed. *Ottawa River: A Background Study for Nomination of the Ottawa River Under the Canadian Heritage Rivers System*:17–36.

Mortimer, B.
2012 Whos Pot Is This? Analysis of Middle to Late Woodland Ceramics From the Kitchikewana Site, Georgian Bay Islands National Park of Canada. Unpublished M.A. Thesis, Trent University, Peterborough.

OLR, (50)
Ontario Land Registry Records - Russell (50).

Paterson Group
2015 *Stage 1, 2, & 3 Archaeological Assessment: Pago Point Site BjFt-5 Pago Point Proposed Residential Development Part Lot 22, Concession 1 Old Survey Geographic Township of Clarence United Counties of Prescott and Russell, Clarence-Rockland, Ontario*. Ottawa.

Perrault, Jean-Pierre
1986 *Un Peuple Autour d'une Croix: Centenaire de La Paroisse Sainte-Euphémie de Casselman, 1886-1986*. Kaice-Tec Reproduction, Ottawa.

Pilon, J.-L.
2005 Ancient History of the Lower Ottawa River Valley. *Ottawa River: A Background Study for Nomination of the Ottawa River Under the Canadian Heritage Rivers System*:12–17.

Ritchie, W. A.
1969 *The Archaeology of New York State*. Revised. The Natural History Press, Garden City.

Sarazin, G
220 Years of Broken Promises. Algonquins of Greater Golden Lake First Nation. http://www.greatergoldenlake.com/220.html.

Schut, L. W., and E. A. Wilson
1987 *The Soils of the Regional Municipality of Ottawa-Carleton (Excluding the Ottawa Urban Fringe)*. Vol. Volume 1. Soil Survey Report No. 58 of the Ontario Institute of Pedology. Agriculture Canada, Ottawa.

Statistics Canada
1861 Census of Canada.

1871 Census of Canada.

1881 Census of Canada.

1891 Census of Canada.

Sylvestre, Paul-François
1984 *Casselman*. Le Centre franco-ontarien de resources pédagogiques, Ottawa.

Trigger, B. G.
1986 *Natives and Newcomers: Canada's "Heroic Age" Reconsidered*. McGill-Queen's University Press, Montreal.

Walling
1862 Plan of the Counties of Stormont, Dundas, Glengarry, Prescott & Russell.

Watson, Gordon D.
1972 A Woodland Indian Site at Constance Bay, Ontario. *Ontario Archaeology* 18:1–24.

1980 The Wyght Site: A Multicomponent Woodland Site on the Lower Rideau Lake, Leeds County, Ontario. Unpublished M.A. Thesis, Trent University, Peterborough.

1990 Paleo-Indian and Archaic Occupations of the Rideau Lakes. *Ontario Archaeology* 50:5–26.

1999 The Paleo-Indian Period in the Ottawa Valley. In *Ottawa Valley Prehistory*, J.-L. Pilon, editor, pp. 28–41. Imprimerie Gauvin, Hull.

Whiteduck, Kirby J.
1995 Algonquin Traditional Culture. BA Thesis, York University. Council of the Algonquins of Pikwakanagan, Golden Lake.

Wicklund, R. E., and N. R. Richards
1962 *Soil Survey of Russell and Prescott Counties*. Research Branch, Canada Department of Agriculture, Guelph, On.

Wright, James V.
1966 *The Ontario Iroquois Tradition*. Bulletin 210. National Museum of Canada, Ottawa.

2004 *A History of the Native People of Canada: Volume III (A.D. 500 - European Contact)*. National Museum of Canada Mercury Series, Archaeological Survey of Canada Paper No. 152. Canadian Museum of Civilization, Hull.

## 11.1 Images

**Figure 1: Entrance to dog park with hydro station in the background. (MH1125-D138)**

**Figure 2: Hydro station with ditch and drain. (MH1125-D141)**

**Figure 3: New subdivision currently under development, looking up steep slope. (MH1125-D161)**

**Figure 4: Steep slope with ditch and large stone gravel. (MH1125-D151)**

Figure 5: Ditch with gravel shoulder. (MH1125-D190)

Figure 6: Ditch with gravel shoulder. (MH1125-D198)

**Figure 7: Ditch along southern side. (MH1125-D222)**

**Figure 8: Gravel shoulder by houses with buried utilities, northern side. (MH1125-D171)**

**Figure 9: Gravel shoulder, disturbances, utilities and driveways, northern side. (MH1125-D178)**

**Figure 10: Corner at western end of study area, ditch, gravel shoulder. (MH1125-D204)**

**Figure 11: Ditch with banked soil on southern side. (MH1125-D233)**

**Figure 12: Ditch with banked gravel on southern side. (MH1125-D235)**


**Figure 13: Driveways and ditches on southern side. (MH1125-D146)**


**Figure 14: Driveways and ditches on the northern side. (MH1125-D174)**

Figure 15: Gravel should and ditches, showing buried utility lines. (MH1125-D175)

Figure 16: Ditch on the southern side, near dog park, showing buried Hydro lines. (MH1125-D240)

Figure 17: Central portion of study area, showing road sloping up and prominent ridge. (MH1125-D109)

Figure 18: Berm and slope up to western side of the study area with buried utilities. (M1125-D155)

**Figure 19: Slope down to eastern half of the study area, entrance to construction company. (MH1125-D122)**

**Figure 20: Large marsh in the central portion of the study area. (MH1125-D129)**

**Figure 21: Debris and culvert with creek flowing into the marsh. (MH1125-D118)**


**Figure 22: Landscaped entrance into new subdivision to the east. (MH1125-D072)**

**Figure 23: Gravel utility access road, retention pond, and new subdivision to the east of the study area. (MH1125-D094)**

**Figure 24: Driveway into new subdivision, to the east and south, central portion of the study area. (MH1125-D106)**

Figure 25: Entrance to school on east side. (MH1125-D022)


Figure 26: Residential area, buried utilities, in the northern portion of the study area. (MH1125-D018)

Figure 27: Ditch with creek, flowing behind houses on the western side. (MH1125-D060)

Figure 28: Creek flowing behind houses on the western side. (MH1125-D067)

**Figure 29: Creek ion ditch flowing behind houses on the western side. (MH1125-D078)**

**Figure 30: Ditch with creek and buried utilities. (MH1125-D025)**

Figure 31: Ditch with banked soil, eastern side. (MH1125-D035)

Figure 32: Ditch with banked soil on the eastern side. (MH1125-D042)

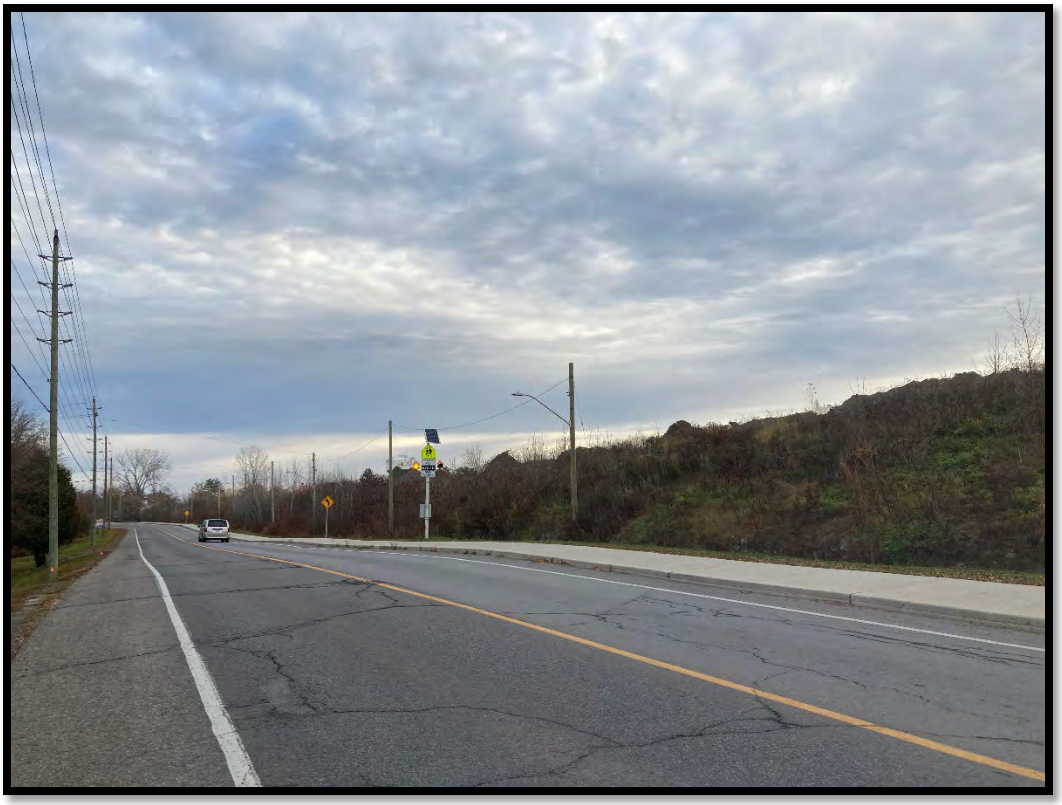


**Figure 33: Banked soil associated with the new subdivision on the eastern side. (MH1125-D071)**

**Figure 34: Piled soil, gravel, and debris from subdivision development, central portion of the study area. (MH1125-D114)**

**Figure 35: Concrete sidewalk with banked soil and buried utilities. (MH1125-D044)**

**Figure 36: Buried utilities by ditch with creek. (MH1125-D024)**

**Figure 37: Buried utilities visibly marked along the road, steep slope down to dirch/creek. (MH1125-D137)**

**Figure 38: Steep ditch and banked soil. (MH1125-D051)**

Figure 39: Steep slope from road down to ditch with creek. (MH1125-D066)

Figure 40: Sidewalk, ditch, and banked soil from new subdivision. (MH1125-D070)

**Figure 41: Steeply banked artificial landscaped new subdivision, ditch, marshy conditions. (MH1125-D074)**

**Figure 42: Large marshland in the central portion of the study area. (MH1125-D091)**

**Figure 43: Steep ditch to large marshland, buried utilities. (MH1125-D093)**

**Figure 44: Retention pond by new subdivision, gravel access road, buried utilities. (MH1125-D096)**

**Figure 45: Culvert and drain with large stone gravel into creek on western side. (MH1125-D057)**

**Figure 46: Disturbed soil, debris, fill, culvert and drain for creek into marshland in central portion. (MH1125-D120)**

**Figure 47: Culvert and creek into large marshland in central portion of the study area, steep hill up to ridge visible. (MH1125-D128)**

**Figure 48: Intersection at St. Jean Street and Poupart Road, buried utilities, ditch, hydro station. (MH1125-D142)**

**Figure 49: Entrance to construction company in the central portion of the study area, gravel shoulder, ditches, disturbed soils. (MH1125-D152)**

**Figure 50: Steep slope up to the western portion, gravel shoulder, buried utility lines. (MH1125-D157)**

**Figure 51: Gravel shoulder and ditch, gravel fill. (MH1125-D189)**

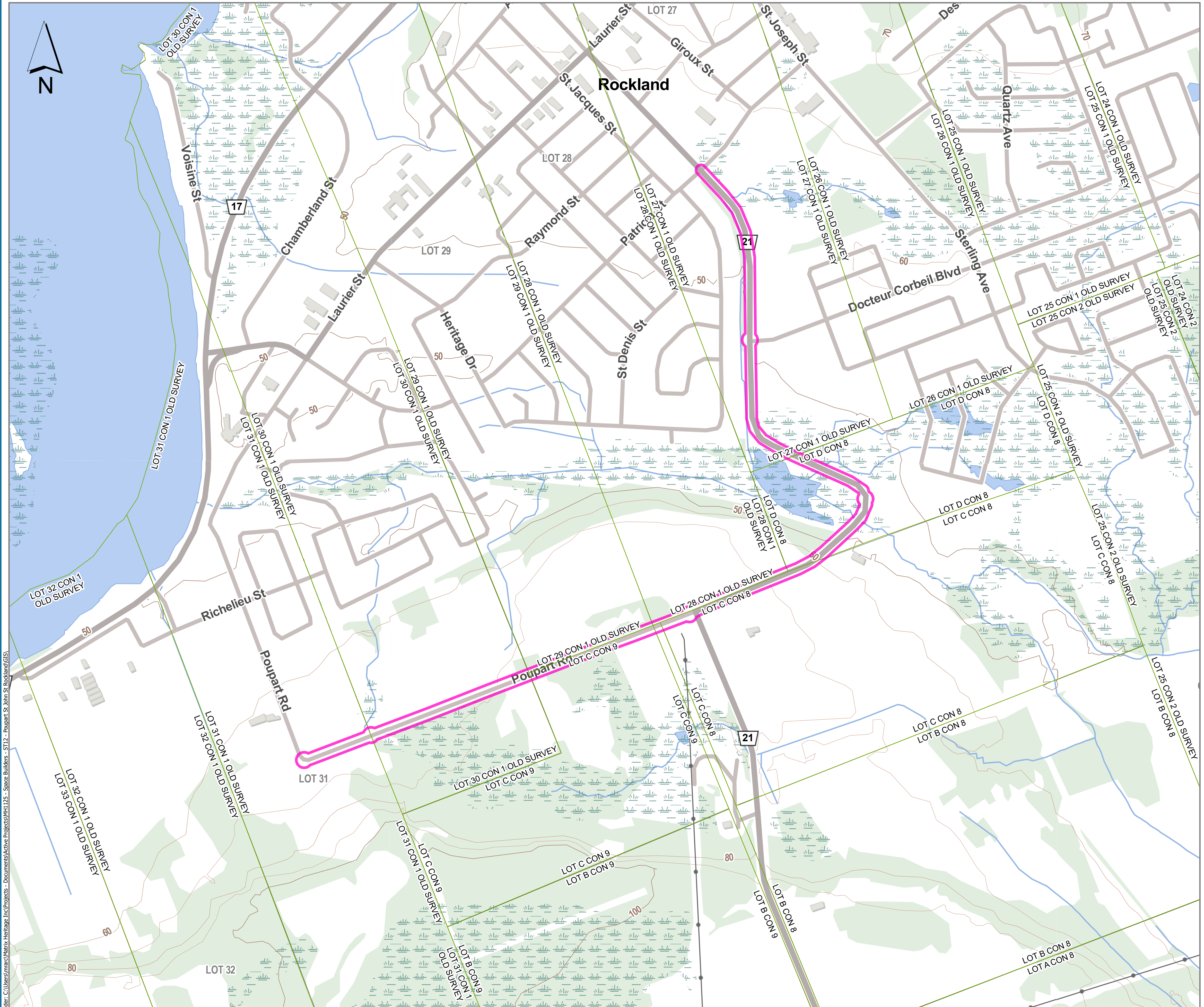
**Figure 52: Western extent of the study area, gravel shoulder, culvert, wet conditions. (MH1125-D207)**

**Figure 53: Western portion of study area, south side of the road, ditch, gravel shoulder, fill. (MH1125-D211)**

**Figure 54: Ditch on southern side with gravel shoulder, marshy conditions, buried utilities. (MH1125-D220)**

**Figure 55: Ditch with gravel shoulder and fill bank visible. (MH1125-D227)**

## 12.0 Maps





LEGEND

DEVELOPMENT AREA

0 150 300 450 600 Meters 1:10,000

REFERENCES:
CITY OF OTTAWA, PROVINCE OF ONTARIO, ESRI CANADA, ESRI, HERE, GARMIN, USGS, NGA, EPA, USDA, NPS, AAFC, NRCAN

FILE MH1125

DATE 2022-12-01

CREATED BY: BM

PROJECTION: NAD 1983 UTM Zone 18N

CHECKED BY:NK

PROJECT

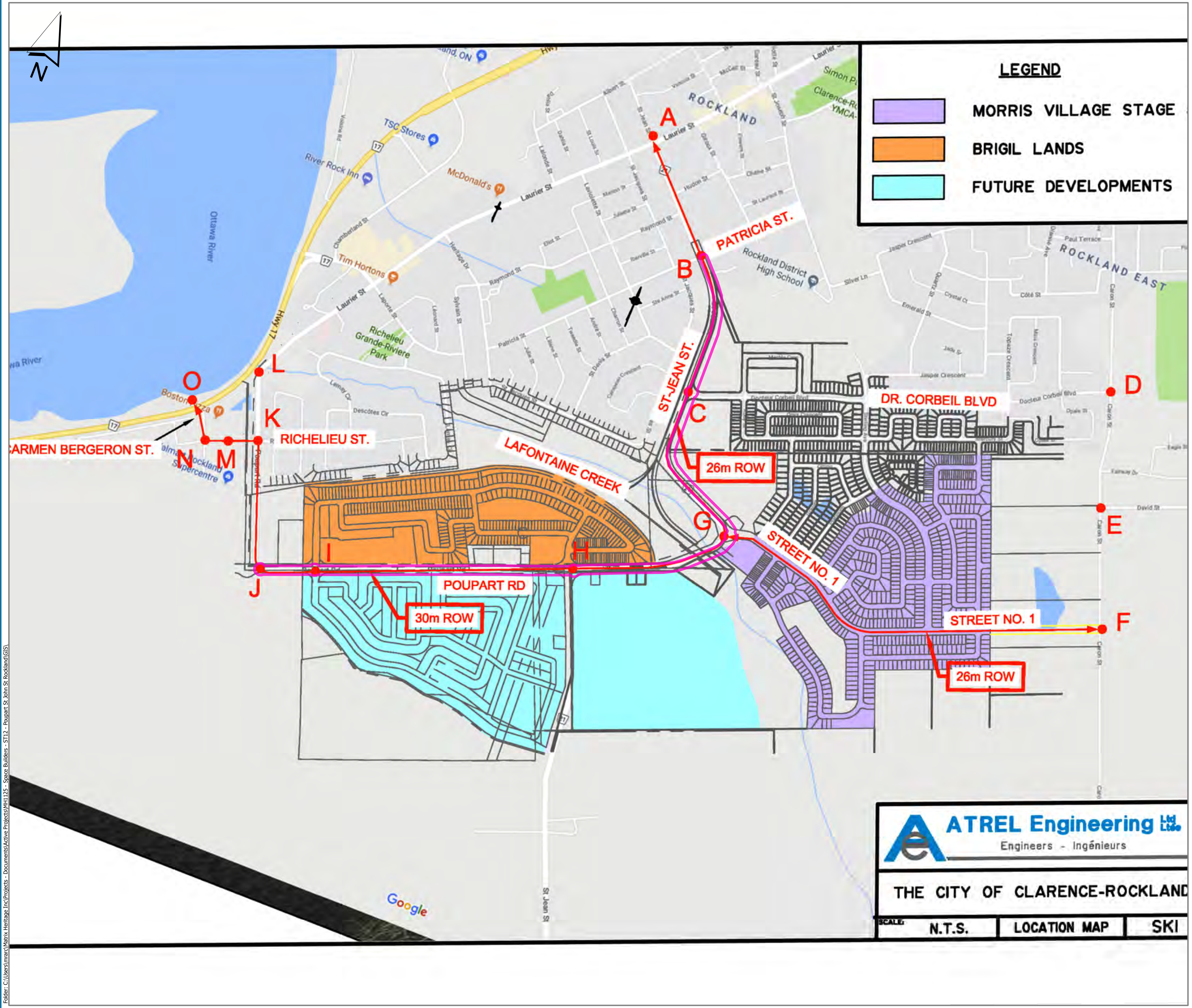
STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
ST-JEAN STREET, ROCKLAND, ONTARIO

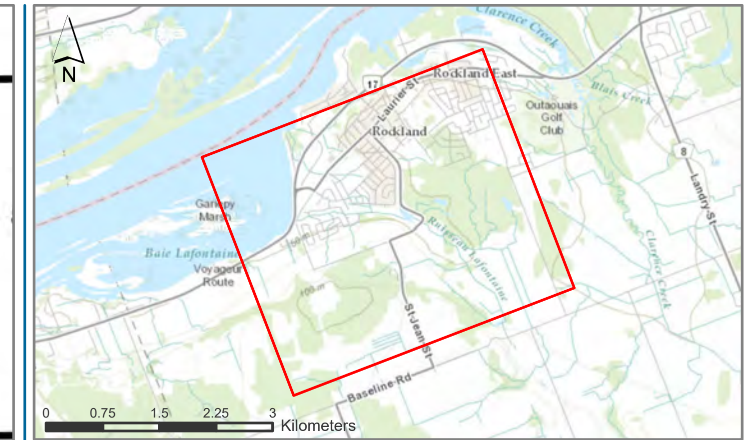
TITLE

**LOCATION**

MAP

1




LEGEND

STUDY AREA

0 160 320 480 640 Meters 1:13,000

REFERENCES:
CITY OF OTTAWA, PROVINCE OF ONTARIO, ESRI CANADA, ESRI, HERE, GARMIN, GEOTECHNOLOGIES, INC., USGS, METI/NASA, NGA, EPA, USDA, AAFC, NRCAN

PLAN PROVIDED BY PROPONENT

NOTE PLAN PROVIDED NOT TO SCALE

FILE MH1125

DATE 2022-12-01

CREATED BY: BM

PROJECTION: NAD 1983 UTM Zone 18N

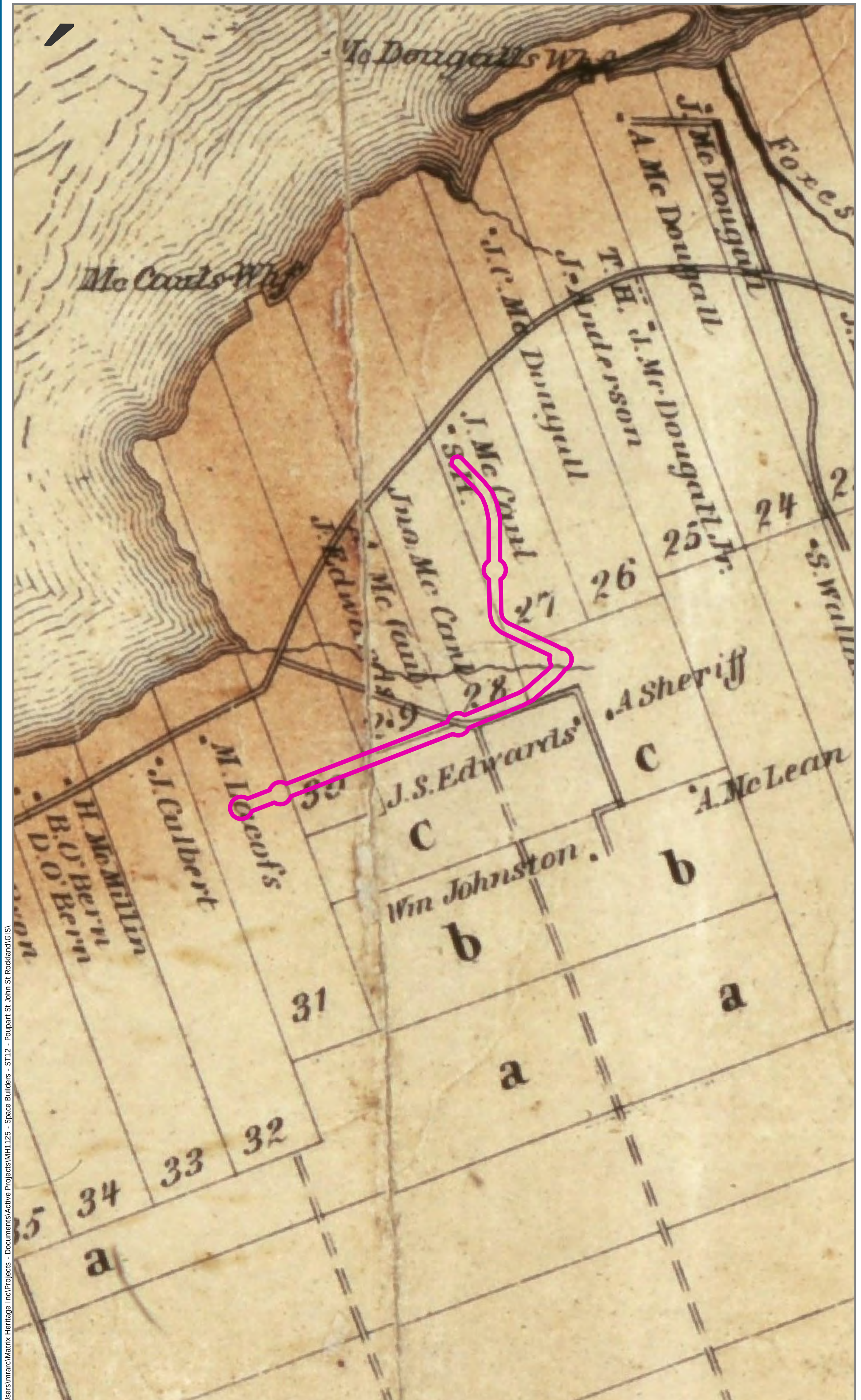
CHECKED BY:NK

PROJECT
STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
ST-JEAN STREET, ROCKLAND, ONTARIO

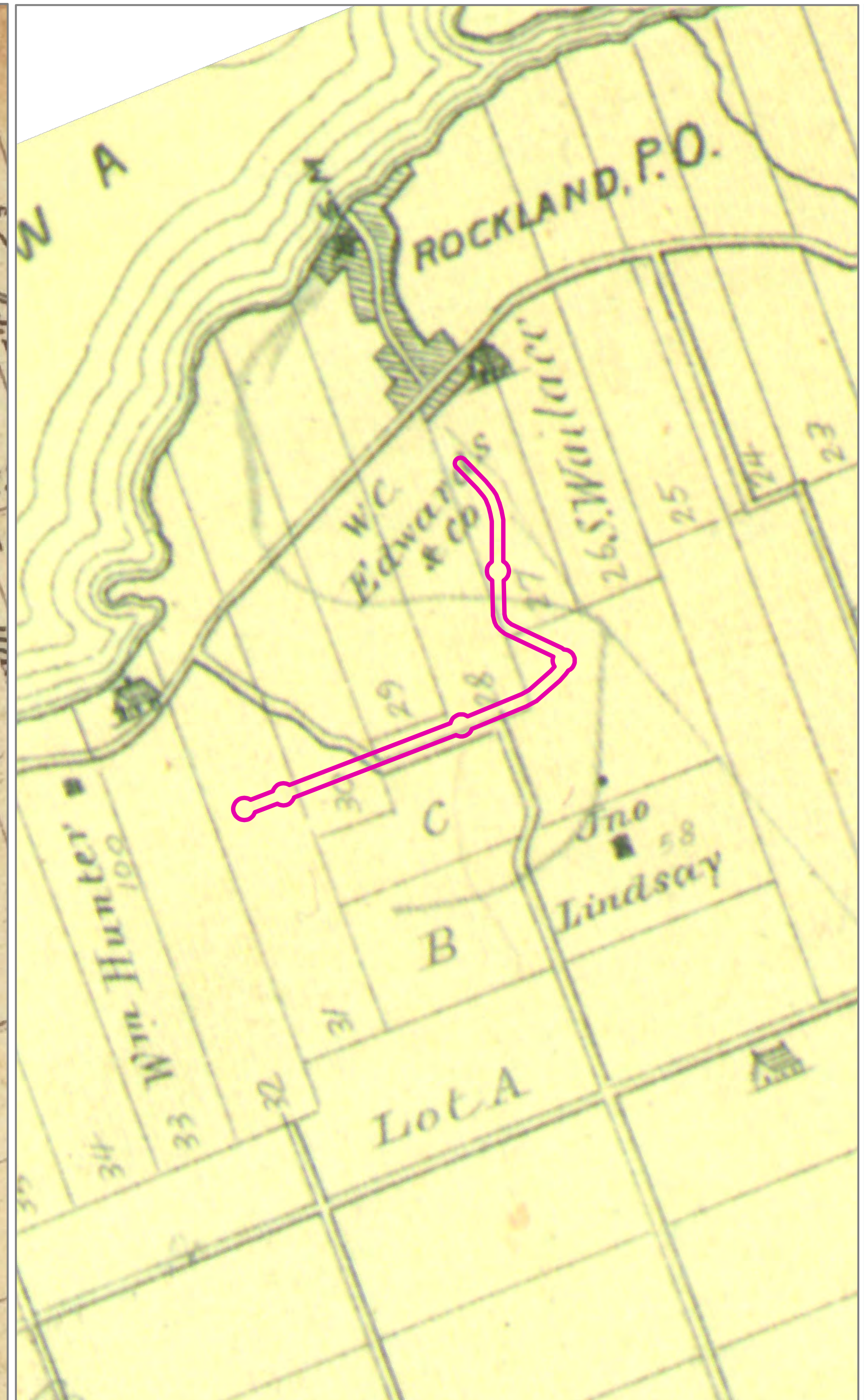
TITLE
**SKETCH OF STUDY CORRIDOR**

MAP 2

Folder: C:\Users\mrarc\Matrix Heritage Inc\Projects - Documents\Active Projects\MH1125 - Space Builders - ST12 - Poupart St John St Rockland\GIS\



WALLING 1862



BELDEN 1881


LEGEND

STUDY AREA

Matrix

0 390 780 1,170 1,560 Meters 1:25,000

REFERENCES:
PROVINCE OF ONTARIO, ONTARIO MNR, ESRI CANADA, ESRI, HERE, GARMIN, USGS, NGA, EPA, USDA, NPS, AAFC, NRCAN

SEGMENT OF WALLING 1862 STORMONT, DUNDAS, GLENGARRY, PRESCOTT & RUSSELL, CANADA WEST: FROM SURVEYS UNDER THE DIRECTION OF H.F. WALLING
SEGMENT OF THE BELDEN 1881 CLARENCE TOWNSHIP MAP FROM THE PRESCOTT AND RUSSELL SUPPLEMENT IN ILLUSTRATED ATLAS OF THE DOMINION OF CANADA.

FILE MH1125

DATE 2022-10-07

CREATED BY: BM

CHECKED BY: NK

PROJECTION: NAD 1983 UTM Zone 18N

PROJECT

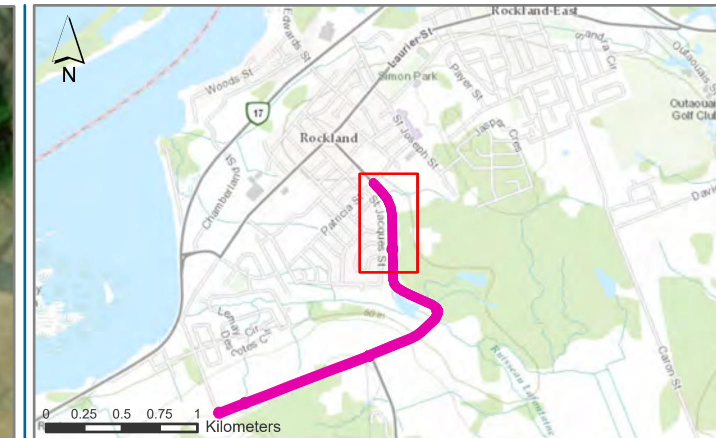
STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
ST-JEAN STREET, ROCKLAND, ONTARIO

TITLE

**HISTORIC**

MAP

3


LEGEND

DEVELOPMENT AREA

**ASSESSMENT METHOD**

LOW POTENTIAL - EXCLUDED

DISTURBED

PHOTO LOCATION, DIRECTION, AND FIGURE NUMBER

Matrix

0 25 50 75 100

Meters 1:2,500

REFERENCES:
MAXAR, MICROSOFT, PROVINCE OF ONTARIO, ESRI CANADA, ESRI, HERE, GARMIN, GEOTECHNOLOGIES, INC., USGS, METI/NASA, EPA, USDA, AAFC, NRCAN

FILE MH1125

DATE 2022-12-01

CREATED BY: BM

CHECKED BY:NK

PROJECTION: NAD 1983 UTM Zone 18N

PROJECT

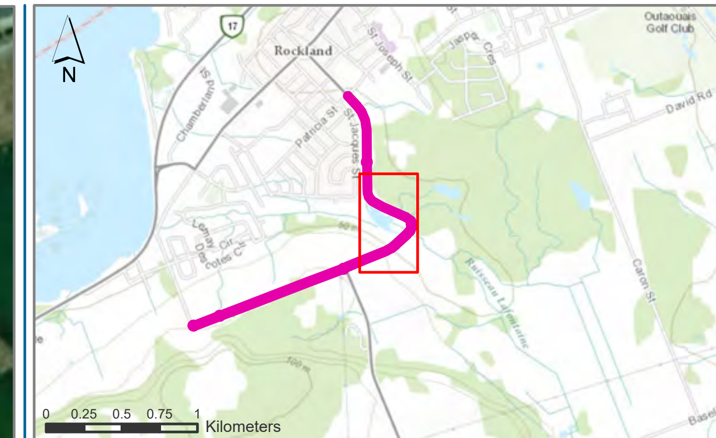
STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
ST-JEAN STREET, ROCKLAND, ONTARIO

TITLE

**METHODS AND KEY 1**

MAP

4


LEGEND

DEVELOPMENT AREA

**ASSESSMENT METHOD** LOW POTENTIAL - EXCLUDED

PERMANENTLY WET

DISTURBED

STEEP SLOPE (>20 DEGREES)

PHOTO LOCATION, DIRECTION, AND FIGURE NUMBER

Matrix

0 25 50 75 100 Meters 1:2,500

REFERENCES:
MAXAR, MICROSOFT, CITY OF OTTAWA, PROVINCE OF ONTARIO, ESRI CANADA, ESRI, HERE, GARMIN, GEOTECHNOLOGIES, INC., USGS, METI/NASA, EPA, USDA, AAFC, NRCAN

FILE MH1125

DATE 2022-12-01

CREATED BY: BM

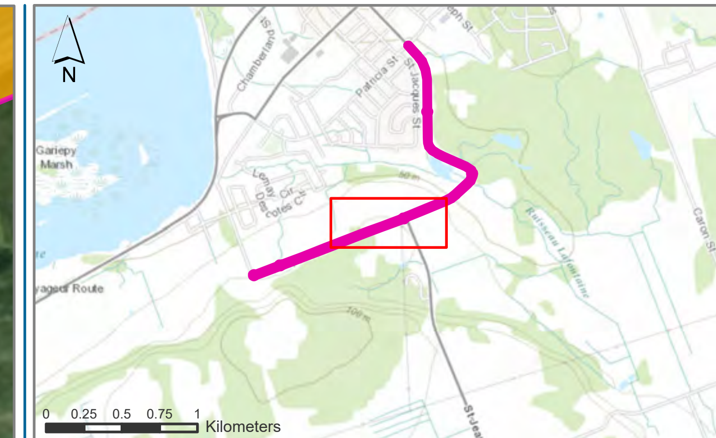
CHECKED BY:NK

PROJECTION: NAD 1983 UTM Zone 18N

PROJECT
STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
ST-JEAN STREET, ROCKLAND, ONTARIO

TITLE
**METHODS AND KEY 2**

MAP
5


LEGEND

DEVELOPMENT AREA

**ASSESSMENT METHOD**

LOW POTENTIAL - EXCLUDED

DISTURBED

PHOTO LOCATION, DIRECTION, AND FIGURE NUMBER

0 25 50 75 100 Meters 1:2,500

REFERENCES:
MAXAR, MICROSOFT, CITY OF OTTAWA, PROVINCE OF ONTARIO, ESRI CANADA, ESRI, HERE, GARMIN, GEOTECHNOLOGIES, INC., USGS, METI/NASA, EPA, USDA, AAFC, NRCAN

FILE MH1125

DATE 2022-12-01

CREATED BY: BM

CHECKED BY:NK

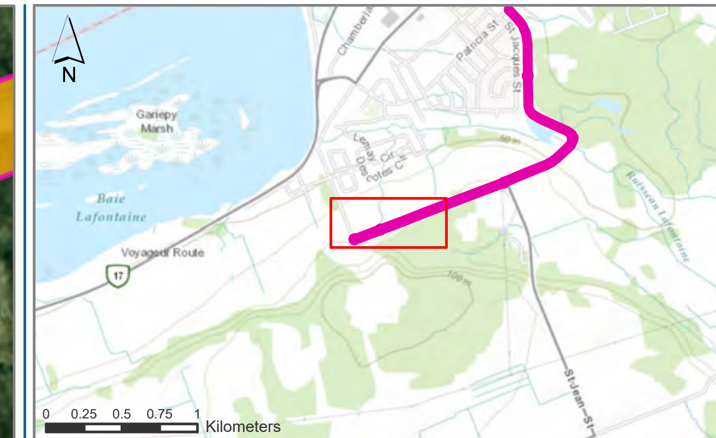
PROJECTION: NAD 1983 UTM Zone 18N

PROJECT
STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
ST-JEAN STREET, ROCKLAND, ONTARIO

TITLE
**METHODS AND KEY 3**

MAP
6

Folder: C:\Users\mrarc\Matrix Heritage Inc\Projects - Documents\Active Projects\MH1125 - Space Builders - ST12 - Poupart St John St Rockland\GIS\


LEGEND

DEVELOPMENT AREA

**ASSESSMENT METHOD**

LOW POTENTIAL - EXCLUDED

DISTURBED

PHOTO LOCATION, DIRECTION, AND FIGURE NUMBER

0 25 50 75 100 Meters 1:2,500

REFERENCES:
MAXAR, MICROSOFT, CITY OF OTTAWA, PROVINCE OF ONTARIO, ESRI CANADA, ESRI, HERE, GARMIN, GEOTECHNOLOGIES, INC., USGS, METI/NASA, EPA, USDA, AAFC, NRCAN

FILE MH1125

DATE 2022-12-01

CREATED BY: BM

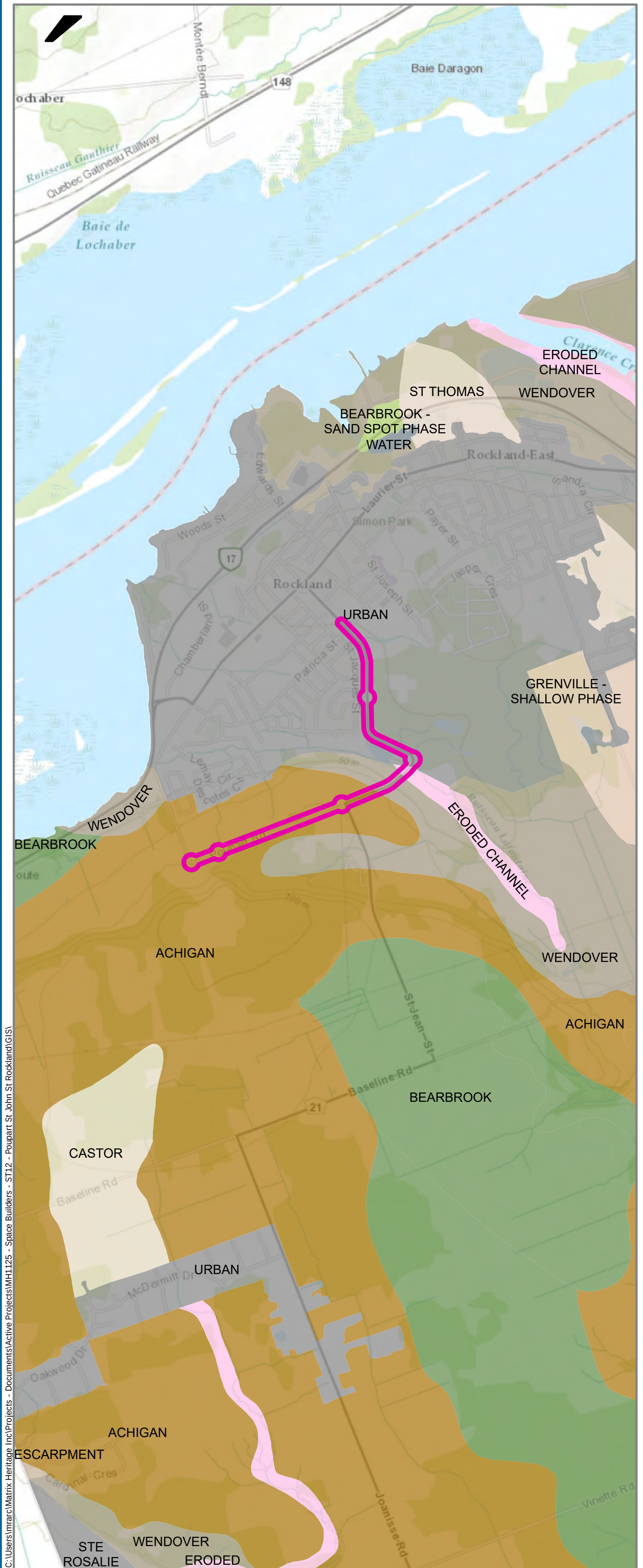
CHECKED BY:NK

PROJECTION: NAD 1983 UTM Zone 18N

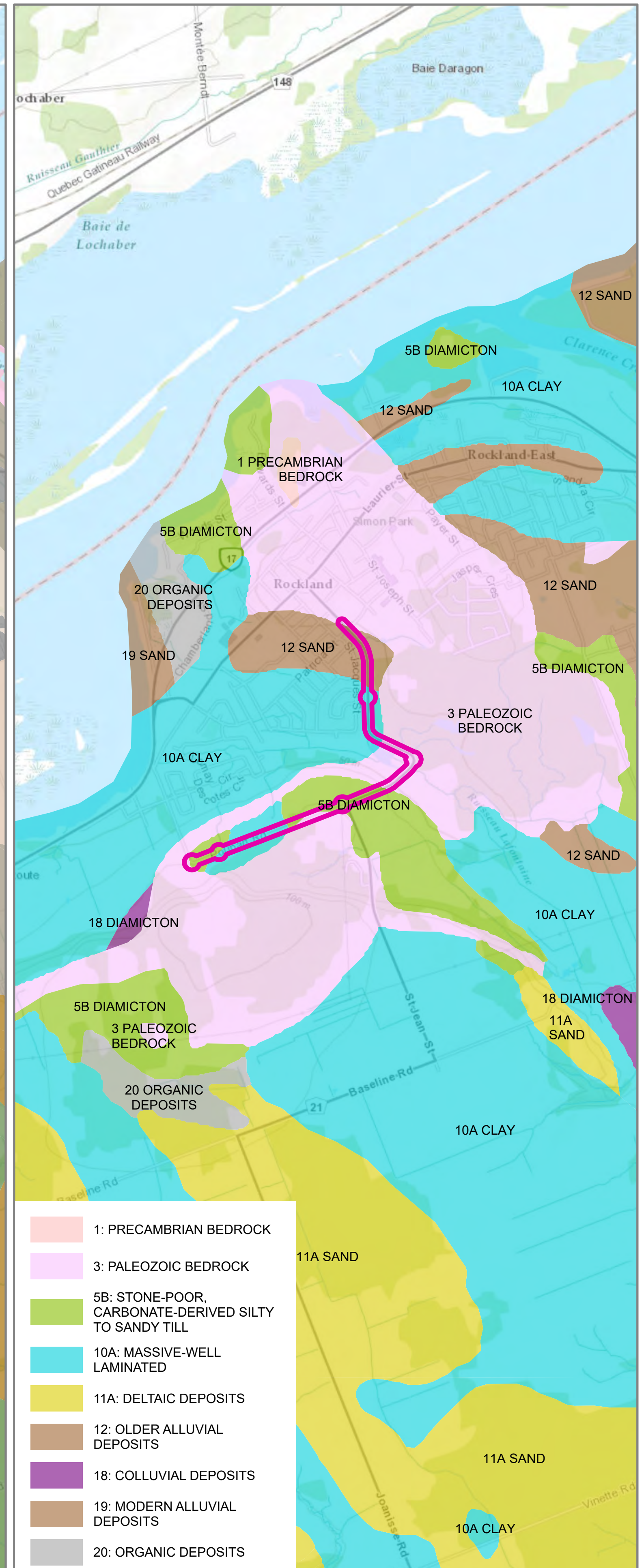
PROJECT
STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
ST-JEAN STREET, ROCKLAND, ONTARIO

TITLE
**METHODS AND KEY 4**

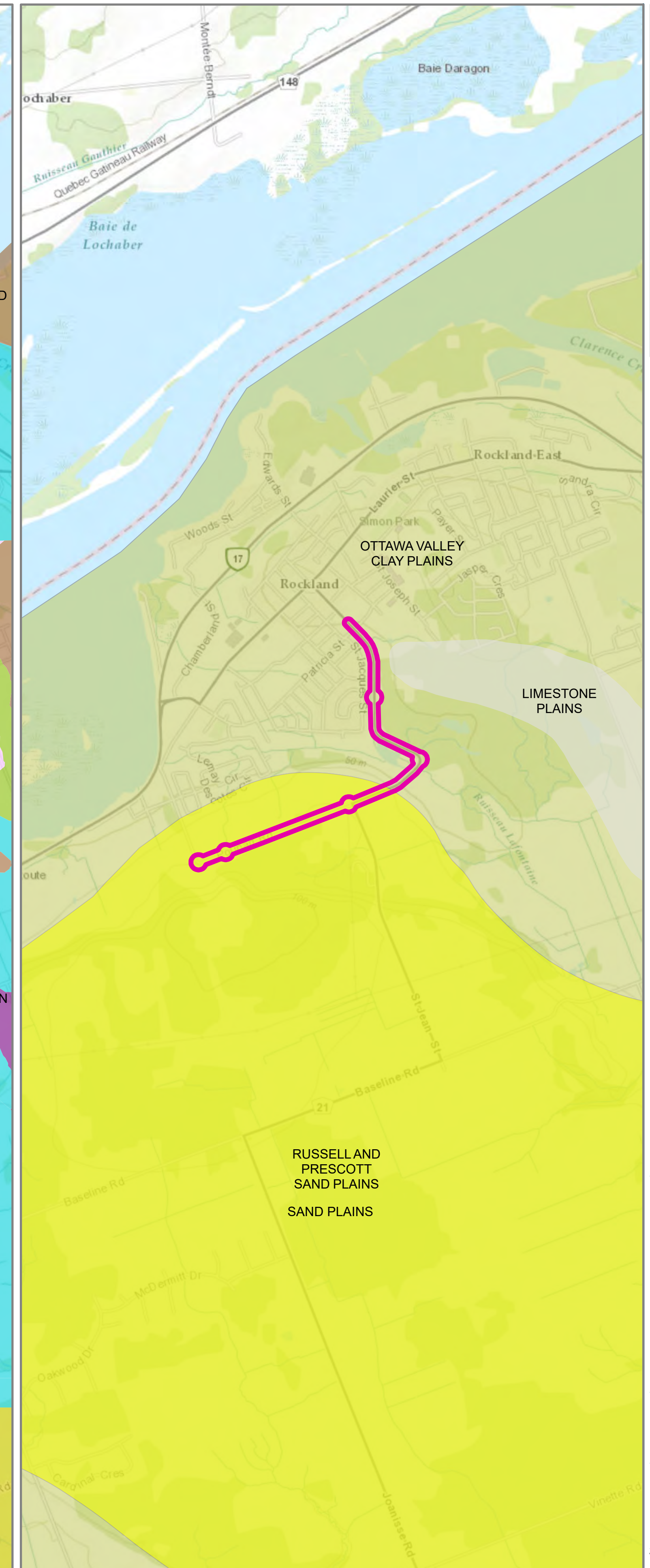
MAP
7




SOIL SURVEY COMPLEX




SURFICIAL GEOLOGY




PHYSIOGRAPHY


LEGEND

STUDY AREA

0 680 1,360 2,040 2,720 Meters 1:40,000

REFERENCES:
PROVINCE OF ONTARIO, ONTARIO MNR, ESRI CANADA, ESRI, HERE, GARMIN, USGS, NGA, EPA, USDA, NPS, AAFC, NRCAN, CITY OF OTTAWA, PROVINCE OF ONTARIO, ESRI CANADA, ESRI, HERE, GARMIN, GEOTECHNOLOGIES, INC., USGS, METI/NASA, EPA, USDA, AAFC, NRCAN
SOIL SURVEY COMPLEX LIO
SURFICIAL GEOLOGY OF SOUTHERN ONTARIO 2003
CHAPMAN AND PUTNAM 2007 PHYSIOGRAPHY OF SOUTHERN ONTARIO

FILE MH1125 | DATE 2022-09-08
CREATED BY: BM
PROJECTION: NAD 1983 UTM Zone 18N | CHECKED BY:NK

PROJECT
STAGE 1 & 2 ARCHAEOLOGICAL ASSESSMENT
ST-JEAN STREET, ROCKLAND, ONTARIO

TITLE
**SOILS AND GEOLOGY**

MAP
8

## Appendix A: Photographic Catalogue

| Photo Number | Description | Bearing | By | Date |
|---|---|---|---|---|
| MH1125-D001 | Sidewalk and ditch at northern extent | 313 | A. Jackson | 31-Oct-22 |
| MH1125-D002 | Boat shop at northern extent | 251 | A. Jackson | 31-Oct-22 |
| MH1125-D003 | Yard of boat shop at northern end | 191 | A. Jackson | 31-Oct-22 |
| MH1125-D004 | General conditions | 156 | A. Jackson | 31-Oct-22 |
| MH1125-D005 | Ditch and built-up lawns (weeper beds) | 101 | A. Jackson | 31-Oct-22 |
| MH1125-D006 | Ditch and built-up lawns (weeper beds) | 358 | A. Jackson | 31-Oct-22 |
| MH1125-D007 | Sidewalk | 112 | A. Jackson | 31-Oct-22 |
| MH1125-D008 | Sidewalk | 113 | A. Jackson | 31-Oct-22 |
| MH1125-D009 | Intersection at St. Jean and Patricia | 125 | A. Jackson | 31-Oct-22 |
| MH1125-D010 | Multiple buried utilities marked | 158 | A. Jackson | 31-Oct-22 |
| MH1125-D011 | Built up lawn | 244 | A. Jackson | 31-Oct-22 |
| MH1125-D012 | Intersection at St. Jean and Patricia | 212 | A. Jackson | 31-Oct-22 |
| MH1125-D013 | Intersection at St. Jean and Patricia, showing utilities | 104 | A. Jackson | 31-Oct-22 |
| MH1125-D014 | Multiple buried utilities marked | 128 | A. Jackson | 31-Oct-22 |
| MH1125-D015 | Intersection at St. Jean and Patricia | 228 | A. Jackson | 31-Oct-22 |
| MH1125-D016 | Intersection at St. Jean and Patricia | 209 | A. Jackson | 31-Oct-22 |
| MH1125-D017 | Built up land, ditch, sidewalk | 103 | A. Jackson | 31-Oct-22 |
| MH1125-D018 | Intersection at St. Jean and Patricia | 333 | A. Jackson | 31-Oct-22 |
| MH1125-D019 | Intersection at St. Jean and Patricia | 279 | A. Jackson | 31-Oct-22 |
| MH1125-D020 | Built up land, ditch, sidewalk | 105 | A. Jackson | 31-Oct-22 |
| MH1125-D021 | Built up land, ditch, sidewalk | 342 | A. Jackson | 31-Oct-22 |
| MH1125-D022 | Entrance to school | 110 | A. Jackson | 31-Oct-22 |
| MH1125-D023 | Houses and ditch | 204 | A. Jackson | 31-Oct-22 |
| MH1125-D024 | Ditch and utilities | 156 | A. Jackson | 31-Oct-22 |
| MH1125-D025 | Ditch and utilities | 127 | A. Jackson | 31-Oct-22 |
| MH1125-D026 | Ditch and utilities | 175 | A. Jackson | 31-Oct-22 |
| MH1125-D027 | Ditch and utilities | 162 | A. Jackson | 31-Oct-22 |
| MH1125-D028 | Ditch and utilities | 143 | A. Jackson | 31-Oct-22 |
| MH1125-D029 | Built up land, ditch, sidewalk | 102 | A. Jackson | 31-Oct-22 |
| MH1125-D030 | Built up land, ditch, sidewalk | 112 | A. Jackson | 31-Oct-22 |
| MH1125-D031 | Ditch with stream | 166 | A. Jackson | 31-Oct-22 |
| MH1125-D032 | Ditch with stream | 303 | A. Jackson | 31-Oct-22 |
| MH1125-D033 | Ditch with stream | 166 | A. Jackson | 31-Oct-22 |
| MH1125-D034 | Ditch with stream | 177 | A. Jackson | 31-Oct-22 |
| MH1125-D035 | Ditch with stream | 7 | A. Jackson | 31-Oct-22 |
| MH1125-D036 | Built up land, ditch, sidewalk | 120 | A. Jackson | 31-Oct-22 |
| MH1125-D037 | Built up land, ditch, sidewalk | 103 | A. Jackson | 31-Oct-22 |
| MH1125-D038 | Built up land, ditch, sidewalk | 302 | A. Jackson | 31-Oct-22 |
| MH1125-D039 | Built up land, ditch, sidewalk | 103 | A. Jackson | 31-Oct-22 |
| MH1125-D040 | Built up fill/ berm | 75 | A. Jackson | 31-Oct-22 |
| MH1125-D041 | Ditch and utilities | 289 | A. Jackson | 31-Oct-22 |
| MH1125-D042 | Built up fill/ berm | 124 | A. Jackson | 31-Oct-22 |
| MH1125-D043 | Built up fill/ berm | 21 | A. Jackson | 31-Oct-22 |
| MH1125-D044 | Built up land, ditch, sidewalk | 156 | A. Jackson | 31-Oct-22 |
| MH1125-D045 | Ditch with stream | 339 | A. Jackson | 31-Oct-22 |
| MH1125-D046 | Ditch with stream | 175 | A. Jackson | 31-Oct-22 |
| MH1125-D047 | Ditch with stream | 340 | A. Jackson | 31-Oct-22 |
| MH1125-D048 | Ditch with stream | 184 | A. Jackson | 31-Oct-22 |
| MH1125-D049 | Built up land, ditch, sidewalk | 140 | A. Jackson | 31-Oct-22 |
| MH1125-D050 | Built up fill/ berm | 130 | A. Jackson | 31-Oct-22 |
| MH1125-D051 | Built up land, ditch, sidewalk | 173 | A. Jackson | 31-Oct-22 |
| MH1125-D052 | Rocky outcrops in ditch with stream | 30 | A. Jackson | 31-Oct-22 |
| MH1125-D053 | Rocky outcrops in ditch with stream | 320 | A. Jackson | 31-Oct-22 |
| MH1125-D054 | Rocky outcrops in ditch with stream | 238 | A. Jackson | 31-Oct-22 |
| MH1125-D055 | Built up land, ditch, sidewalk | 187 | A. Jackson | 31-Oct-22 |
| MH1125-D056 | Ditch with stream | 13 | A. Jackson | 31-Oct-22 |
| MH1125-D057 | Ditch with stream | 140 | A. Jackson | 31-Oct-22 |
| MH1125-D058 | Built up land, ditch, sidewalk | 80 | A. Jackson | 31-Oct-22 |

| Photo Number | Description | Bearing | By | Date |
|---|---|---|---|---|
| MH1125-D059 | Stream and neighbouring houses | 246 | A. Jackson | 31-Oct-22 |
| MH1125-D060 | Stream and neighbouring houses | 342 | A. Jackson | 31-Oct-22 |
| MH1125-D061 | Culvert under road | 44 | A. Jackson | 31-Oct-22 |
| MH1125-D062 | Ditch with stream | 4 | A. Jackson | 31-Oct-22 |
| MH1125-D063 | Built up land, ditch, sidewalk | 153 | A. Jackson | 31-Oct-22 |
| MH1125-D064 | Built up land, ditch, sidewalk | 185 | A. Jackson | 31-Oct-22 |
| MH1125-D065 | Built up land, ditch, sidewalk | 141 | A. Jackson | 31-Oct-22 |
| MH1125-D066 | Slope down to stream in ditch | 174 | A. Jackson | 31-Oct-22 |
| MH1125-D067 | Stream and neighbouring houses | 200 | A. Jackson | 31-Oct-22 |
| MH1125-D068 | Ditch with stream | 162 | A. Jackson | 31-Oct-22 |
| MH1125-D069 | Slope down to stream in ditch | 73 | A. Jackson | 31-Oct-22 |
| MH1125-D070 | Built up fill/ berm | 74 | A. Jackson | 31-Oct-22 |
| MH1125-D071 | Built up fill/ berm | 28 | A. Jackson | 31-Oct-22 |
| MH1125-D072 | General conditions looking up Docteur Corbeil Blvd | 83 | A. Jackson | 31-Oct-22 |
| MH1125-D073 | General conditions looking up Docteur Corbeil Blvd | 27 | A. Jackson | 31-Oct-22 |
| MH1125-D074 | Built up land, ditch, sidewalk | 165 | A. Jackson | 31-Oct-22 |
| MH1125-D075 | Built up land, ditch, sidewalk | 191 | A. Jackson | 31-Oct-22 |
| MH1125-D076 | Built up land, ditch, sidewalk | 75 | A. Jackson | 31-Oct-22 |
| MH1125-D077 | Built up land, ditch, sidewalk | 149 | A. Jackson | 31-Oct-22 |
| MH1125-D078 | Stream and neighbouring houses | 300 | A. Jackson | 31-Oct-22 |
| MH1125-D079 | Ditch with stream | 194 | A. Jackson | 31-Oct-22 |
| MH1125-D080 | Gravel shoulder | 143 | A. Jackson | 31-Oct-22 |
| MH1125-D081 | Marshy ditch | 109 | A. Jackson | 31-Oct-22 |
| MH1125-D082 | Built up ditch by marshland | 160 | A. Jackson | 31-Oct-22 |
| MH1125-D083 | Built up ditch by marshland | 324 | A. Jackson | 31-Oct-22 |
| MH1125-D084 | Built up ditch by marshland | 134 | A. Jackson | 31-Oct-22 |
| MH1125-D085 | Built up ditch by marshland | 343 | A. Jackson | 31-Oct-22 |
| MH1125-D086 | Marshland near centre of study area | 182 | A. Jackson | 31-Oct-22 |
| MH1125-D087 | Marshland near centre of study area | 343 | A. Jackson | 31-Oct-22 |
| MH1125-D088 | Marshy ditch | 79 | A. Jackson | 31-Oct-22 |
| MH1125-D089 | Retention pond by subdivision | 50 | A. Jackson | 31-Oct-22 |
| MH1125-D090 | Marshland near centre of study area | 257 | A. Jackson | 31-Oct-22 |
| MH1125-D091 | Marshland near centre of study area | 220 | A. Jackson | 31-Oct-22 |
| MH1125-D092 | Marshland near centre of study area | 176 | A. Jackson | 31-Oct-22 |
| MH1125-D093 | Marshland near centre of study area | 133 | A. Jackson | 31-Oct-22 |
| MH1125-D094 | Gravel road by retention pond | 79 | A. Jackson | 31-Oct-22 |
| MH1125-D095 | Gravel road by retention pond | 312 | A. Jackson | 31-Oct-22 |
| MH1125-D096 | Gravel road by retention pond | 112 | A. Jackson | 31-Oct-22 |
| MH1125-D097 | Buried utilities by gravel road by pond | 107 | A. Jackson | 31-Oct-22 |
| MH1125-D098 | Gravel road, ditch, street, marshland | 161 | A. Jackson | 31-Oct-22 |
| MH1125-D099 | Gravel road by retention pond | 112 | A. Jackson | 31-Oct-22 |
| MH1125-D100 | Retention pond by subdivision | 72 | A. Jackson | 31-Oct-22 |
| MH1125-D101 | Gravel road by retention pond | 99 | A. Jackson | 31-Oct-22 |
| MH1125-D102 | Marshland near centre of study area | 195 | A. Jackson | 31-Oct-22 |
| MH1125-D103 | General view of road | 288 | A. Jackson | 31-Oct-22 |
| MH1125-D104 | Subdivision disturbance in centre of study area | 90 | A. Jackson | 31-Oct-22 |
| MH1125-D105 | Subdivision disturbance in centre of study area | 54 | A. Jackson | 31-Oct-22 |
| MH1125-D106 | Subdivision disturbance in centre of study area | 82 | A. Jackson | 31-Oct-22 |
| MH1125-D107 | Curve in road in centre of study area | 168 | A. Jackson | 31-Oct-22 |
| MH1125-D108 | Slope down to marshland | 289 | A. Jackson | 31-Oct-22 |
| MH1125-D109 | Marshland near centre of study area | 214 | A. Jackson | 31-Oct-22 |
| MH1125-D110 | Slope down to marshland | 303 | A. Jackson | 31-Oct-22 |
| MH1125-D111 | Marshland near centre of study area | 223 | A. Jackson | 31-Oct-22 |
| MH1125-D112 | Curve in road in centre of study area | 17 | A. Jackson | 31-Oct-22 |
| MH1125-D113 | Fill and disturbed soil near subdivision | 134 | A. Jackson | 31-Oct-22 |
| MH1125-D114 | Fill and disturbed soil near subdivision | 72 | A. Jackson | 31-Oct-22 |
| MH1125-D115 | Fill and disturbed soil near subdivision | 174 | A. Jackson | 31-Oct-22 |
| MH1125-D116 | Marshland near centre of study area | 277 | A. Jackson | 31-Oct-22 |
| MH1125-D117 | Stream into marshland | 185 | A. Jackson | 31-Oct-22 |

| Photo Number | Description | Bearing | By | Date |
|---|---|---|---|---|
| MH1125-D118 | Stream into marshland | 81 | A. Jackson | 31-Oct-22 |
| MH1125-D119 | Stream into marshland | 106 | A. Jackson | 31-Oct-22 |
| MH1125-D120 | Stream into marshland | 60 | A. Jackson | 31-Oct-22 |
| MH1125-D121 | Stream into marshland | 191 | A. Jackson | 31-Oct-22 |
| MH1125-D122 | Base of steep slope, construction company entrance | 217 | A. Jackson | 31-Oct-22 |
| MH1125-D123 | Disturbed soils near construction company | 97 | A. Jackson | 31-Oct-22 |
| MH1125-D124 | Curve in road in centre of study area | 7 | A. Jackson | 31-Oct-22 |
| MH1125-D125 | Marshland near centre of study area | 314 | A. Jackson | 31-Oct-22 |
| MH1125-D126 | Stream into marshland | 39 | A. Jackson | 31-Oct-22 |
| MH1125-D127 | Stream into marshland | 307 | A. Jackson | 31-Oct-22 |
| MH1125-D128 | Stream into marshland | 241 | A. Jackson | 31-Oct-22 |
| MH1125-D129 | Marshland near centre of study area | 271 | A. Jackson | 31-Oct-22 |
| MH1125-D130 | Marshland near centre of study area | 351 | A. Jackson | 31-Oct-22 |
| MH1125-D131 | Slope down to marshland | 264 | A. Jackson | 31-Oct-22 |
| MH1125-D132 | Built up ditch by marshland | 292 | A. Jackson | 31-Oct-22 |
| MH1125-D133 | Stream and neighbouring houses | 291 | A. Jackson | 31-Oct-22 |
| MH1125-D134 | Ditch with stream | 332 | A. Jackson | 31-Oct-22 |
| MH1125-D135 | Ditch with stream | 208 | A. Jackson | 31-Oct-22 |
| MH1125-D136 | Built up land, ditch, sidewalk | 339 | A. Jackson | 31-Oct-22 |
| MH1125-D137 | Built up land, ditch, sidewalk, showing utilities | 70 | A. Jackson | 31-Oct-22 |
| MH1125-D138 | Hydro installation | 86 | A. Jackson | 14-Nov-22 |
| MH1125-D139 | Hydro installation | 98 | A. Jackson | 14-Nov-22 |
| MH1125-D140 | Ditch by intersection of Poupart Road and St. Jean St. | 97 | A. Jackson | 14-Nov-22 |
| MH1125-D141 | Ditch by intersection of Poupart Road and St. Jean St. | 219 | A. Jackson | 14-Nov-22 |
| MH1125-D142 | Ditch by intersection of Poupart Road and St. Jean St. | 224 | A. Jackson | 14-Nov-22 |
| MH1125-D143 | Ditch along field, showing utilities | 82 | A. Jackson | 14-Nov-22 |
| MH1125-D144 | Ditch along field, showing utilities | 82 | A. Jackson | 14-Nov-22 |
| MH1125-D145 | Ditch along lawn | 75 | A. Jackson | 14-Nov-22 |
| MH1125-D146 | Ditch along lawn | 77 | A. Jackson | 14-Nov-22 |
| MH1125-D147 | Ditch along lawn | 89 | A. Jackson | 14-Nov-22 |
| MH1125-D148 | Ditch along lawn | 96 | A. Jackson | 14-Nov-22 |
| MH1125-D149 | Ditch with berm, gravel | 99 | A. Jackson | 14-Nov-22 |
| MH1125-D150 | Ditch with berm, gravel | 76 | A. Jackson | 14-Nov-22 |
| MH1125-D151 | Ditch with berm, gravel | 213 | A. Jackson | 14-Nov-22 |
| MH1125-D152 | Ditch with berm, gravel, construction company entrance | 73 | A. Jackson | 14-Nov-22 |
| MH1125-D153 | Ditch with berm, gravel | 83 | A. Jackson | 14-Nov-22 |
| MH1125-D154 | Ditch with gravel and utilities | 30 | A. Jackson | 14-Nov-22 |
| MH1125-D155 | Ditch with gravel and utilities | 216 | A. Jackson | 14-Nov-22 |
| MH1125-D156 | Ditch with gravel and utilities | 249 | A. Jackson | 14-Nov-22 |
| MH1125-D157 | Ditch with gravel and utilities | 251 | A. Jackson | 14-Nov-22 |
| MH1125-D158 | Ditch with gravel and utilities | 252 | A. Jackson | 14-Nov-22 |
| MH1125-D159 | Ditch with gravel and utilities | 263 | A. Jackson | 14-Nov-22 |
| MH1125-D160 | Ditch along field, showing utilities | 271 | A. Jackson | 14-Nov-22 |
| MH1125-D161 | Ditch along field, showing utilities | 268 | A. Jackson | 14-Nov-22 |
| MH1125-D162 | Ditch along field, showing utilities | 266 | A. Jackson | 14-Nov-22 |
| MH1125-D163 | Ditch along field, showing utilities | 262 | A. Jackson | 14-Nov-22 |
| MH1125-D164 | Driveway into current development | 263 | A. Jackson | 14-Nov-22 |
| MH1125-D165 | Ditch with gravel and utilities | 270 | A. Jackson | 14-Nov-22 |
| MH1125-D166 | Ditch with gravel and utilities | 265 | A. Jackson | 14-Nov-22 |
| MH1125-D167 | Ditch with gravel and utilities | 274 | A. Jackson | 14-Nov-22 |
| MH1125-D168 | Ditch with gravel and utilities | 260 | A. Jackson | 14-Nov-22 |
| MH1125-D169 | Ditch with gravel and utilities | 255 | A. Jackson | 14-Nov-22 |
| MH1125-D170 | Ditch with gravel and utilities | 261 | A. Jackson | 14-Nov-22 |
| MH1125-D171 | Ditch with gravel and utilities | 256 | A. Jackson | 14-Nov-22 |
| MH1125-D172 | Ditch with gravel and utilities | 256 | A. Jackson | 14-Nov-22 |
| MH1125-D173 | Ditch with gravel and utilities | 263 | A. Jackson | 14-Nov-22 |

| Photo Number | Description | Bearing | By | Date |
|---|---|---|---|---|
| MH1125-D174 | Ditch with gravel and utilities | 264 | A. Jackson | 14-Nov-22 |
| MH1125-D175 | Ditch with gravel and utilities | 258 | A. Jackson | 14-Nov-22 |
| MH1125-D176 | Ditch with gravel and utilities | 249 | A. Jackson | 14-Nov-22 |
| MH1125-D177 | Ditch with gravel and utilities | 264 | A. Jackson | 14-Nov-22 |
| MH1125-D178 | Ditch with gravel and utilities | 262 | A. Jackson | 14-Nov-22 |
| MH1125-D179 | Ditch with gravel and utilities | 263 | A. Jackson | 14-Nov-22 |
| MH1125-D180 | Ditch with gravel and utilities | 260 | A. Jackson | 14-Nov-22 |
| MH1125-D181 | Ditch with gravel and utilities | 246 | A. Jackson | 14-Nov-22 |
| MH1125-D182 | Ditch with gravel and utilities | 257 | A. Jackson | 14-Nov-22 |
| MH1125-D183 | Ditch with gravel and utilities | 258 | A. Jackson | 14-Nov-22 |
| MH1125-D184 | Ditch with gravel and utilities | 253 | A. Jackson | 14-Nov-22 |
| MH1125-D185 | Driveway into construction company | 262 | A. Jackson | 14-Nov-22 |
| MH1125-D186 | Ditch and gravel | 260 | A. Jackson | 14-Nov-22 |
| MH1125-D187 | Ditch and gravel | 251 | A. Jackson | 14-Nov-22 |
| MH1125-D188 | Ditch and gravel | 250 | A. Jackson | 14-Nov-22 |
| MH1125-D189 | Ditch and gravel | 247 | A. Jackson | 14-Nov-22 |
| MH1125-D190 | Ditch and gravel | 243 | A. Jackson | 14-Nov-22 |
| MH1125-D191 | Ditch and gravel | 246 | A. Jackson | 14-Nov-22 |
| MH1125-D192 | Ditch and gravel | 81 | A. Jackson | 14-Nov-22 |
| MH1125-D193 | Ditch and gravel | 237 | A. Jackson | 14-Nov-22 |
| MH1125-D194 | Ditch and gravel | 249 | A. Jackson | 14-Nov-22 |
| MH1125-D195 | Ditch and gravel | 237 | A. Jackson | 14-Nov-22 |
| MH1125-D196 | Ditch and gravel | 252 | A. Jackson | 14-Nov-22 |
| MH1125-D197 | Ditch and gravel | 246 | A. Jackson | 14-Nov-22 |
| MH1125-D198 | Ditch and gravel | 238 | A. Jackson | 14-Nov-22 |
| MH1125-D199 | Ditch and gravel | 233 | A. Jackson | 14-Nov-22 |
| MH1125-D200 | Ditch and gravel | 233 | A. Jackson | 14-Nov-22 |
| MH1125-D201 | Ditch and gravel | 249 | A. Jackson | 14-Nov-22 |
| MH1125-D202 | Ditch and gravel | 271 | A. Jackson | 14-Nov-22 |
| MH1125-D203 | Ditch and gravel | 50 | A. Jackson | 14-Nov-22 |
| MH1125-D204 | Western extent of study area, curve in the road | 267 | A. Jackson | 14-Nov-22 |
| MH1125-D205 | Western extent of study area, curve in the road | 250 | A. Jackson | 14-Nov-22 |
| MH1125-D206 | Western extent of study area, curve in the road | 301 | A. Jackson | 14-Nov-22 |
| MH1125-D207 | Western extent of study area, curve in the road | 303 | A. Jackson | 14-Nov-22 |
| MH1125-D208 | Western extent of study area, curve in the road | 85 | A. Jackson | 14-Nov-22 |
| MH1125-D209 | Ditch and gravel | 80 | A. Jackson | 14-Nov-22 |
| MH1125-D210 | Ditch and gravel | 82 | A. Jackson | 14-Nov-22 |
| MH1125-D211 | Ditch and gravel | 90 | A. Jackson | 14-Nov-22 |
| MH1125-D212 | Ditch and gravel | 82 | A. Jackson | 14-Nov-22 |
| MH1125-D213 | Ditch with gravel and utilities | 85 | A. Jackson | 14-Nov-22 |
| MH1125-D214 | Ditch with gravel and utilities | 92 | A. Jackson | 14-Nov-22 |
| MH1125-D215 | Ditch with gravel and utilities | 82 | A. Jackson | 14-Nov-22 |
| MH1125-D216 | Ditch with gravel and utilities | 224 | A. Jackson | 14-Nov-22 |
| MH1125-D217 | Ditch with gravel and utilities | 81 | A. Jackson | 14-Nov-22 |
| MH1125-D218 | Ditch with gravel and utilities | 69 | A. Jackson | 14-Nov-22 |
| MH1125-D219 | Ditch with gravel and utilities | 244 | A. Jackson | 14-Nov-22 |
| MH1125-D220 | Ditch with gravel and utilities | 86 | A. Jackson | 14-Nov-22 |
| MH1125-D221 | Ditch with gravel and utilities | 88 | A. Jackson | 14-Nov-22 |
| MH1125-D222 | Ditch and gravel | 80 | A. Jackson | 14-Nov-22 |
| MH1125-D223 | Ditch and gravel | 230 | A. Jackson | 14-Nov-22 |
| MH1125-D224 | Ditch and gravel | 72 | A. Jackson | 14-Nov-22 |
| MH1125-D225 | Ditch and gravel | 75 | A. Jackson | 14-Nov-22 |
| MH1125-D226 | Ditch and gravel | 87 | A. Jackson | 14-Nov-22 |
| MH1125-D227 | Ditch and gravel | 103 | A. Jackson | 14-Nov-22 |
| MH1125-D228 | Ditch and gravel | 101 | A. Jackson | 14-Nov-22 |
| MH1125-D229 | Ditch and gravel | 90 | A. Jackson | 14-Nov-22 |
| MH1125-D230 | Ditch and gravel | 93 | A. Jackson | 14-Nov-22 |
| MH1125-D231 | Ditch and gravel | 83 | A. Jackson | 14-Nov-22 |
| MH1125-D232 | Ditch and gravel | 245 | A. Jackson | 14-Nov-22 |
| MH1125-D233 | gravel, berm, ditch | 83 | A. Jackson | 14-Nov-22 |
| MH1125-D234 | gravel, berm, ditch | 221 | A. Jackson | 14-Nov-22 |

| Photo Number | Description | Bearing | By | Date |
|---|---|---|---|---|
| MH1125-D235 | gravel, berm, ditch | 96 | A. Jackson | 14-Nov-22 |
| MH1125-D236 | gravel, berm, ditch | 93 | A. Jackson | 14-Nov-22 |
| MH1125-D237 | gravel, berm, ditch | 90 | A. Jackson | 14-Nov-22 |
| MH1125-D238 | gravel, berm, ditch | 153 | A. Jackson | 14-Nov-22 |
| MH1125-D239 | gravel, berm, ditch | 93 | A. Jackson | 14-Nov-22 |
| MH1125-D240 | gravel, berm, ditch | 90 | A. Jackson | 14-Nov-22 |
| MH1125-D241 | Curve in the road, centre of study area, marshland | 270 | B. Mortimer | 31-Oct-22 |
| MH1125-D242 | Curve in the road, centre of study area, near subdivision | 170 | B. Mortimer | 31-Oct-22 |
| MH1125-D243 | Curve in the road, centre of study area, near subdivision | 116 | B. Mortimer | 31-Oct-22 |

## Appendix B: Document Catalogue

| Project | Description | Created By |
|---|---|---|
| MH1125 | Stage 2 – Poupart / St.-Jean St, Rockland - Field Notes Stage 2 Archaeological Assessment (One Note file) | A. Jackson |

## Appendix C: Map Catalogue

| Map Number | Description | Created By |
|---|---|---|
| 1 | Location | B. Mortimer |
| 2 | Assessment Area | B. Mortimer |
| 3 | Historic | B. Mortimer |
| 4 | Conditions, Key, Methods 1 | B. Mortimer |
| **5** | Conditions, Key, Methods 2 | B. Mortimer |
| **6** | Conditions, Key, Methods 3 | B. Mortimer |
| **7** | Conditions, Key, Methods 4 | B. Mortimer |
| 8 | Soils and Geology | B. Mortimer |

# APPENDIX “R”

## Communication with Ministry of the Environment, Conservation and Parks

# CORPORATION
# de la Cité de / of the City of
# CLARENCE-ROCKLAND

Clarence-Rockland

February 2nd, 2023

To: Mr. Jon Orpana
Regional Environmental Planner, Environmental Assessment Branch, Kingston Regional Office
**Ministry of Environment, Conservation and Parks**
PO Box 22032, 1259 Gardiners Road
Kingston, Ontario
K7M 8S5
Sent by E-mail to: jon.orpana@ontario.ca

**Re: NOTICE OF STUDY COMMENCEMENT**
**Proposed Poupart Road Widening Project, City of Clarence-Rockland**
**Phase 3 and 4 of Municipal Class Environmental Assessment (MCEA)**

The City of Clarence-Rockland is initiating a Municipal Class Environmental Assessment to address the future requirements of the St. Jean Street-Poupart Road corridor. The corridor presently serves as a primary route that accommodates both local and regional community traffic.

The City of Clarence-Rockland completed a Multi-Modal Transportation Master Plan (MMTMP) that was accepted by Council's Committee of the Whole in March, 2020. The transportation masterplan was designed to, and has followed, the requirements of Phase 1 and 2 of the MCEA process for the recommended initiatives as approved under Ontario's Environmental Assessment Act. Hence, the need and justification for this infrastructure project have been addressed.

The environmental assessment (EA) process requires Phase 3 and 4 to be completed. The assessment will determine the long-term mobility requirements along the St. Jean Street-Poupart Road corridor. Please see the attached illustration. The infrastructure improvement would include:

- The widening of the corridor to accommodate 4 travel lanes;
- The upgrade and/or addition of 4 roundabouts or traffic signal-controlled intersections; and

- The addition of pedestrian and cycling facilities along the corridor.

The EA will examine a range of alternative solutions and identify and address the various technical, environmental, land use and constructability challenges.

This purpose of this letter being forwarded is to inform all interested parties of the study commencement and to identify and confirm the appropriate contacts, stakeholders and parties within the various identified organizations that may wish to be informed of the study as it progresses. This environmental assessment will provide an opportunity for public input and consultation which would include a public open house venue and various meetings.

We encourage your organizations involvement and will invite feedback throughout the EA process. The City of Clarence- Rockland wishes to ensure that all who may be interested be kept informed about the progress of this EA study.

Should you wish to receive updates on this project, please respond by way of e-mail back to:

- Mr. Konstantin Joulanov kjoulanov@castleglenn.ca leaving your contact information. Castleglenn Consultants Inc. has been selected to undertake this environmental Assessment on behalf of the municipality.
- Should you have any additional questions, concerns or comments, feel free to add them to your email response.

Regards

Richard Campeau

Gestionnaire, Projets en capital / Manager, Capital Projects
Infrastructures et Aménagement du territoire / Infrastructure and Planning
Cité de / City of Clarence-Rockland
1560 rue Laurier Street, Rockland, On. K4K 1P7
tél.: (613) 446-6022 #2239
rcampeau@clarence-rockland.com


**St. Jean Street-Poupart Road Corridor**

**CORPORATION**
**de la Cité de / of the City of**
**CLARENCE-ROCKLAND**

December 9th, 2022

Director, Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5
[enviropermissions@ontario.ca], [eanotification.eregion@ontario.ca]

**Re: Request for Approval to Commence Phase 3 and 4 of the MCAE Processes associated with the Proposed Poupart Road Widening Project within the City of Clarence-Rockland.**

On October 7th, 2019, the City of Clarence-Rockland completed its Multi-Modal Transportation Master Plan (MMTMP) which was accepted by Council's Committee of the Whole. In March 2020, the City then communicated a Notice of Completion of the MMTMP to the Eastern Region of the Ministry of the Environment, Conservation and Parks. This MMTMP project specifically indicated from its terms of reference, its notice of commencement, all public notices and in its notice of project completion that:

> "*The Clarence-Rockland MMTMP was developed in accordance with the master planning process following the requirements of Phase 1 and 2 of the municipal Class Environmental Assessment (October 2000, as amended in 2007, 2011 and 2015) which is an approved process under Ontario's Environmental Assessment Act. The MMTMP addresses the need and justification at a broad level and the recommended infrastructure projects require further detailed studies as per the Municipal Class Environmental process.*"

The MMTMP was developed through a stakeholder consultation process that involved consultation with the public, government technical agencies, the development community, utility agencies, other municipalities, and First Nations. The consultation process was developed and carried out in accordance with Section A.2.7 of the Municipal Class EA process. In addition, the MMTMP final document dated June 2019 noted:

*"The Municipal Class EA process addresses Phases 1 and 2 of the EA process including the identification of problems & opportunities, as well as identifying and*

*evaluating alternative solutions to address the problem and establish the preferred solution. Approach 1 for Master Plans involves the preparation of a Master Plan*

*document at the conclusion of the first two phases of the Municipal Class EA. This document is made available for public comment prior to being approved by the municipality. Master Plans are typically done at a broad level of assessment thereby requiring more in order to fulfill the requirements for specific Schedule B and C projects identified within the Master Plan."*

The City of Clarence Rockland now wishes to complete the MCEA process for one of its roadway projects that was specifically addressed within its MMTMP. The project involves the proposed Poupart Road Widening Project between the north-south leg of Poupart Road and the new local east-west roadway and would result in the 2-lane corridor being widened to 4-lanes with a multi-use path on the north side of the roadway. This project has been designated as a Class "C" roadway project under the MCEA process by the municipality.

The MMTMP recognized the proposed Poupart Road Widening Project is needed to accommodate the influx of new residential property that is planned adjacent to the corridor. A number of intersection improvements are coupled with the road widening project including the conversion of the existing intersection of Poupart Road / St. Jean Street to a roundabout. The MMTMP was structured so as to fully address the need and justification phases for this project.

The purpose of this letter is to formally request acknowledgement from the Ministry of the Environment, Conservation and Parks that:

- the City of Clarence-Rockland's MMTMP has satisfied the Phase 1 and Phase 2 components for the Municipal Class EA process for the proposed Poupart Road widening project.

To this end, please find attached a copy of the City's MMTMP document study. *(Please reference Section 1.4 and 1.5 as regards the EA Process and the public engagement process and Section 3.2.3 as regards the proposed Poupart Road widening project.)* As well, please find attached various materials that documents the communication and public outreach associated with the now completed MMTMP.

We anxiously await the Ministry's acknowledgement so that we can commence the necessary Phases 3 and 4 work/studies and assure compliance with Provincial Class EA requirements.

Regards

Richard Campeau

Gestionnaire, Projets en capital / Manager, Capital Projects
Infrastructures et Aménagement du territoire / Infrastructure and Planning
Cité de / City of Clarence-Rockland
1560 rue Laurier Street, Rockland, On. K4K 1P7
tél.: (613) 446-6022 #2239
rcampeau@clarence-rockland.com

Attachments:

1. Multi-Modal Transportation Master Plan (MMTMP) (June, 2019)
2. Documentation of MMTMP Public Notices, Consultation Process and Contacts (Attachment Pages A-1 thru A-

cc. Mr. Arthur Gordon, Principal CastleGlenn Consultants Inc

**Ministry of the Environment, Conservation and Parks**

Environmental Assessment Branch

1st Floor
135 St. Clair Avenue W
Toronto ON  M4V 1P5
**Tel.**: 416 314-8001
**Fax**.: 416 314-8452

**Ministère de l'Environnement, de la Protection de la nature et des Parcs**

Direction des évaluations environnementales

Rez-de-chaussée
135, avenue St. Clair Ouest
Toronto ON  M4V 1P5
**Tél.** : 416 314-8001
**Téléc.** : 416 314-8452

March 8, 2023

**Richard Campeau**
**Manager, Capital Projects**
**City of Ottawa**
**Email:** rcampeau@clarence-rockland.com

BY EMAIL ONLY

Re: Proposed Poupart Road Widening Project, City of Clarence-Rockland
Phase 3 and 4 of Municipal Class Environmental Assessment (MCEA)
**Response to Notice of Project Commencement**

Dear Richard Campeau,

This letter is in response to the Notice of Commencement issued February 2nd, 2023 for the above noted project. The Ministry of the Environment, Conservation and Parks (MECP) acknowledges that the Proponent has indicated that the study will be completing the approved environmental planning process as a Schedule C (Phases 3 & 4) project under the Municipal Class Environmental Assessment (Class EA) following the completion of Phases 1 & 2 under the Multi-Modal Transportation Master Plan as accepted by Ottawa Council's Committee of the Whole in March 2020.

**Study:**

The City of Clarence-Rockland is initiating a Municipal Class Environmental Assessment to address the future requirements of the St. Jean Street-Poupart Road corridor. The corridor presently serves as a primary route that accommodates both local and regional community traffic.

As noted above the environmental assessment (EA) process requires Phase 3 and 4 to be completed.

The assessment will determine the long-term mobility requirements along the St. Jean Street-Poupart Road corridor. Please see the attached illustration. The infrastructure improvement would include:

- The widening of the corridor to accommodate 4 travel lanes;
- The upgrade and/or addition of 4 roundabouts or traffic signal-controlled intersections; and
- The addition of pedestrian and cycling facilities along the corridor.

The **updated (February 2021)** attached "Areas of Interest" document provides guidance regarding the ministry's interests with respect to the Class EA process. Please address all areas of interest in the EA documentation at an appropriate level for the EA study. The Areas of Interest is a current and complete list and may not pertain to every project depending on scale and scope. Proponents and /or consultants are best positioned to assess the items that would be appropriately addressed in the respective ESR or project file. Proponents who address all the applicable areas of interest can minimize potential delays to the project schedule. **Further information is provided at the end of the Areas of Interest document relating to recent changes to the Environmental Assessment Act through Bill 197, Covid-19 Economic Recovery Act 2020.**

Considering that this project is a Schedule C Municipal Class EA for a long stretch of roadway that is in relatively close proximity to sensitive receptors < 500 m, an Air Quality Impact Assessment (AQIA) is required as part of the decision-making process for the preferred alternative to address all potential air quality impacts to sensitive receptors. This AQIA should include at a minimum the predicted traffic flows and the current and future emissions estimates, as well as any required mitigation measures. General guidance regarding the scope of AQIA requirements for Schedule C road improvement Municipal Class EA is attached to this letter for your reference.

The Crown has a legal duty to consult Aboriginal communities when it has knowledge, real or constructive, of the existence or potential existence of an Aboriginal or treaty right and contemplates conduct that may adversely impact that right. Before authorizing this project, the Crown must ensure that its duty to consult has been fulfilled, where such a duty is triggered. Although the duty to consult with Aboriginal peoples is a duty of the Crown, the Crown may delegate procedural aspects of this duty to project proponents while retaining oversight of the consultation process.

The proposed project may have the potential to affect Aboriginal or treaty rights protected under Section 35 of Canada's *Constitution Act* 1982. Where the Crown's duty to consult is triggered in relation to the proposed project**, the MECP is delegating the procedural aspects of rights-based consultation to the proponent through this letter.** The Crown intends to rely on the delegated consultation process in discharging its duty to consult and maintains the right to participate in the consultation process as it sees fit.

Based on information provided to date and the Crown`s preliminary assessment the proponent is required to consult with the following communities who have been identified as potentially affected by the proposed project:

- **Algonquins of Ontario (AOO)**
- **Algonquins of Pikwàkanagàn First Nation**

**If the proponent has undertaken archeological studies and are required to undertake any work related to archeological resources, they should also include:**

- **Huron-Wendat**

Steps that the proponent may need to take in relation to Aboriginal consultation for the proposed project are outlined in the "Code of Practice for Consultation in Ontario's Environmental Assessment Process". Additional information related to Ontario's Environmental Assessment Act is available online at: www.ontario.ca/environmentalassessments.

**Please also refer to the attached document "A Proponent's Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities" for further information, including the MECP's expectations for EA report documentation related to consultation with communities.**

The proponent must contact the Director of Environmental Assessment Branch (EABDirector@ontario.ca) under the following circumstances subsequent to initial discussions with the communities identified by the MECP:

- Aboriginal or treaty rights impacts are identified to you by the communities;
- You have reason to believe that your proposed project may adversely affect an Aboriginal or treaty right;
- Consultation with Indigenous communities or other stakeholders has reached an impasse; or
- A Section 16 Order request is expected on the basis of impacts to Aboriginal or treaty rights

The MECP will then assess the extent of any Crown duty to consult for the circumstances and will consider whether additional steps should be taken, including what role you will be asked to play should additional steps and activities be required.

---

**A draft copy of the report should be sent directly to me prior to the filing of the final report, allowing a minimum of 30 days for the ministry's technical reviewers to provide comments.**

**Please also ensure a copy of the final notice is sent to the ministry's Eastern Region EA notification email account (eanotification.eregion@ontario.ca) after the draft report is reviewed and finalized.**

Should you or any members of your project team have any questions regarding the material above, please contact me at jon.orpana@ontario.ca.

Sincerely,

Jon Orpana
Regional Environmental Planner – Eastern Region

Cc:

Charlie Primeau, (A) Compliance Supervisor, Cornwall Area Office, MECP
Email: Charlie.primeau@ontario.ca

Mr. Konstantin Joulanov, Castleglenn Consultants Inc
Email: kjoulanov@castleglenn.ca

Encl. Areas of Interest;
Proponent's Intro to Delegation of Procedural Aspects of Consultation with Aboriginal Communities;
Species at Risk Proponents Guide to Preliminary Screening (Draft May 2019).

**AREAS OF INTEREST (v. February 2021)**

*It is suggested that you check off each section after you have considered / addressed it.*

☐ **Planning and Policy**

- Projects located in MECP Eastern Region may be subject to the Oak Ridges Moraine Conservation Plan (2017), Greenbelt Plan (2017) or Lake Simcoe Protection Plan (2014). Applicable plans and the applicable policies should be identified in the report, and the proponent should describe how the proposed project adheres to the relevant policies in these plans.

- The **Provincial Policy Statement (2020)** contains policies that protect Ontario's natural heritage and water resources. Applicable policies should be referenced in the report, and the proponent should describe how the proposed project is consistent with these policies.

- In addition to the provincial planning and policy level, the report should also discuss the planning context at the municipal and federal levels, as appropriate.

☐ **Source Water Protection**

The *Clean Water Act*, 2006 (CWA) aims to protect existing and future sources of drinking water. To achieve this, several types of vulnerable areas have been delineated around surface water intakes and wellheads for every municipal residential drinking water system that is located in a source protection area. These vulnerable areas are known as a Wellhead Protection Areas (WHPAs) and surface water Intake Protection Zones (IPZs). Other vulnerable areas that have been delineated under the CWA include Highly Vulnerable Aquifers (HVAs), Significant Groundwater Recharge Areas (SGRAs), Event-based modelling areas (EBAs), and Issues Contributing Areas (ICAs). Source protection plans have been developed that include policies to address existing and future risks to sources of municipal drinking water within these vulnerable areas.

Projects that are subject to the Environmental Assessment Act that fall under a Class EA, or one of the Regulations, have the potential to impact sources of drinking water if they occur in designated vulnerable areas or in the vicinity of other at-risk drinking water systems (i.e. systems that are not municipal residential systems). MEA Class EA projects may include activities that, if located in a vulnerable area, could be a threat to sources of drinking water (i.e. have the potential to adversely affect the quality or quantity of drinking water sources) and the activity could therefore be subject to policies in a source protection plan. Where an activity poses a risk to drinking water, policies in the local source protection plan may impact how or where that activity is undertaken. Policies may prohibit certain activities, or they may require risk management measures for these activities. Municipal Official Plans, planning decisions, Class EA projects (where the project includes an activity that is a threat to drinking water) and prescribed instruments must conform with policies that address significant risks to drinking water and must have regard for policies that address moderate or low risks.

- In October 2015, the MEA Parent Class EA document was amended to include reference to the Clean Water Act (Section A.2.10.6) and indicates that proponents undertaking a Municipal Class EA project must identify early in their process whether a project is or could potentially be occurring with a vulnerable area. **Given this requirement, please include a section in the report on source water protection.**

    - The proponent should identify the source protection area and should clearly document how the proximity of the project to sources of drinking water (municipal or other) and any delineated vulnerable areas was considered and assessed. Specifically, the report should discuss whether or not the project is located in a vulnerable area and provide applicable details about the area.

    - If located in a vulnerable area, proponents should document whether any project activities are prescribed drinking water threats and thus pose a risk to drinking water (this should be consulted on with the appropriate Source Protection Authority). Where an activity poses a risk to drinking water, the proponent must document and discuss in the report how the project adheres to or has regard to applicable policies in the local source protection plan. This section should then be used to inform and be reflected in other sections of the report, such as the identification of net positive/negative effects of alternatives, mitigation measures, evaluation of alternatives etc.

- While most source protection plans focused on including policies for significant drinking water threats in the WHPAs and IPZs it should be noted that even though source protection plan policies may not apply in HVAs, these are areas where aquifers are sensitive and at risk to impacts and within these areas, activities may impact the quality of sources of drinking water for systems other than municipal residential systems.

- In order to determine if this project is occurring within a vulnerable area, proponents can use this mapping tool: http://www.applications.ene.gov.on.ca/swp/en/index.php. Note that various layers (including WHPAs, WHPA-Q1 and WHPA-Q2, IPZs, HVAs, SGRAs, EBAs, ICAs) can be turned on through the “Map Legend” bar on the left. The mapping tool will also provide a link to the appropriate source protection plan in order to identify what policies may be applicable in the vulnerable area.

- For further information on the maps or source protection plan policies which may relate to their project, proponents must contact the appropriate source protection authority. **Please consult with the local source protection authority to discuss potential impacts on drinking water. Please document the results of that consultation within the report and include all communication documents/correspondence.**

More Information
For more information on the *Clean Water Act*, source protection areas and plans, including specific information on the vulnerable areas and drinking water threats, please refer to Conservation Ontario's website where you will also find links to the local source protection plan/assessment report.

A list of the prescribed drinking water threats can be found in section 1.1 of Ontario Regulation 287/07 made under the *Clean Water Act*. In addition to prescribed drinking water threats, some source protection plans may include policies to address additional "local" threat activities, as approved by the MECP.

- **Climate Change**

The document "Considering Climate Change in the Environmental Assessment Process" (Guide) is now a part of the Environmental Assessment program's Guides and Codes of Practice. The Guide sets out the MECP's expectation for considering climate change in the preparation, execution and documentation of environmental assessment studies and processes. The guide provides examples, approaches, resources, and references to assist proponents with consideration of climate change in EA. Proponents should review this Guide in detail.

- **The MECP expects proponents of Class EA projects to:**

  1. Consider during the assessment of alternative solutions and alternative designs, the following:
     a. the project's expected production of greenhouse gas emissions and impacts on carbon sinks (climate change mitigation); and
     b. resilience or vulnerability of the undertaking to changing climatic conditions (climate change adaptation).
  2. Include a discrete section in the report detailing how climate change was considered in the EA.

How climate change is considered can be qualitative or quantitative in nature and should be scaled to the project's level of environmental effect. In all instances, both a project's impacts on climate change (mitigation) and impacts of climate change on a project (adaptation) should be considered.

- The MECP has also prepared another guide to support provincial land use planning direction related to the completion of energy and emission plans. The "Community Emissions Reduction Planning: A Guide for Municipalities" document is designed to educate stakeholders on the municipal opportunities to reduce energy and greenhouse gas emissions, and to provide guidance on methods and techniques to incorporate consideration of energy and greenhouse gas emissions into municipal activities of all types. We encourage you to review the Guide for information.

**Air Quality, Dust and Noise**

- If there are sensitive receptors in the surrounding area of this project (500 m), a quantitative air quality/odour impact assessment will be useful to evaluate alternatives, determine impacts and identify appropriate mitigation measures. The scope of the assessment can be determined based on the potential effects of the proposed alternatives, and typically includes source and receptor characterization and a quantification of local air quality impacts on the sensitive receptors and the environment in the study area. The assessment will compare to all applicable standards or guidelines for all contaminants of concern. **Please contact this office for further consultation on the level of Air Quality Impact Assessment required for this project if not already advised.**

- If a quantitative Air Quality Impact Assessment is not required for the project, the MECP expects that the report contain a qualitative assessment which includes:

  - A discussion of local air quality including existing activities/sources that significantly impact local air quality and how the project may impact existing conditions;
  - A discussion of the nearby sensitive receptors and the project's potential air quality impacts on present and future sensitive receptors;
  - A discussion of local air quality impacts that could arise from this project during both construction and operation; and
  - A discussion of potential mitigation measures.

- As a common practice, "air quality" should be used an evaluation criterion for all road projects.

- Dust and noise control measures should be addressed and included in the construction plans to ensure that nearby residential and other sensitive land uses within the study area are not adversely affected during construction activities.

- The MECP recommends that non-chloride dust-suppressants be applied. For a comprehensive list of fugitive dust prevention and control measures that could be applied, refer to *Cheminfo Services Inc. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities* report prepared for Environment Canada. March 2005.

- The report should consider the potential impacts of increased noise levels during the operation of the completed project. The proponent should explore all potential measures to mitigate significant noise impacts during the assessment of alternatives.

- **Ecosystem Protection and Restoration**

- Any impacts to ecosystem form and function must be avoided where possible. The report should describe any proposed mitigation measures and how project planning will protect and enhance the local ecosystem.

- Natural heritage and hydrologic features should be identified and described in detail to assess potential impacts and to develop appropriate mitigation measures. The following sensitive environmental features may be located within or adjacent to the study area:
    - Key Natural Heritage Features: Habitat of endangered species and threatened species, fish habitat, wetlands, areas of natural and scientific interest (ANSIs), significant valleylands, significant woodlands; significant wildlife habitat (including habitat of special concern species); sand barrens, savannahs, and tallgrass prairies; and alvars.
    - Key Hydrologic Features: Permanent streams, intermittent streams, inland lakes and their littoral zones, seepage areas and springs, and wetlands.
    - Other natural heritage features and areas such as: vegetation communities, rare species of flora or fauna, Environmentally Sensitive Areas, Environmentally Sensitive Policy Areas, federal and provincial parks and conservation reserves, Greenland systems etc.

We recommend consulting with the Ministry of Northern Development Natural Resources and Forestry (NDMNRF), Fisheries and Oceans Canada (DFO) and your local conservation authority to determine if special measures or additional studies will be necessary to preserve and protect these sensitive features. In addition, you may consider the provisions of the Rouge Park Management Plan if applicable.

- **Species at Risk**

- The Ministry of the Environment, Conservation and Parks has now assumed responsibility of Ontario's Species at Risk program. Information, standards, guidelines, reference materials and technical resources to assist you are found at https://www.ontario.ca/page/species-risk.

- The Client's Guide to Preliminary Screening for Species at Risk (Draft May 2019) has been attached to the covering email for your reference and use. Please review this document for next steps.

- For any questions related to SAR consideration and subsequent permit requirements, you should contact SAROntario@ontario.ca to ensure that SAR are appropriately considered during the study phase of this project prior to project implementation.

- **Surface Water**

- The report must include enough information to demonstrate that there will be no negative impacts on the natural features or ecological functions of any watercourses within the study area. Measures should be included in the planning and design process to ensure that any impacts to watercourses from construction or operational activities (e.g. spills, erosion, pollution) are mitigated as part of the proposed undertaking.

- Additional stormwater runoff from new pavement can impact receiving watercourses and flood conditions. Quality and quantity control measures to treat stormwater runoff should be considered for all new impervious areas and, where possible, existing surfaces. The ministry's Stormwater Management Planning and Design Manual (2003) should be referenced in the report and utilized when designing stormwater control methods. **A Stormwater Management Plan should be prepared as part of the Class EA process** that includes:

    - Strategies to address potential water quantity and erosion impacts related to stormwater draining into streams or other sensitive environmental features, and to ensure that adequate (enhanced) water quality is maintained
    - Watershed information, drainage conditions, and other relevant background information
    - Future drainage conditions, stormwater management options, information on erosion and sediment control during construction, and other details of the proposed works
    - Information on maintenance and monitoring commitments.

- Ontario Regulation 60/08 under the *Ontario Water Resources Act* (OWRA) applies to the Lake Simcoe Basin, which encompasses Lake Simcoe and the lands from which surface water drains into Lake Simcoe. If the proposed sewage treatment plant is listed in Table 1 of the regulation, the report should describe how the proposed project and its mitigation measures are consistent with the requirements of this regulation and the OWRA.

- Any potential approval requirements for surface water taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, except for certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information. Additionally, an

Environmental Compliance Approval under the OWRA is required for municipal stormwater management works.

- **Groundwater**

- The status of, and potential impacts to any well water supplies should be addressed. If the project involves groundwater takings or changes to drainage patterns, the quantity and quality of groundwater may be affected due to drawdown effects or the redirection of existing contamination flows. In addition, project activities may infringe on existing wells such that they must be reconstructed or sealed and abandoned. Appropriate information to define existing groundwater conditions should be included in the report.

- If the potential construction or decommissioning of water wells is identified as an issue, the report should refer to Ontario Regulation 903, Wells, under the OWRA.

- Potential impacts to groundwater-dependent natural features should be addressed. Any changes to groundwater flow or quality from groundwater taking may interfere with the ecological processes of streams, wetlands or other surficial features. In addition, discharging contaminated or high volumes of groundwater to these features may have direct impacts on their function. Any potential effects should be identified, and appropriate mitigation measures should be recommended. The level of detail required will be dependent on the significance of the potential impacts.

- Any potential approval requirements for groundwater taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, with the exception of certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information.

- Consultation with the railroad authorities is necessary wherever there is a plan to use construction dewatering in the vicinity of railroad lines or where the zone of influence of the construction dewatering potentially intercepts railroad lines.

- **Excess Materials Management**

- In December 2019, MECP released a new regulation under the Environmental Protection Act, titled "On-Site and Excess Soil Management" (O. Reg. 406/19) to support improved management of excess construction soil. This regulation is a key step to support proper management of excess soils, ensuring valuable resources don't go to waste and to provide clear rules on managing and reusing excess soil. New risk-based standards referenced by this regulation help to facilitate local beneficial reuse which in turn will reduce greenhouse gas emissions from soil transportation, while ensuring strong protection of human health and the environment. The new regulation is being phased in over time, with the first phase in effect on January 1, 2021. For more information, please visit https://www.ontario.ca/page/handling-excess-soil.

- The report should reference that activities involving the management of excess soil should be completed in accordance with O. Reg. 406/19 and the MECP's current guidance document titled "Management of Excess Soil – A Guide for Best Management Practices" (2014).

- All waste generated during construction must be disposed of in accordance with ministry requirements

**Contaminated Sites**

- Any current or historical waste disposal sites should be identified in the report. The status of these sites should be determined to confirm whether approval pursuant to Section 46 of the EPA may be required for land uses on former disposal sites. We recommend referring to the MECP's D-4 guideline for land use considerations near landfills and dumps.
    - Resources available may include regional/local municipal official plans and data; provincial data on large landfill sites and small landfill sites; Environmental Compliance Approval information for waste disposal sites on Access Environment.

- Other known contaminated sites (local, provincial, federal) in the study area should also be identified in the report (Note – information on federal contaminated sites is found on the Government of Canada's website).

- The location of any underground storage tanks should be investigated in the report. Measures should be identified to ensure the integrity of these tanks and to ensure an appropriate response in the event of a spill. The ministry's Spills Action Centre must be contacted in such an event.

- Since the removal or movement of soils may be required, appropriate tests to determine contaminant levels from previous land uses or dumping should be undertaken. If the soils are contaminated, you must determine how and where they are to be disposed of, consistent with *Part XV.1 of the Environmental Protection Act* (EPA) and Ontario Regulation 153/04, Records of Site Condition, which details the new requirements related to site assessment and clean up. Please contact the appropriate MECP District Office for further consultation if contaminated sites are present.

- **Servicing, Utilities and Facilities**

- The report should identify any above or underground utilities in the study area such as transmission lines, telephone/internet, oil/gas etc. The owners should be consulted to discuss impacts to this infrastructure, including potential spills.

- The report should identify any servicing infrastructure in the study area such as wastewater, water, stormwater that may potentially be impacted by the project.

- Any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste must have an Environmental Compliance Approval (ECA) before it can operate lawfully. Please consult with MECP's Environmental Permissions Branch to determine whether a new or amended ECA will be required for any proposed infrastructure.

- We recommend referring to the ministry's environmental land use planning guides to ensure that any potential land use conflicts are considered when planning for any infrastructure or facilities related to wastewater, pipelines, landfills or industrial uses.

- **Mitigation and Monitoring**

- Contractors must be made aware of all environmental considerations so that all environmental standards and commitments for both construction and operation are met. Mitigation measures should be clearly referenced in the report and regularly monitored during the construction stage of the project. In addition, we encourage proponents to conduct post-construction monitoring to ensure all mitigation measures have been effective and are functioning properly.

- Design and construction reports and plans should be based on a best management approach that centres on the prevention of impacts, protection of the existing environment, and opportunities for rehabilitation and enhancement of any impacted areas.

- The proponent's construction and post-construction monitoring plans must be documented in the report, as outlined in Section A.2.5 and A.4.1 of the MEA Class EA parent document.

☐ **Consultation**

- The report must demonstrate how the consultation provisions of the Class EA have been fulfilled, including documentation of all stakeholder consultation efforts undertaken during the planning process. This includes a discussion in the report that identifies concerns that were raised and **describes how they have been addressed by the proponent** throughout the planning process. The report should also include copies of comments submitted on the project by interested stakeholders, and the proponent's responses to these comments (as directed by the Class EA to include full documentation).

- Please include the full stakeholder distribution/consultation list in the documentation.

☐ **Class EA Process**

- If this project is a Master Plan: there are several different approaches that can be used to conduct a Master Plan, examples of which are outlined in Appendix 4 of the Class EA. **The Master Plan should clearly indicate the selected approach for conducting the plan**, by identifying whether the levels of assessment, consultation and documentation are sufficient to fulfill the requirements for Schedule B or C projects. Please note that any Schedule B or C projects identified in the plan would be subject to Section 16 Order Requests under the Environmental Assessment Act, although the plan itself would not be. **Please include a description of the approach being undertaken (use Appendix 4 as a reference).**

- If this project is a Master Plan: Any identified projects should also include information on the MCEA schedule associated with the project.

- The report should provide clear and complete documentation of the planning process in order to allow for transparency in decision-making.

- The Class EA requires the consideration of the effects of each alternative on all aspects of the environment (including planning, natural, social, cultural, economic, technical). The report should include a level of detail (e.g. hydrogeological investigations, terrestrial and aquatic assessments, cultural heritage assessments) such that all potential impacts can be identified, and appropriate mitigation measures can be developed. Any supporting studies conducted during the Class EA process should be referenced and included as part of the report.

- Please include in the report a list of all subsequent permits or approvals that may be required for the implementation of the preferred alternative, including but not limited to, MECP's PTTW, EASR Registrations and ECAs, conservation authority permits, species at risk permits, MTO permits and approvals under the *Impact Assessment Act*, 2019.

- Ministry guidelines and other information related to the issues above are available at http://www.ontario.ca/environment-and-energy/environment-and-energy. We encourage you to review all the available guides and to reference any relevant information in the report.

**Amendments to the EAA through the Covid-19 Economic Recovery Act, 2020**
Once the EA Report is finalized, the proponent must issue a Notice of Completion providing a minimum 30-day period during which documentation may be reviewed and comment and input can be submitted to the proponent. The Notice of Completion must be sent to the appropriate MECP Regional Office email address (for projects in MECP Eastern Region, the email is eanotification.eregion@ontario.ca).

The public has the ability to request a higher level of assessment on a project if they are concerned about potential adverse impacts to constitutionally protected Aboriginal and treaty rights. In addition, the Minister may issue an order on his or her own initiative within a specified time period. The Director (of the Environmental Assessment Branch) will issue a Notice of Proposed Order to the proponent if the Minister is considering an order for the project within 30 days after the conclusion of the comment period on the Notice of Completion. At this time, the Director may request additional information from the proponent. Once the requested information has been received, the Minister will have 30 days within which to make a decision or impose conditions on your project.

Therefore, the proponent cannot proceed with the project until at least 30 days after the end of the comment period provided for in the Notice of Completion. Further, the proponent may not proceed after this time if:

- a Section 16 Order request has been submitted to the ministry regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, or
- the Director has issued a Notice of Proposed order regarding the project.

Please ensure that the Notice of Completion advises that outstanding concerns are to be directed to the proponent for a response, and that in the event there are outstanding concerns regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, Section 16 Order requests on those matters should be addressed in writing to:

Minister
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca