

Regional Municipality of Niagara

Schedule 'C' Municipal Class Environmental Assessment
for Merritt Road (Regional Road 37) and Rice Road
(Regional Road 54) in the Town of Pelham, the City of
Thorold and the City of Welland

Environmental Study Report

March 2024





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Niagara Region**Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)**

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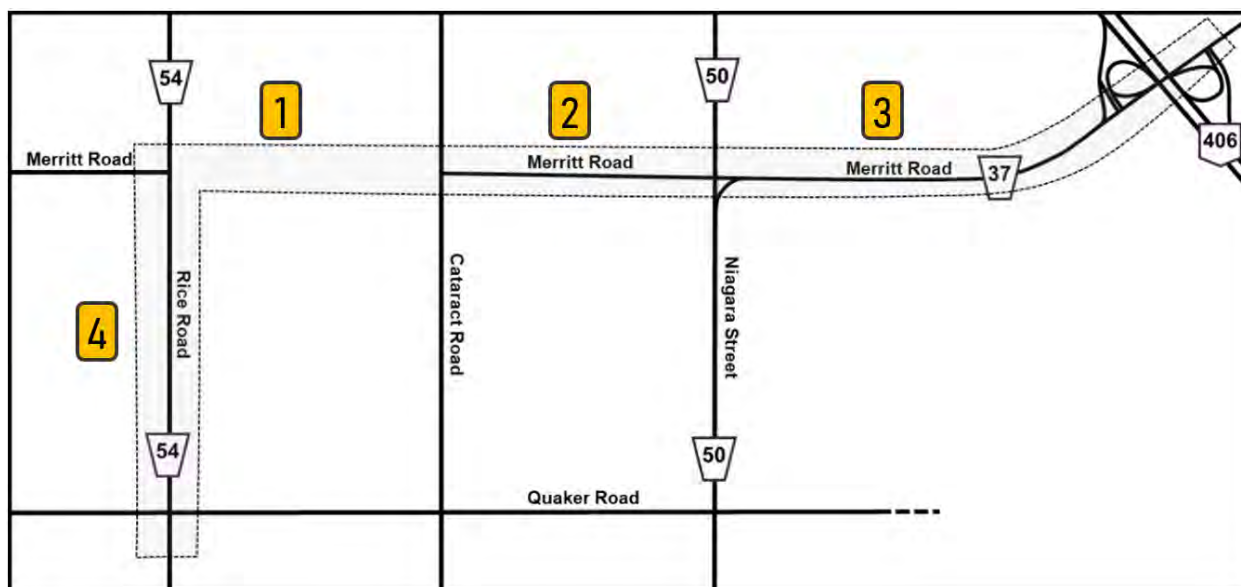
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Executive Summary

The Regional Municipality of Niagara (herein referred to as 'Niagara Region') has completed a Schedule 'C' Municipal Class Environmental Assessment (MCEA) study for improvements to Merritt Road (Regional Road 37) and Rice Road (Regional Road 54) to accommodate future traffic growth in the area as a result of future developments in the Town of Pelham, the City of Thorold and the City of Welland. For the purpose of this study, the subject roadways were divided into the following four road segments:

- Segment 1: Merritt Road from Rice Road to Cataract Road
- Segment 2: Merritt Road from Cataract Road to Merrittville Highway / Niagara Street (Regional Road 50)
- Segment 3: Merritt Road from Merrittville Highway / Niagara Street to Highway 406
- Segment 4: Rice Road from 200 metres north of Merritt Road to Quaker Road

Figure E1: Study Area



This study was built on the recommendations of the Niagara Region's approved Transportation Master Plan, and it was aimed at identifying improvements to the two roadways to meet the future needs of the surrounding community for all road users. The study also aimed at addressing active transportation needs by providing dedicated pedestrian and cyclist infrastructure that is safe, attractive, conforms to a complete streets approach, and is compatible with the changing land use in the three local municipalities.

This Municipal Class Environmental Assessment Study was conducted in accordance with the requirements for a Schedule 'C' Project (Phases 1 to 4) as outlined in the Municipal Engineers Association's Class Environmental Assessment document. This Environmental Study Report was developed to document Phases 1 – 4 of the Schedule 'C' Municipal Class Environmental Assessment process for this project.

Problem Statement

Phase 1 of the Class EA process requires that a problem / opportunity statement be developed to outline the problem being addressed by the Class EA Study. To accommodate traffic growth, the Niagara Region's Transportation Master Plan and City of Thorold's Transportation Master Plan identified the need for additional east/west transportation capacity. This need for additional transportation capacity was further reviewed and confirmed via a detailed transportation assessment completed as part of this Class Environmental Assessment Study.

The following Problem and Opportunity Statement was identified for this project:

As a result of the proposed development, significant congestion on the road network is expected, particularly on Merritt Road between the Merrittville Highway / Niagara Street and the Highway 406 interchange by 2041. Without the extension of Merritt Road, Niagara Street between Merritt Road and Quaker Road, and Quaker Road between Rice Road and Niagara Street will also experience a significant increase in traffic volumes given the need for motorists to take an indirect route between the Town of Pelham and the Highway 406 intersection, resulting in congestion and the need for significant intersection improvements. The traffic assessment confirmed the findings of Niagara Region's Transportation Master Plan regarding the need for improvements.

Existing Roadways

Segment 1 – Merritt Road, from Rice Road to Cataract Road, spans an approximate distance of 800 metres in an east-west direction with an approximate existing right-of-way width of 20 metres. The 200 metres long section of this segment to the east of Rice Road is located within the jurisdiction of the Town of Pelham, while the other 600 metres long segment is located within the jurisdiction of the City of Thorold. This corridor presently functions as an unopened road allowance (meaning that there is currently no existing roadway). Segment 1 is currently under the ownership of the Town of Pelham and the City of Thorold. Following the completion of the Class EA Study, the ownership will need to be transferred to the Niagara Region. There are low-voltage hydro-electric power timber poles running the length of the corridor along the north side.

Segment 2 – Merritt Road, from Cataract Road to Merrittville Highway / Niagara Street, spans an approximate distance of 800 metres in an east-west direction with an approximate existing right-of-way width of 20 metres. This segment is located entirely within the jurisdiction of the City of Thorold. This corridor presently functions as a two-lane, rural, local, undivided roadway with a posted speed limit of 50 kilometres per hour and a five-tonne load restriction. This road segment carries two vehicular traffic lanes (one lane in each direction). There are no sidewalks or bike lanes for pedestrians and cyclists along this segment.

Segment 3 – Merritt Road, from Merrittville Highway / Niagara Street and Highway 406, spans an approximate distance of 1.60 kilometres in an east-west direction with an approximate existing right-of-way width of 30 metres. The 400 metres long section of this road segment to the east of Merrittville Highway / Niagara Street is located within the jurisdiction of the City of Welland, whilst the other 1.20 kilometres long segment to the east is located within the jurisdiction of the City of Thorold. This corridor presently functions as a two-lane, rural, arterial, undivided roadway with a posted speed limit of 60 kilometres per hour. There are no sidewalks or bike lanes for pedestrians and cyclists along this segment.

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This road segment is intersected by Eastman Gateway approximately 580 metres to the east of Merrittville Highway / Niagara Street. Eastman Gateway is a local road which provides access to Merritt Meadows subdivision, located on the south side of Segment 3. This road segment is intersected by Grisdale Road approximately 1 kilometre to the east of Merrittville Highway/ Niagara Street (Regional Road 50). Grisdale Road is a local road, which provides access to Towpath Road, which turns into Quaker Road to the west. Grisdale Road is under the ownership of Niagara Region, however, in future there is potential for ownership transfer of this roadway to the City of Thorold. East of Grisdale Road, this segment continues across Highway 406 overpass and end at Kottmeier Road.

Segment 4 – Rice Road, from 200 metres north of Merritt Road to Quaker Road, spans an approximate distance of 1.20 kilometres with an approximate existing right-of way width of 20 metres. The 735 metres long northerly section of this road segment is located within the jurisdiction of the Town of Pelham, whilst the other 465 meters long segment to the south is located within the jurisdiction of the City of Welland. There are no sidewalks or bike lanes for pedestrians and cyclists along this segment.

This corridor presently functions as a two-lane, rural, arterial, undivided roadway with a posted speed limit of 60 kilometres per hour within the limits of Town of Pelham, and 50 kilometres per hour within the limits of City of Welland. Approximately 200 metres to the north of Merritt Road, the Rice Road transitions from the aforementioned cross-section to a recently reconstructed two-lane, rural, arterial, undivided roadway with paved shoulders during a previous capital works project undertaken by Niagara Region.

Technical Studies Completed

The following technical study reports were prepared as part of this Class EA Study:

- Transportation Assessment Report
- Cultural Heritage Assessment Report
- Stage 1 and 2 Archaeological Assessment Reports
- Environmental Impact Study
- Stormwater Management and Hydraulic Assessment
- Preliminary Hydrogeologic Assessment
- Merritt Road at Grisdale Road & Highway 406 Interchange Design Options Memo
- Health Impact Assessment

These discipline specific technical reports were shared with relevant government agencies for their review, comments, and eventual acceptance through resolution of comments to their satisfaction. Information from the technical reports was incorporated into the corresponding sections of this report.

Consultation / Engagement

Comprehensive consultation was a key component of the Class EA Study. The consultation process carried out during the Class EA study was designed to exceed the formal notice and consultation requirements of the Class EA process. Consultation was carried out with public, impacted private property owners, Indigenous Communities, government agencies, and key

stakeholder groups. The following activities were completed as part of the consultation program:

- A Project Webpage was developed on Niagara Region's website to host project documentation throughout the Class EA: <https://niagararegion.ca/projects/regional-road-37/>
- A Study Contact List was developed at the commencement of this Class EA study. This list included contacts from the local Indigenous Communities, federal and provincial government agencies, Niagara Peninsula Conservation Authority, various departments from the Niagara Region, the Town of Pelham, the City of Thorold, and the City of Welland, utility companies, special interest groups, members of the public who expressed interest in the study, the area residents (over 500 addresses), and impacted property owners. The Study Contact List was updated throughout the study.
- Study notices were distributed via several methods, including posting on project webpage, and Niagara Region's Twitter and Facebook pages; publication in the local newspapers; email circulation to the contacts on the Study Contact List; and mailout to over 500 addresses within the Study Area.
- A Technical Advisory Committee was developed to provide technical input into the Class EA Study. Meetings were held with the Technical Advisory Committee to solicit technical input at key project milestones in the Class EA Study. Meetings were held with Ministry of the Environment, Conservation and Parks; Ministry of Transportation and Niagara Peninsula Conservation Authority and the three local area municipalities.
- Study Notices and projects reports were shared with the Indigenous Communities for review. In addition, invitations were sent to the Indigenous Communities to participate in and monitor environmental and archaeological field assessments. The following Indigenous Communities were contacted during this Class EA Study: Mississaugas of the Credit First Nation, Six Nations of the Grand River, and Haudenosaunee Development Institute.
- Three online Public Information Centres were held to share the project updates and to solicit public input.
- Meetings were held with the impacted property owners to share information on property impacts and the property acquisition process that will be followed during detailed design phase.

Alternative Solutions

Phase 2 of the Class EA process requires that various reasonable solutions shall be identified to address the problem and opportunity. The following alternative solutions were identified and evaluated:

Alternative Solution 1 - Do Nothing: As the name implies, this alternative would not propose any improvements to Merritt Road and Rice Road.

Alternative Solution 2 - Manage Transportation Demand: Transportation Demand Management (TDM) alternative would manage the demands placed on transportation infrastructure by implementing a set of policies, programs, services, and/or initiatives that aim to increase efficiency in the transportation network by changing how, how much, when, where, and why people travel.

Alternative Solution 3 - Limit Growth and Development: This alternative would involve restricting development of adjacent lands.

Alternative Solution 4 - Improve Other North-South and East-West Roads: This alternative considers road infrastructure improvements to the other north-south and east-west roads.

Alternative Solution 5 - Improve Merritt Road and Rice Road: This alternative would involve the following:

- Extension of Merritt Road between Rice Road and Cataract Road;
- Improvements to Merritt Road between Cataract Road and Highway 406;
- Improvements to Rice Road between 200 meter north of Merritt Road and Quaker Road;
- Localized intersection improvements, such as addition of dedicated turn lanes, traffic signals/roundabouts and/or improvements to the timing of the existing traffic signal at Merritt Road and Merrittville Highway/Niagara Street intersection to improve traffic operations; and
- Providing active transportation facilities on both Merritt Road and Rice Road.

The alternative solutions were evaluated against criteria related to natural, socio-economic, and cultural environments and technical and cost considerations. **Based on the evaluation, Alternative Solution 5 - Improve Merritt Road and Rice Road was identified as the preferred solution.**

Identification and Evaluation of Alternative Design Concepts

Phase 3 of the Municipal Class EA process involves development and evaluation of alternative design concepts for the Preferred Solution. The alternative design concepts were developed using direction from the Niagara Region's Complete Street Design Manual. Alternative design concepts were identified for the following:

- Road Alignment Alternatives
- Road Cross-Section Alternatives
- Road Intersection Alternatives

These alternatives were evaluated based on comprehensive evaluation criteria related to transportation, socio-economic, natural, and cultural environments and technical and cost considerations. Based on this evaluation process, a preliminary preferred design was identified and presented to the public at the Public Information Centre #3. **It is important to note that following PIC #3, the preliminary design was reviewed and refined. The following provides a summary of the preliminary design alternatives and the preliminary preferred design presented at PIC #3, followed by the final preferred design selected following the PIC #3.**

Preliminary Design Alternatives and Preliminary Preferred Design Presented at PIC #3:

Road Alignment Alternatives

Segment 1: Merritt Road (Rice Road to Cataract Road)

- Alternative A: Centre Alignment
- Alternative B: Hybrid Alignment

Alternative A - Centre Alignment was identified as the preferred design for Segment 1. This alternative would involve a 26 meter wide road right of way alignment along the centreline of the 20 meter wide unopened road allowance.

Segment 2: Merritt Road (Cataract Road to Merrittville Highway / Niagara Street)

- Alternative A: Centre Alignment
- Alternative B: South Alignment
- Alternative C: Hybrid Alignment

Alternative B - South Alignment was identified as the preferred alignment for Segment 2. This alternative would involve widening the existing Merritt Road to a 26 meter road right of way and shifting the centerline to the south.

Segment 3: Merritt Road (Merrittville Highway / Niagara Street to Highway 406)

- Alternative A: Centre Alignment
- Alternative B: North Alignment
- Alternative C: North Alignment with Adjusted Curve

Alternative B - North Alignment was identified as the preferred alignment for Segment 3. This alternative would involve widening the existing Merritt Road to 36 meter wide road right of way between Merrittville Highway and Grisdale Road.

Segment 4: Rice Road (200 meter north of Merritt Road to Quaker Road)

- Alternative A: Centre Alignment
- Alternative B: Hybrid Alignment

Alternative B - Hybrid Alignment was identified as preferred alignment for Segment 4. This alternative would involve widening the existing road to 36 meter road right of way with the north section shifted slightly to the east. The widening would occur on Rice Road from Quaker Road to 200 meter north of Merritt Road.

Road Cross-Sections Alternatives

Segment 1: Merritt Road (Rice Road to Cataract Road)

- Alternative A: Rural Cross-section: Two travel lanes with shoulders, ditches, sidewalk on north side and cycle track on south side
- Alternative B: Hybrid (Rural-Urban) Cross-section: Two travel lanes with curbs and ditches, sidewalk and cycle track on north side

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Alternative B - Hybrid (Rural-Urban) Cross-section was identified as the preliminary preferred cross-section for Segment 1. Key design features of the preferred cross-section for Segment 1 include:

- Two 3.3 meter drive lanes with curbs (no shoulders)
- 1.0 meter wide flat bottom ditch provided on both sides of the road
- 1.8 meter sidewalk and 3.6 meter two-way cycle track, with 0.6 meter tactile strip inlay on the north side

Segment 2: Merritt Road (Cataract Road to Merrittville Highway / Niagara Street)

- Alternative A: Rural Cross-section: Two travel lanes with shoulder, ditches, sidewalk on north side and cycle track on south side
- Alternative B: Hybrid (Rural-Urban) Cross-section: Two travel lanes with curbs and ditches, sidewalk and cycle track on north side

Alternative B - Hybrid (Rural-Urban) Cross-section was identified as the preliminary preferred cross-section for Segment 2. Key design features of the preferred cross-section for Segment 2 include:

- Two 3.3 meter drive lanes with 0.5 meter curbs
- 1.0 meter wide flat bottom ditch provided on both sides of the road
- 1.8 meter sidewalk and 3.6 meter two-way cycle track, with 0.6 meter tactile strip inlay on the north side.

Segment 3: Merritt Road (Merrittville Highway / Niagara Street to Highway 406)

- Alternative A: Urban Cross-section: Four travel lanes, sidewalk and cycle track on south side
- Alternative B: Urban Cross-section: Four travel lanes with curbs and sidewalk and cycle track on both sides

Alternative A - Urban Cross-section was identified as preliminary preferred cross-section for Road Segment 3. Key design features of the preliminary preferred cross-section for Segment 3 include:

- Four 3.3 meter drive lanes separated by a 2.5 meter median
- 1.8 meter sidewalk and 3.6 meter two-way cycle track, with 0.6 meter tactile strip inlay on the north side.

The width of the proposed road widening has been reduced from 36 meter to 31.2 meter in Segment 3. This reduces impacts on private properties, natural environment, and cultural environment.

Segment 4: Rice Road (200 meter north of Merritt Road to Quaker Road)

- Alternative A: Rural Cross-section: Four drive lanes with ditches, sidewalk on both sides and cycle track on west side
- Alternative B: Hybrid (Rural-Urban) Cross-section: Four drive lanes with curbs and ditches, sidewalk on both sides and cycle track on west side

Alternative B - Hybrid (Rural-Urban) Cross section was identified as preliminary preferred cross-section for Segment 4. Key design features of the preliminary preferred cross-section for Segment 4 include:

- Four 3.3 meter drive lanes with curbs
- Oncoming traffic lanes separated by a 2.5 meter median
- Two 1.8 meter sidewalks (one on each side)
- 3.6 meter bi-directional cycle track on the west side
- 1.0 meter wide flat bottom ditch provided on both sides of the road

Road Intersection Alternatives

In terms of intersection improvements, the following intersections were evaluated for a traffic signal and roundabout:

- Merritt Road and Rice Road
- Merritt Road and Cataract Road
- Merritt Road and Merrittville Highway / Niagara Street
- Rice Road and Quaker Road

Revisions to Preferred Design following PIC #3

Following PIC #3, the preliminary preferred design was reviewed and technical studies (e.g., Stormwater Management Assessment) were advanced. A need was identified to revise the design to avoid the need to further widen the road right-of-way and minimize impacts to the natural environment and private properties. Revisions were made to cross-sections for Segments 1, 2 and 4, whereby two-way cycle track and sidewalks were replaced with a multi-use path.

Preferred Design

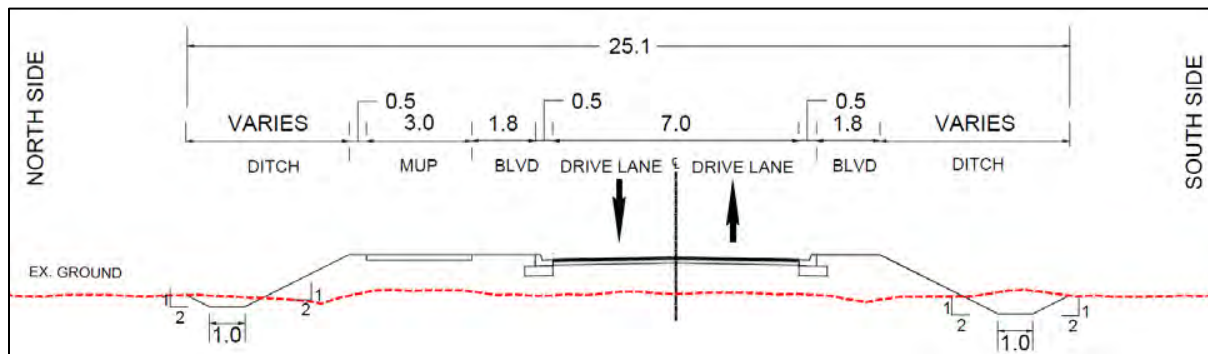
The preferred design for all subject road segments is discussed below:

Segment 1: Merritt Road (Rice Road to Cataract Road)

The proposed cross-section for Segment 1 is a Hybrid (Rural-Urban) Cross-section with following design features (based on Rural Scenic typology):

- Two 3.5 meter drive lanes with curbs
- A 3.0 meter multi-use path on the north side
- Ditches on both sides

Figure E2: Proposed Cross-Section for Segment 1 – Merritt Road, from Rice Road to Cataract Road

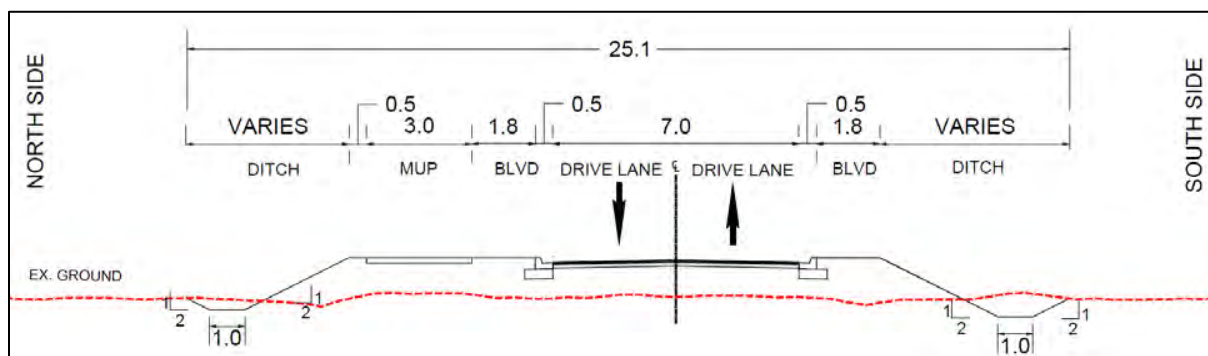


Segment 2: Merritt Road (Cataract Road to Merrittville Highway / Niagara Street)

The proposed cross-section for Segment 2 is a Hybrid (Rural-Urban) Cross-section with following design features (based on Urban General - typology):

- Two 3.5 meter drive lanes with curbs
- A 3.0 meter multi-use path on the north side
- Ditches on both sides

Figure E3: Proposed Cross-Section for Segment 2 - Merritt Road from Cataract Road to Merrittville Highway/Niagara Street



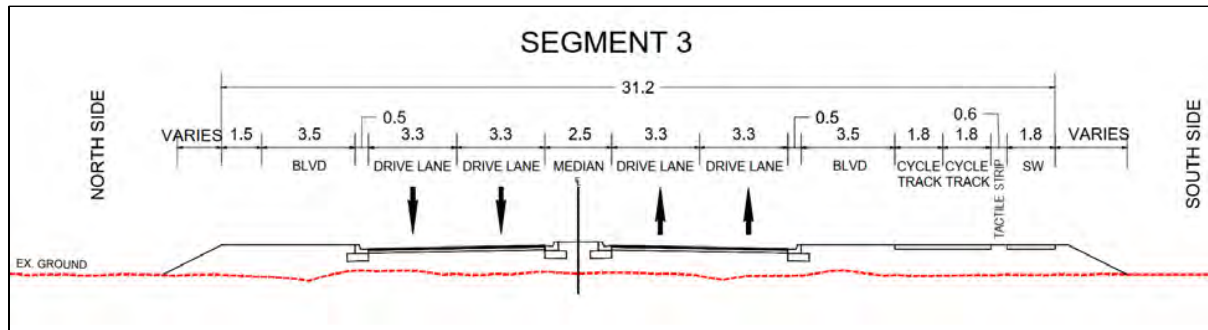
Segment 3: Merritt Road (Merrittville Highway / Niagara Street to Highway 406)

Merritt Road from Merrittville Highway/Niagara Street to Grisdale Road

The proposed cross-section for Segment 3 is an Urban Cross-section with following design features (based on Urban General typology):

- Four 3.3 meter drive lanes separated by a 2.5 meter median
- 1.8 meter sidewalk on the south side
- A 3.6 meter separated two-way cycle track on the south side

Figure E4: Proposed Cross-Section for Segment 3 – Merritt Road from Merrittville Highway/Niagara Street to Grisdale Road



Merritt Road from Grisdale Road to Highway 406 Overpass/Kottmeier Road

The design for Merritt Road east of Grisdale Road over Highway 406 overpass and up to Kottmeier Road was determined in consultation with the Ministry of Transportation. Key features of Ministry approved preferred design are discussed below (detailed information is provided in a technical memo provide in Appendix R):

- Provision of a multi-use path on the south side, which would transition to the north side at Highway 406 off-ramp and on-ramp intersection, along with a traffic signal at the same intersection. The multi-use path east of this intersection would be a raised facility. This option will provide safer pedestrian crossing at the proposed signalized intersection and not yielding at on-ramps.
- Maintaining an existing eastbound left turn and providing additional eastbound through lane at off-ramp and on-ramp intersection at Merritt Road, while matching eastbound lanes prior to bridge westerly abutment to avoid impacts and widening of the existing bridge structure over the highway.
- Permitting a westbound left turn at Grisdale Road/Merritt Road intersection along with eastbound right and northbound right turning movements, in other words a right-in right-out plus westbound left turn (left-in). Northbound left turn from Grisdale Road to Merritt Road is not permitted under this option. The median island and right-turn channel have been proposed to ensure that northbound left turn is completely restricted. This option would facilitate safer turn onto Grisdale Road from Merritt Road with a provision of a dedicated westbound left turn lane (refer to Figure E6).
- Removal of westbound right turn channel (due to low traffic volumes) and provision of a short westbound right turn lane instead at the Highway 406 southbound ramp. Removal of westbound right turn lane over the bridge will be a cost-effective solution where the MUP could be provided without widening bridge structure. Initially, a concrete median was proposed between the vehicular traffic lanes and the MUP. However, based on the feedback provided by MTO Executive Review Meeting (held March 21, 2023), the concrete median was removed from the proposed cross-section. Further, the multi-use path was proposed as a raised multi-use path.

Figure E5: Proposed Cross-Section for Merritt Road at Highway 406 Overpass

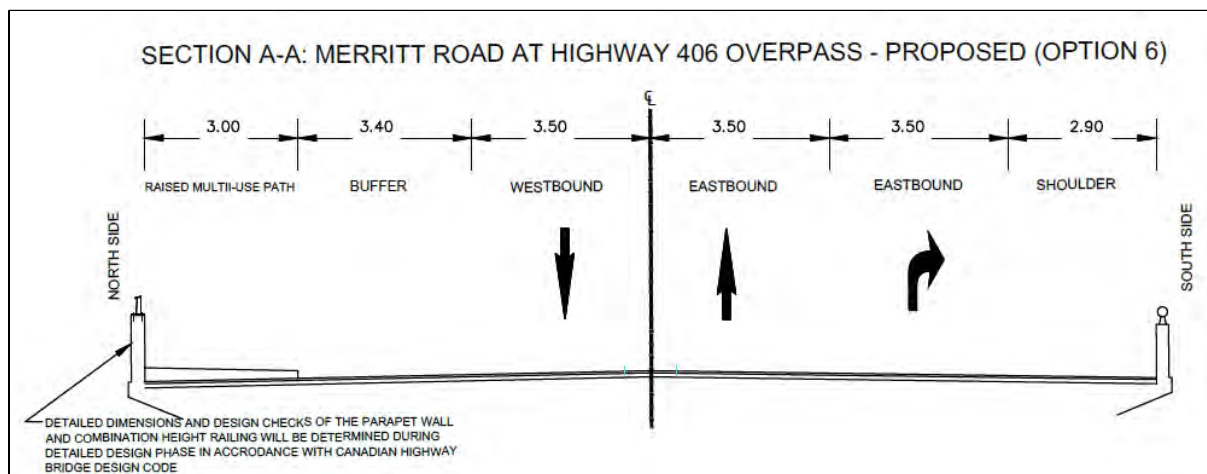
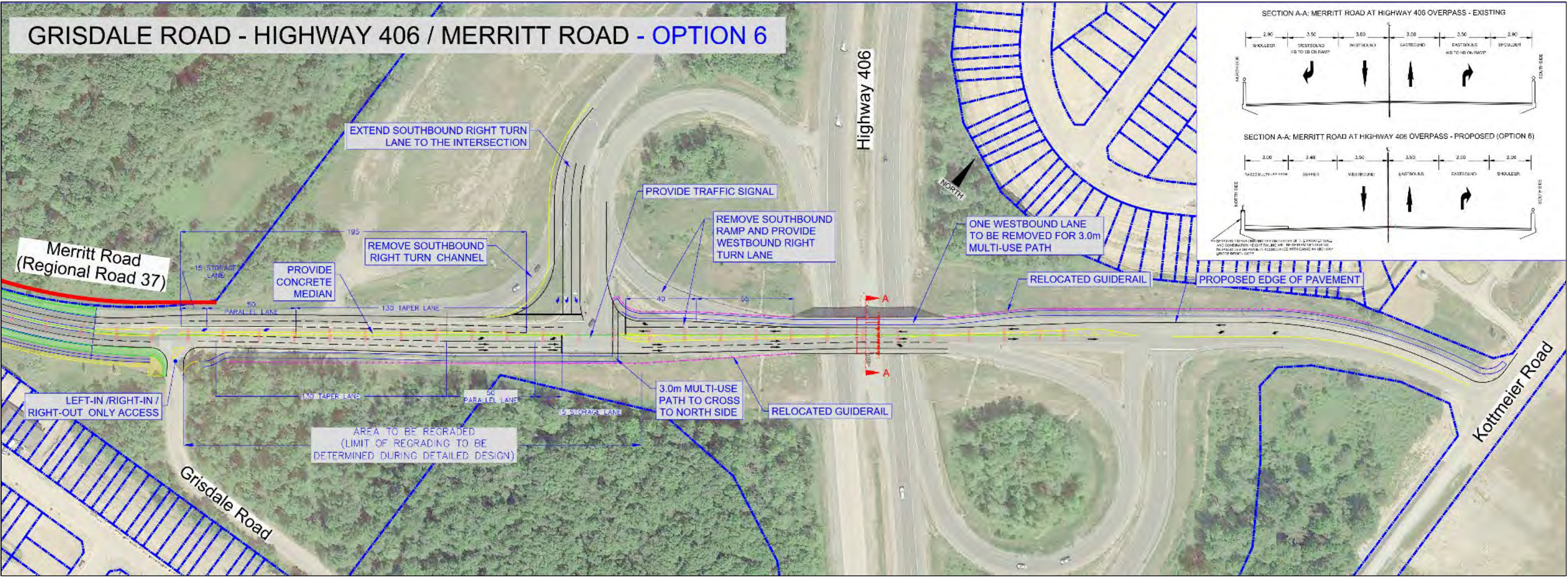


Figure E6: Proposed Design for Merritt Road at Highway 406 Overpass

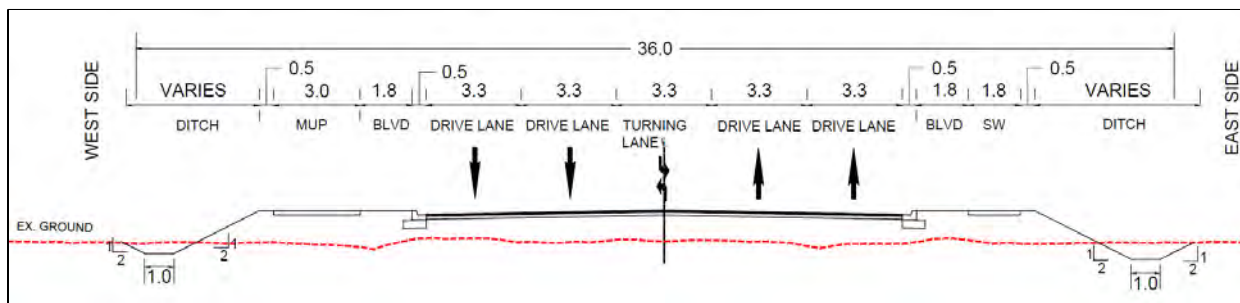


Segment 4: Rice Road (200 meter north of Merritt Road to Quaker Road)

The proposed cross-section for Segment 4 is an Urban Cross-section with following design features (based on Urban General typology):

- Four 3.3 meter drive lanes with a 2.5 meter median or 3.3 meter two-way left turn lane in centre
- 1.8 meter sidewalk on the east side
- A 3.0 meter multi-use path on the west side
- Ditches on both sides

Figure E7: Proposed Cross-Section for Segment 4 – Rice Road from Merritt Road to Quaker Road (with Centre Turning Lane)



Potential Environmental Effects, Mitigation Measures and Commitments for Future Work

Based on the existing conditions inventory within the Study Area and the proposed project works, potential effects were identified, and mitigation measures and monitoring requirements were proposed. In addition, commitments for additional work and permits were identified as well as monitoring measures for the next steps of the project.

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Appendix U: Notice of Study Completion

***If technical reports are required in an alternative format for accessibility needs, please contact:**

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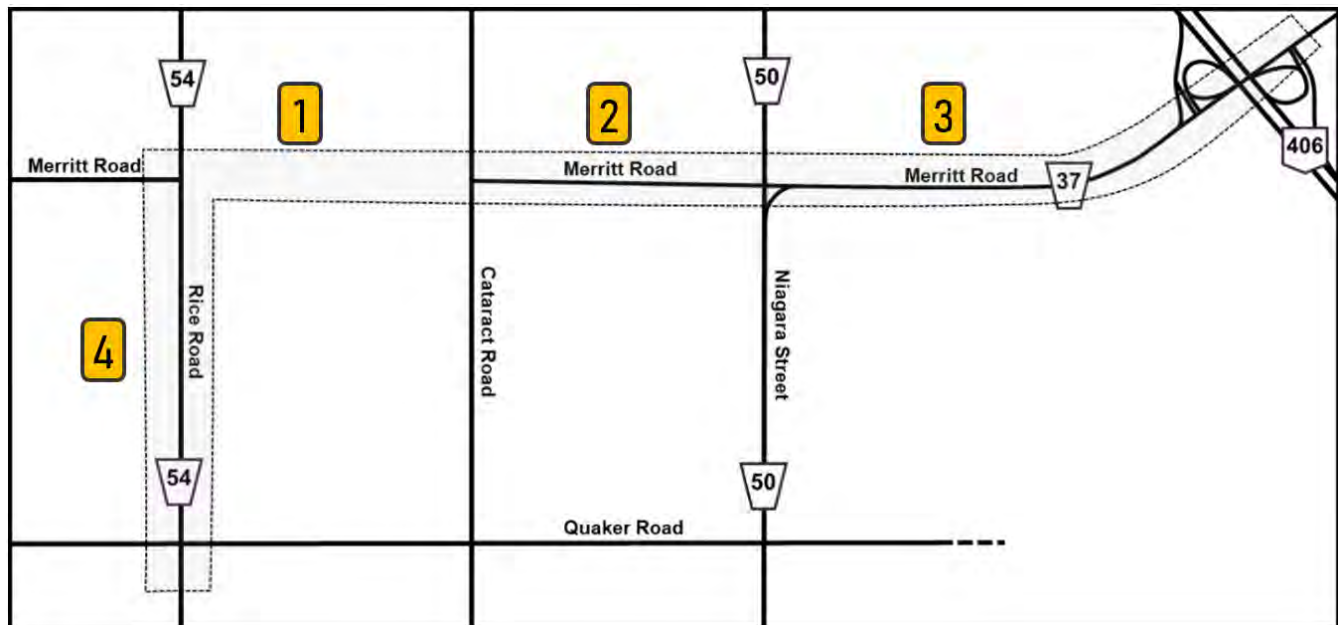
1 Introduction

1.1 Study Area

The Regional Municipality of Niagara (herein referred to as 'Niagara Region') has completed a Schedule 'C' Municipal Class Environmental Assessment (MCEA) study for improvements to Merritt Road (Regional Road 37) and Rice Road (Regional Road 54) to accommodate future traffic growth in the area as a result of future developments in the Town of Pelham, the City of Thorold and the City of Welland. For the purpose of this study, the subject roadways were divided into the following four road segments:

- Segment 1: Merritt Road from Rice Road to Cataract Road
- Segment 2: Merritt Road from Cataract Road to Merrittville Highway / Niagara Street (Regional Road 50)
- Segment 3: Merritt Road from Merrittville Highway / Niagara Street to Highway 406
- Segment 4: Rice Road from 200 metres north of Merritt Road to Quaker Road

Figure 1-1: Study Area



This study was built on the recommendations of the Niagara Region's approved Transportation Master Plan (TMP) and it was aimed at identifying improvements to the two roadways to meet the future needs of the surrounding community for all road users. The study also aimed at addressing active transportation needs by providing dedicated pedestrian and cyclist infrastructure that is safe, attractive, conforms to a complete streets approach, and is compatible with the changing land use in the three local municipalities.

1.2 Municipal Class Environmental Assessment Process

The Ontario *Environmental Assessment Act* (R.S.O. 1990, c. E.18; EA Act) (Ontario, 1990) was put into place to provide for the protection, conservation and wise management of the environment within the province. The EA Act applies to all projects being undertaken by provincial, municipal or other public bodies within the province (unless explicitly exempted). It defines the environmental assessment studies that must be completed prior to commencement of any undertaking, as well as the proponent's obligations to consult with all affected and/or interested parties.

Under the EA Act, projects are classified as exempted, subject to an approved Class EA process, or subject to a full Individual Environmental Assessment. This environmental assessment was conducted in accordance with the requirements for a Schedule 'C' Project (Phases 1 to 4) as outlined in the Municipal Engineers Association's Class EA document (Municipal Engineers Association, 2023).

The Class EA process is a mechanism by which planning, and approval of municipal infrastructure is provided in an efficient, timely, economical and environmentally responsible manner. It represents a consistent, streamlined and easily understood process for planning and implementing municipal infrastructure projects.

The Municipal Class EA process is an approved process under the EA Act. All municipalities in Ontario are required to follow this approved process for the infrastructure planning projects. This project is classified as being subject to the Class EA process. It was carried out according to the requirements outlined in the Municipal Engineers Association document titled Municipal Class Environmental Assessment (Municipal Engineers Association, 2023).

The Class EA process classifies projects according to their level of complexity and potential environmental impacts. These are termed "Schedules" and are summarized below.

Exempt Projects include various municipal maintenance, operational activities, rehabilitation works, minor reconstruction or replacement of existing facilities, and new facilities that are limited in scale and have minimal adverse effects on the environment. These projects were formerly classified as Schedule A and A+ projects. These projects are exempted from the requirements of the Environmental Assessment Act (Ontario, 1990).

Schedule B includes projects that involve improvements and minor expansion to existing facilities. There is a potential for some adverse environmental impacts and, therefore, the proponent is required to proceed through a screening process, including consultation with those affected. Schedule B projects are required to proceed through Phases 1, 2 and 5 of the Class EA process.

Schedule C includes projects that involve construction of new facilities and major expansion of existing facilities. These projects proceed through the environmental assessment planning process outlined in the Class EA document. These projects are required to fulfil the requirements of all five phases of the Class EA process.

The Municipal Class EA process includes five phases. Schedule 'C' projects require that all five phases be conducted. Phases 1, 2, 3, and 4 are part of this study; the fifth phase will be initiated following completion of this study. A description of the Class EA planning phases is provided below, and more details are shown in Figure 1-2.

Phase 1 – Problem or Opportunity Statement: Identify the problem (deficiency) or opportunity.

Phase 2 – Alternative Solutions: Identify and evaluate alternative solutions to address the problem or opportunity by taking into consideration the existing environment, and establish the preferred solution considering public and review agency input.

Phase 3 – Alternative Design Concepts for the Preferred Solution: Identify Alternative Design Concepts for the preferred solution implementation by taking into consideration the existing environment and establish the preferred design concept by considering public and review agency input.

Phase 4 – Environment Study Report: Document and file the Environmental Assessment including the design and consultation process in an Environmental Study Report (ESR) for public review.

Phase 5 – Implementation: Complete detailed design and required additional investigations, obtain permits and approvals, and proceed to construction and operation. Monitor construction for adherence to environmental provisions and commitments. Where special conditions dictate, also monitor the operation of the completed facility.

Figure 1-2: Municipal Class Environmental Assessment Process

PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5
- Notice of study commencement - Problem or opportunity statement - Public Information Centre #1	- Inventory natural, social and economic existing conditions - Identify and evaluate alternative solutions - Identify preferred solution - Public Information Centre #2	- Inventory natural, social and economic existing conditions - Identify and evaluate alternative design concepts for preferred solution - Identify preferred design concept - Public Information Centre #3	- Document Study process and findings in Environmental Study Report (ESR) - Issue Notice of Study Completion - Place ESR on public record for a minimum of 30-day review period	- Proceed to the detailed design and construction of the project - Monitor environmental provisions and commitments

1.3 Environmental Study Report

This report was developed to document Phases 1 – 4 of the Class EA process for this project. This report is divided into following sections:

Section 1.0 provides introduction to the study and the study process.

Section 2.0 outlines the need for the project and provides justification for proposed improvements, including the problem and opportunity statement (Class EA Phase 1).

Section 3.0 the various provincial, regional and local municipal policies that are applicable to this project.

Section 4.0 provides a description of the existing and future conditions within the Study Area.

Section 5.0 provides details of the consultation program that was executed for this study, which involved consultation with the Indigenous Communities, the public, impacted property owners, government agencies, and key stakeholders.

Section 6.0 summarizes the alternative solutions that were identified and evaluated to identify a preferred solution to address the problem and opportunity (Class EA Phase 2).

Section 7.0 summarizes the alternative design concepts for the preferred solution that were identified and evaluated to identify a preferred design (Class EA Phase 3).

Section 8.0 provides a detailed description of the preferred design, including the preliminary cost estimate, implementation strategy, and timing of the proposed works.

Section 9.0 identifies project's potential effects and proposed mitigation measures.

Section 10.0 outlines the commitments for future work, including required additional investigations and permits/approvals and the monitoring measures.

Section 11.0 outlines the Section 16 (6) Order Request Process.

Section 12.0 lists the documents cited throughout the report.

1.4 Technical Studies Completed

The following technical study reports were prepared as part of this Class EA Study:

- Transportation Assessment Report
- Cultural Heritage Assessment Report
- Stage 1 and 2 Archaeological Assessment Reports
- Environmental Impact Study
- Stormwater Management and Hydraulic Assessment
- Preliminary Hydrogeologic Assessment
- Merritt Road at Grisdale Road & Highway 406 Interchange Design Options Memo
- Health Impact Assessment

These discipline specific technical reports were shared with relevant government agencies for their review, comments, and eventual acceptance through resolution of comments to their satisfaction. Information from the technical reports was incorporated into the corresponding sections of this report. It is important to note that Archaeological Assessment and Cultural Heritage Assessment Reports were shared in their draft form with the Indigenous Communities for review. Eventually, all reports were shared with the Indigenous Communities for their review as part of the Environmental Study Report review.

2 Class EA Phase 1: Problem or Opportunity

The first phase in the Municipal Class EA process is the identification of problem and opportunity statement. The Municipal Class EA document notes that the municipalities generally undertake projects in response to certain identified problems or deficiencies. In other cases, there may be opportunities which need to be addressed. Previous studies/reports undertaken by a proponent may be available to assist in defining the problem. Therefore, as part of the Class EA Phase 1, a clear problem and opportunity statement should be identified for the proposed project.

As noted earlier, the need for the proposed improvements were identified in the Niagara Region's 2017 TMP. Further, as part of this Class EA Study, a detailed transportation assessment was completed to identify existing and future traffic conditions, and to confirm the need for the project.

Merritt Road is a discontinuous east/west roadway located within the Town of Pelham, City of Thorold, and City of Welland. It starts at Pelham Street in the Town of Pelham and extends approximately 1.25 kilometres to the east before terminating at Rice Road. For the next 800 metres easterly, Merritt Road crosses the inter-municipal boundary between the Town of Pelham and the City of Thorold through an unopened road allowance. It reinitiates at Cataract Road in the City of Thorold extending approximately 800 metres to the east before transitioning to Merritt Road (Regional Road 37) at Merrittville Highway/Niagara Street (Regional Road 50). For the next 1.80 kilometres, Merritt Road (Regional Road 37) continues east through City of Welland, and intersecting with Highway 406 in the City of Thorold, ending at Kottmeier Road.

Rice Road (Regional Road 54) is a continuous north/south roadway located within the Town of Pelham and the City of Welland. It starts at Highway 20 (Regional Road 20) in the Town of Pelham and extends approximately 1.70 kilometres to the south before intersecting with Merritt Road. For the next 1-kilometre, it continues south crossing the inter-municipal boundary between the Town of Pelham and the City of Welland approximately halfway between Merritt Road and Quaker Road.

There are three secondary plans for the lands adjacent to Merritt Road and Rice Road, which are intended to introduce future development, resulting in increased traffic along Merritt Road and Rice Road. These secondary plans are as follows:

- Town of Pelham's East Fonthill Secondary Plan;
- City of Thorold's Port Robinson Secondary Plan; and
- The City of Welland's Northwest Welland Secondary Plan.

To accommodate traffic growth, the Niagara Region's TMP and City of Thorold's TMP identified the need for additional east/west transportation capacity. This need for additional transportation capacity was further reviewed and confirmed via a detailed transportation assessment completed as part of this Class EA Study. The purpose of this environmental assessment was to address the need for additional east/west transportation capacity and connectivity of the active transportation network through extension and improvement of Merritt

Road and improvement of Rice Road in the Town of Pelham, City of Thorold, and City of Welland.

2.1 Secondary Plans Guiding Future Developments

2.1.1 Town of Pelham's East Fonthill Secondary Plan

The Town of Pelham's East Fonthill Secondary Plan was approved concurrently with the Town's Official Plan in 2014. This plan is intended as a guide to the development of the Secondary Plan Area. The East Fonthill Secondary Plan Area is bounded by Rice Road to the east, Steve Bauer Trail to the west, Highway 20 (Regional Road 20) to the north and the Pelham-Welland border to the south. To the north, there is established significant commercial/institutional development. The south end, still under development, will have low density development with natural heritage protected areas.

This Secondary Plan provides policies for a comprehensively planned community structure that will accommodate between 6,500 and 7,500 new residents and jobs combined. It is expected that this Plan will be substantially built-out by the year 2031.

The East Fonthill Secondary Plan Area and the planned land use is shown in the figure below. This planned land use was incorporated in the transportation assessment of this study and has been accounted for in Niagara Region's traffic forecast model.

Figure 2-1: Town of Pelham's East Fonthill Secondary Plan - Land Use (Excerpt)



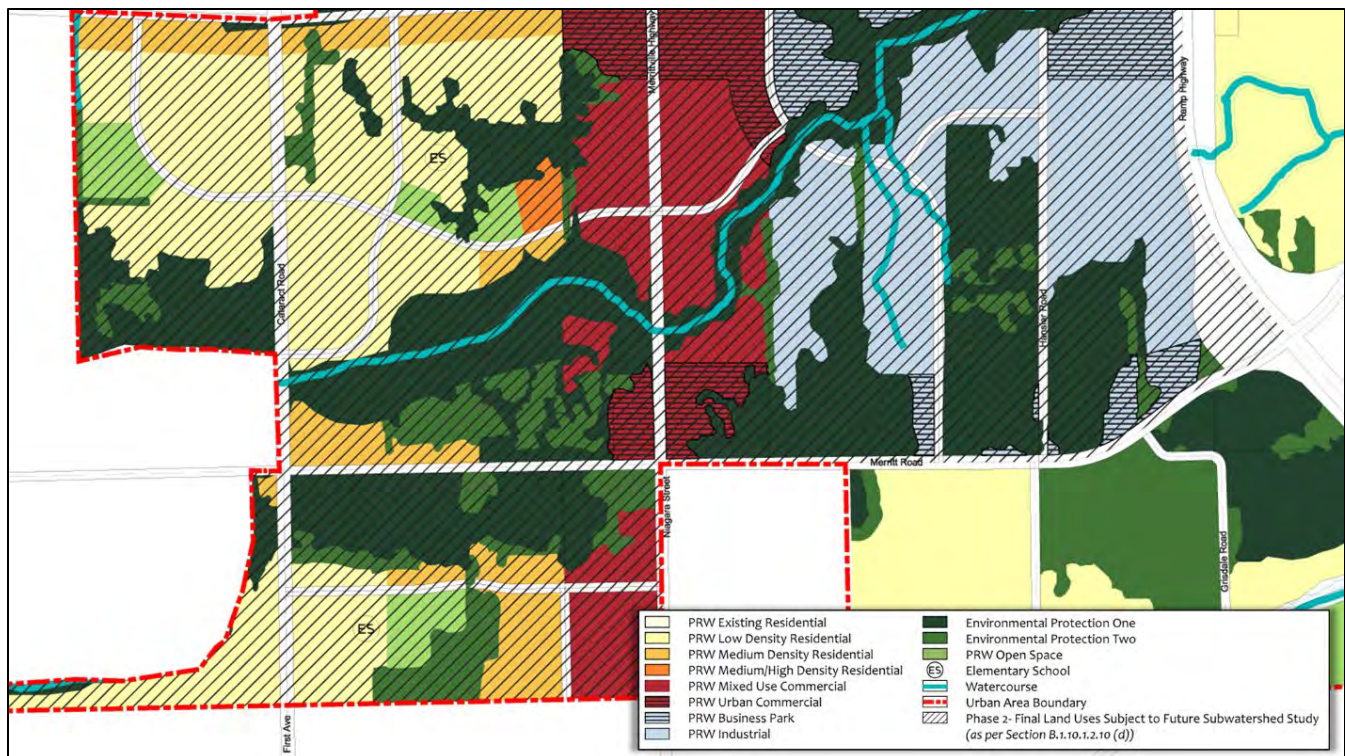
2.1.2 City of Thorold's Port Robinson West Secondary Plan

The Port Robinson West Secondary Plan was prepared concurrently with the City's new Official Plan. The Port Robinson West Secondary Plan Area is roughly bounded by Port Robinson Road to the north, the Thorold-Welland border to the south, the Pelham-Thorold border to the west and the Welland Canal to the east. The area will have a business park/industrial land user directly adjacent to Highway 406 (west side) with possible frontage on Merritt Road. Remaining areas will be low, medium and high density residential with some commercial development.

This Secondary Plan provides policies to create a complete community with a safe, healthy and functional environment that can accommodate between approximately 14,000 and 15,000 new residents and jobs combined.

The Port Robinson West Secondary Plan Area and the planned land use is shown in the figure below. The Residential Development from the Port Robinson West Secondary Plan was considered in the transportation assessment completed as part of this study.

Figure 2-2: City of Thorold's Port Robinson West Secondary Plan - Land Use (Excerpt)



2.1.3 City of Welland's Northwest Welland Secondary Plan

The Northwest Welland Secondary Plan was approved in July 2021. The Northwest Welland Secondary Plan Area is generally bound by the Town of Pelham and City of Thorold boundary to the north, the Niagara College Welland Campus to the south, the rear lot lines of properties abutting Niagara Street to the east, and Line Avenue and Clare Avenue to the west.

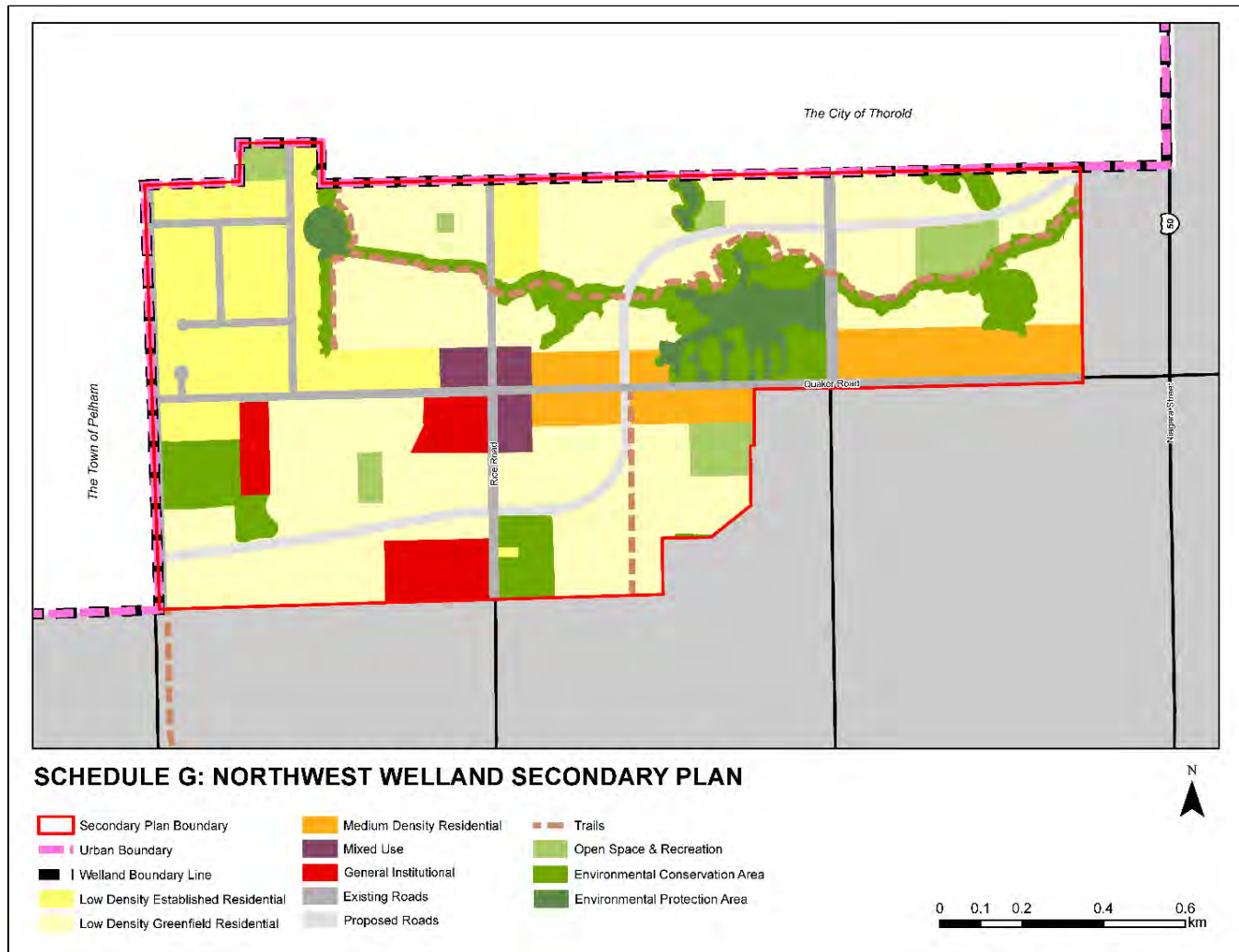
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This Secondary Plan is intended to accommodate future urban growth within the City of Welland.

The Northwest Welland Secondary Plan Area and the planned land use is shown in the figure below. The Region's model was updated to reflect the population growth by 2031 based on the Secondary Plan.

Figure 2-3: City of Welland's Northwest Welland Secondary Plan - Land Use



2.2 Planning Documents Recommending Road Improvements

2.2.1 Niagara Region Transportation Master Plan

The Niagara Region TMP (2017), *How We Go*, is a strategic planning document that sets out a long-term transportation vision and action plan to address future transportation needs through an integrated network of pedestrian and cycling facilities, transit, roads and highways in the Niagara Region to 2041. The major components of the TMP are: the Regional Road System;

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Transportation Demand Management; Transportation Systems Management; Public Transit; Active Transportation; Complete Streets; and Goods Movement.

As the Niagara Region implements its future growth plan outlined in How We GROW, the TMP ensures that Niagara Region plans and budgets for future transportation needs for an integrated multimodal transportation network. The Niagara Region is committed to implementing the overall goals of the TMP as part of its transportation capital projects.

The Niagara Region TMP (2017) recommended the following improvements to Merritt Road and Rice Road:

- Extension of Merritt Road between Rice Road and Cataract Road;
- Capacity improvements of Merritt Road from Cataract Road to Highway 406; and
- Capacity improvements to Rice Road from 200 meters north of Merritt Road to Quaker Road.

2.2.2 City of Thorold Transportation Master Plan

The recently completed (2020) City of Thorold TMP recommended that capacity improvements be undertaken on Merritt Road (to a four-lane cross section). The section between Merrittville Highway and Cataract Road be transferred to the Region, and the extension between Cataract Road and Rice Road be constructed. Furthermore, a multi-use pathway is recommended along the entire length of Merritt Road within the City of Thorold (including the newly constructed section).

2.3 Problem Statement

The following Problem and Opportunity Statement was identified for this project:

As a result of the proposed development, significant congestion on the road network is expected, particularly on Merritt Road between the Merrittville Highway/Niagara Street and the Highway 406 interchange by 2041. Without the extension of Merritt Road, Niagara Street between Merritt Road and Quaker Road, and Quaker Road between Rice Road and Niagara Street will also experience a significant increase in traffic volumes given the need for motorists to take an indirect route between the Town of Pelham and the Highway 406 intersection, resulting in congestion and the need for significant intersection improvements. The traffic assessment confirmed the findings of Niagara Region's Transportation Master Plan regarding the need for improvements.

3 Policy Context

3.1 Federal Policy Context

3.1.1 *Species at Risk Act*

The federal *Species at Risk Act* (S.C. 2002, c. 29) was passed into law in 2002 and was last amended on 3 February 2022. The purpose of this *Act* is to prevent wildlife species in Canada from disappearing, to provide for the recovery of wildlife species, and to manage species to prevent further risk to their status. The *Species at Risk Act* provides legal protection to species at risk listed in Schedule 1 if they have a designation of Extirpated, Endangered, or Threatened with respect to harming the species (Section 32 of the *Act*) or its residence (Section 33 of the *Act*). The *Species at Risk Act* applies to federal lands (e.g., Canada's oceans and waterways, national parks, military training areas, national wildlife areas, some migratory bird sanctuaries, and First Nations reserve lands) and outside of federal lands to the following:

- Migratory birds (i.e., those species listed under Article I of the *Migratory Birds Convention Act*, 1994) that also fall under Schedule 1 of the *Species at Risk Act*. This does not include the species' critical habitat; however, it does include residences of migratory birds which have residence descriptions (i.e., Barn Swallow); and
- Aquatic species that fall under Schedule 1 of the *Species at Risk Act*.

Species at risk with these federal designations require recovery strategies or conservation action plans that identify their critical habitat for mandatory prohibition from damage or destruction (Section 58 of the *Act*). Species listed as Special Concern in Schedule 1 are not legally protected under *Species at Risk Act* but require a management plan. Species listed in Schedule 2 or 3 of the *Species at Risk Act* are not legally protected under the *Act*. Still, they require status assessment through the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) to determine conservation status and priority for recovery and action planning pursuant to Section 27 of the *Species at Risk Act*. Notably, *Species at Risk Act* prohibitions can be applied if provincial legislation or voluntary measures do not adequately protect federally listed species and their residence. Generally, compliance with provincial legislation in Ontario does satisfy the requirements under the *Species at Risk Act*.

Applicability to the Project

The Study Area is not located within federal lands. Therefore, the *Species at Risk Act* only applies if migratory birds that fall under Schedule 1. Migratory birds that have residence descriptions, and aquatic species that fall under Schedule 1 are found in the Study Area. The *Species at Risk Act* applies to this Project concerning federally listed migratory birds that may occur. Watercourses that were considered aquatic habitat were found in the Study Area. One aquatic species listed on Schedule 1 was identified in the Natural Heritage information Center grid search, but it occurs in the Welland Canal and not in the Study Area.

3.1.2 *Migratory Birds Convention Act*

The *Migratory Birds Convention Act* (S.C. 1994, c. 22) was passed in 1917 and updated in 1994, and the last amendment was on 12 December 2017. This *Act* prohibits harming and/or killing most species of birds and/or destroying or collecting their eggs or nests. This *Act* is

enforced by Environment and Climate Change Canada. Protected species are listed under Article I of the *Act*. These species are native or naturally occurring in Canada and are species that are known to occur regularly in Canada. Most birds found in the Study Area receive protection under the *Migratory Birds Convention Act*, and nearly all of the remaining species receive similar protection under the provincial *Fish and Wildlife Conservation Act*.

The *Migratory Birds Convention Act*, together with the *Migratory Birds Regulations* (C.R.C., c. 1035), last amended on 31 July 2022, are federal legislative requirements binding members of the public and all levels of government. The new *Migratory Birds Regulations, 2022*, provides protection to migratory bird nests when they are considered to have a high conservation value for migratory birds (i.e., generally during the nesting period). The nests of 18 species, whose nests are reused or subsequently used by other species, continue to have year-round nest protection unless they have been shown to be abandoned. The “incidental take” of migratory birds and the disturbance, destruction, or taking of the nest of a migratory bird is prohibited. Bird species not regulated under the *Act* include Rock Dove, American Crow, Brown-headed Cowbird, Common Grackle, House Sparrow, Red-winged Blackbird, and European Starling. Some species are not protected under the *Migratory Birds Convention Act* but are listed under the *Endangered Species Act* (e.g., Rusty Blackbird).

Environment and Climate Change Canada and the Canadian Wildlife Service have compiled nesting calendars that show the variation in nesting intensity by habitat type and nesting zone within broad geographical areas distributed across Canada. While this does not mean nesting birds will not nest outside of these periods, the calendars can greatly reduce the risk of encountering a nest.

Applicability to the Project

The *Migratory Birds Convention Act* applies to all of Canada. As such, the *Migratory Birds Convention Act* is applicable to this Project. Therefore, if a protected species or its nest is encountered during project ground disturbance activities, the Project must comply with the prohibitions of the *Migratory Birds Convention Act* and *Migratory Birds Regulations*; this includes following appropriate timing windows or Best Management Practices for vegetation removals. The Project site occurs in nesting zone C1, which has a regional nesting period of late March to late August. The nesting period is developed based on the nesting history of species known to occur in the general habitat (open, wetland, forest habitats). In open habitats, it is predicted that nesting is likely to start around late March (28th) and continue to late August (26th). In wetland habitats, it is predicted that nesting is likely to start around late March (23rd) and continue to mid-August (15th). In forest habitats, it is predicted that nesting is likely to start around late March (23rd) and continue to late August (26th). Given the climatic and species variables, vegetation removal should be avoided between March 23rd and August 26th in any given year. Additionally, the nests of the Pileated Woodpecker, Great Blue Heron, and Green Heron have year-round protection from destruction. A mandatory wait period before the nest of these species must be observed. The nest must be proven abandoned before removal and registered.

3.1.3 Fisheries Act

The *Fisheries Act* (R.S.C., 1985, c. F-14) was established in 1985 with amendments that came into effect on 25 November 2013 and 29 October 2019. This *Act* provides protection to fish and fish habitats such that:

"No person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish.", and

"No person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat".

The *Act* defines fish habitat as:

"water frequented by fish and any other areas on which fish depend directly or indirectly to carry out their life processes, including spawning grounds and nursery, rearing, food supply and migration areas".

The *Fisheries Act* requires that any development project avoid the death of fish, as well as harmful alteration, disruption or destruction of fish habitat unless authorized by Fisheries and Oceans Canada. If mitigation measures cannot be applied, and residual effects will cause a harmful alteration, disruption or destruction of fish habitat, then provisions under the *Act* may apply (i.e., authorization).

Applicability to the Project

Watercourses containing fish habitat were documented in the Study Area; therefore, the *Fisheries Act* applies to this Project, and the death of fish and the harmful alteration, disruption or destruction of fish habitat must be prevented or permitted through an authorization from Fisheries and Oceans Canada.

3.2 Provincial Policy Context

3.2.1 Provincial Policy Statement

The Provincial Policy Statement (PPS) (2020) is a complimentary policy document to the *Planning Act*, 1990, issued under Section 3 of the *Planning Act*. It provides direction on the matters of land use planning while protecting resources of provincial interest, public health and safety, and the quality of the natural and built environment (Ministry of Municipal Affairs and Housing, 2020).

In the context of this project, the PPS includes policies to provide infrastructure and public service facilities in an efficient manner that prepares for the impacts of a changing climate while accommodating projected needs (Policy 1.6.1). In addition, Policy 1.6.7.1 states that *"Transportation systems should be provided which are safe, energy efficient, facilitate the movement of people and goods, and are appropriate to address projected needs."* Policy 1.6.7.3 states that *"As part of a multimodal transportation system, connectivity within and among transportation systems and modes should be maintained and, where possible, improved including connections which cross jurisdictional boundaries."*

PPS policies in Section 1.7 support long-term economic prosperity. Specifically, Policy 1.7.1 (g) notes that long-term economic prosperity should be supported by *“providing for an efficient, cost-effective, reliable multimodal transportation system that is integrated with adjacent systems and those of other jurisdictions and is appropriate to address projected needs to support the movement of goods and people.”*

The PPS (2020) also includes policies to protect natural features (Policy 2.1.1); conserve significant built heritage resources and significant cultural heritage landscapes (Policy 2.6.1); and protect public health and safety from natural hazards (Policy 3.1.1 and Policy 3.1.2).

Applicability to the Project

In consideration of the above, the PPS provides a strong basis to support improvements to Merritt Road and Rice Road. The proposed improvements to the two roadways are intended to meet the future needs of the surrounding community from the perspective of all road users, supporting multi-modal travel and improve safety. This Class EA Study was completed to inventory natural features and cultural heritage resources along the subject road segments, and to develop a strategy such that the proposed improvements be constructed in a responsible manner to minimize effects on the said resources.

3.2.2 Growth Plan for the Greater Golden Horseshoe

A Place to Grow: Growth Plan for the Greater Golden Horseshoe (“Growth Plan”), (2019, amended in 2020), was prepared and approved under the *Places to Grow Act (2005)*. It is a legal framework that implements the Government of Ontario’s vision for managing growth within the Greater Golden Horseshoe (GGH) to the year 2051 (Ministry of Municipal Affairs and Housing, 2019, Amendment 1 (2020)). The Growth Plan plans for growth and development in the GGH in a way that supports economic prosperity, protects the environment, and helps communities achieve a high quality of life.

The GGH is a dynamic and diverse area, and one of the fastest growing regions in North America. By 2051, this area is forecast to grow to 14.8 million people and 7.0 million jobs. The magnitude and pace of this growth necessitates a plan for building healthy and balanced communities and maintaining and improving our quality of life while adapting to the demographic shift underway.

The Growth Plan is intended to accommodate the forecasted growth in the GGH by providing guidance to provincial and municipal decisions on transportation, infrastructure planning, land-use planning, urban form, housing, natural heritage, cultural heritage, climate change, employment, agriculture and resource protection.

The Growth Plan envisions an integrated transportation network that will allow people choices for easy travel both within and between urban centres throughout the GGH; automobiles will be only one of a variety of effective and well-used choices for transportation, and transit and active transportation will be practical elements of our urban transportation systems.

Applicability to the Project

The proposed improvements on Merritt Road and Rice Road conform to the following sections and policies of the Growth Plan:

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Population and Employment Forecasts:

To better co-ordinate planning for growth across the region, the Growth Plan provides population and employment forecasts for all upper- and single-tier municipalities in the GGH.

Based on provincial growth targets, the population in the Niagara Region is expected to be 674,000 people (Growth Plan; Schedule 3) (Ministry of Municipal Affairs and Housing, 2019, Amendment 1 (2020)). The Growth Plan (2020) allows Niagara Region to use alternative growth forecasts beyond those identified in Growth Plan. As part of development of the 2051 Land Needs Assessment in support of the New Official Plan, the Niagara Region has identified an alternative growth forecast of 694,000 people (Niagara Region, 2022). This population forecast was endorsed, in principle, by Regional Council in August 2021. This population forecast translates to an increase in population by approximately 55% by 2051, from 447,888 people in 2016 (Statistics Canada, 2017) to 694,000 in 2051.

In terms of employment forecasts, the Growth Plan requires Niagara Region to plan for a minimum employment base of 272,000 jobs by 2051 (Growth Plan; Schedule 3) (Ministry of Municipal Affairs and Housing, 2019, Amendment 1 (2020)).

The proposed improvements will help ensure that there is transportation infrastructure available to accommodate future traffic demands associated with growth in the adjacent areas.

Infrastructure to Support Growth:

The Growth Plan states that *“well planned infrastructure is essential to the viability of Ontario's communities and critical to economic competitiveness, quality of life and the delivery of public services”*. The infrastructure framework in the Plan requires that municipalities undertake an integrated approach to land use planning, infrastructure investments and environmental protection to support and accommodate forecasted growth. Policies in Section 3.2.2 of the Growth Plan promote coordinated transportation system planning; connectivity among transportation modes for the movements of people and goods; and a balance of transportation choices that reduces reliance upon the automobile and promotes transit and active transportation.

Moving People:

Policies in Section 3.2.2 of the Growth Plan promote active transportation networks that are comprehensive and integrated and *“provide safe, comfortable travel for pedestrians, bicyclists, and other users of active transportation”*; and *“continuous linkages between strategic growth areas, adjacent neighbourhoods, major trip generators, and transit stations, including dedicated lane space for bicyclists on the major street network, or other safe and convenient alternatives.”*

Protecting What's Valuable:

In addition to above, Section 4.2 of the Growth Plan, 2019 (amended in 2020), provides policies for the protection of matters of provincial interest. Of these, policies related to the protection of Natural Heritage System, Cultural Heritage Resources and Climate Change are of relevance to this project.

3.2.3 Greenbelt Plan

Ontario's Greenbelt protects farmland, communities, forests, wetlands, and watersheds. It also preserves cultural heritage and supports recreation and tourism in Ontario's Greater Golden Horseshoe. The Greenbelt Plan derives its authority from the Greenbelt Act, 2005, S.O. 2005, c. 1 (last amended 19 April 2021). The Greenbelt Plan was first released in 2005 and last updated in May 2017. The Greenbelt Plan identifies where urbanization should not occur in order to provide permanent protection to the agricultural land base and functions of the landscape.

Like other provincial plans, the Greenbelt Plan builds upon the policy foundation provided by the Provincial Policy Statement. It provides additional and more specific land use planning policies to address issues facing the specific geographic area. The policies of the Greenbelt Plan usually satisfy the policies of the Provincial Policy Statement. Where there is conflict, the Greenbelt Plan will take precedence, except where the relevant legislation provides otherwise. Where matters addressed in the Provincial Policy Statement do not overlap with policies in the Greenbelt Plan, those Provincial Policy Statement policies must be independently satisfied. The Greenbelt Plan must also be read in conjunction with other Provincial Plan (in case of this project, the Growth Plan for the Greater Golden Horseshoe). Where the plans, regulations or standards are more restrictive than the Greenbelt Plan, the more restrictive provision shall prevail.

Applicability to the Project

The northwest corner of the Study Area is mapped under the Greenbelt Plan as Protected Countryside and the geographic-specific policy Specialty Crop Area. Specialty Crop Areas within the Protected Countryside are subject to the entirety of the Greenbelt Plan, except Section 6 (Urban River Valley Policies). The Specialty Crop Area is also called the Niagara Peninsula Tender Fruit and Grape Area and was delineated based on provincial soil and climate analysis of current and potential tender fruit and grape production areas. Non-agricultural uses are generally discouraged in specialty crop areas and may only be permitted after the completion of an agricultural impact assessment.

While within the Study Area, it is not expected that the northwest corner will be impacted by the proposed preferred alternative design.

3.2.4 Endangered Species Act

The *Endangered Species Act* was passed into law in 2007 and came into effect on 30 June 2008 and was last amended on 19 October 2021. In Ontario, species at risk is determined by the *Committee on the Status of Species at Risk in Ontario* (COSSARO). If a species is listed under the *Endangered Species Act* as Extirpated, Endangered, or Threatened. Section 9 of the *Act* prohibits killing, harming, harassing, capturing, taking, possessing, collecting, buying, selling, leasing, trading or offering to buy, sell, lease or trade a member of the species. Similarly, Section 10 of the *Act* prohibits the damage or destruction of the habitat of all Endangered and Threatened species. Habitat is broadly characterized within the *Act* as the area prescribed by regulation as the habitat of the species or an area on which the species depends directly or indirectly to carry on its life processes, including reproduction, rearing of young, hibernation, migration, or feeding.

Habitat is specifically defined for some species. Species listed as Special Concern are not afforded protection under Sections 9 and 10 of the *Act*; however, the Provincial Policy Statement provides protection through Significant Wildlife Habitat. Destruction of species at risk and their habitats constitute a contravention of the *Endangered Species Act* unless authorized by the Ministry of the Environment, Conservation and Parks (MECP). The MECP Ministry may authorize damage to habitat or individuals by way of registration or permit.

Applicability to the Project

Any species at risk ranked as Threatened or Endangered that may be impacted by any Project work requires consideration. If impacts on species at risk or their habitat cannot be fully avoided, a permit or registration will be required under the *Endangered Species Act*. Based on fieldwork and secondary sources, a species at risk screening was completed to document which species at risk are confirmed or considered to have a high potential to occur. Seven species at risk are confirmed in the Study Area: Eastern Flowering Dogwood (Endangered), White Wood Aster (Threatened), Round-leaved Greenbrier (Threatened), Eastern Wood-pewee (Special Concern), Wood Thrush (Special Concern), Monarch (Special Concern), and species at risk bats are considered present. Habitat for endangered and threatened species is protected, and alteration or destruction of individuals and this habitat must be permitted/approved by the MECP under the *Endangered Species Act*. Based on the Project location and proposed road design, species at risk may be directly impacted, and the Project is subject to a permit under the *Endangered Species Act* and/or its regulatory exemptions under the *Act* if avoidance is not possible.

3.2.5 Fish and Wildlife Conservation Act

The *Fish and Wildlife Conservation Act* was passed into law in 1997 and was last amended on 3 June 2021. This *Act* applies to 'fish and wildlife' whereby fish are defined as having the same meaning as in the *Fisheries Act*, and wildlife are defined as "an animal that belongs to a species that is wild by nature, and includes game wildlife and specially protected wildlife". Those species considered "specially protected wildlife" include those specially protected amphibians, birds, invertebrates, mammals, and reptiles, as identified within Schedules 6 to 11 under the *Fish and Wildlife Conservation Act*. This *Act* is managed by the Ministry of Natural Resources and Forestry. Where wildlife will require collection or relocation at any point in the project (i.e., through trapping/collection and relocation), permits and approvals under the *Fish and Wildlife Conservation Act* may be required.

If a provision of the *Fish and Wildlife Conservation Act* and a provision of the *Endangered Species Act* conflict with respect to an animal, invertebrate, or fish, the provision that gives the most protection prevails.

Applicability to the Project

Permits under the *Fish and Wildlife Conservation Act* are contractor specific, whereby the individual undertaking the work to rescue and relocate or collect wildlife and/or fish will be the responsible party required to obtain the necessary permits and approvals. The probability that wildlife is found in the Study Area and does not leave on their own accord is medium to high. As such, permits/approvals under the *Fish and Wildlife Conservation Act* are expected to be necessary during construction.

3.2.6 NPCA Policy Document

The NPCA Policy Document: Policies for the Administration of Ontario Regulation 155/06 and the Planning Act (September 2018) provides principles, objectives, and policies for the administration of the NPCA's mandate under Ontario Regulation 155/06, as well as its delegated roles and responsibilities within the planning and approvals process. It is important to note that NPCA updated its policies in November 2022. As this Class EA started before the 2022 policies were in effect, NPCA advised that referencing the previous policies is acceptable.

Applicability to the Project

Policy 4.2.2 of this document permits infrastructure within flood plain areas provided that an approval under the Environmental Assessment Act, and that the approved engineering designs recognize and, where necessary, address the flooding potential at the site. In addition, Policy 8.2.4 allows for public infrastructure through wetlands subject to the following criteria:

- a) The proposed infrastructure is supported by the completion of an appropriate Environmental Assessment or a Comprehensive EIS to the satisfaction of the Authority;
- b) No reasonable alternate location for the infrastructure exists outside of the wetland;
- c) Any impacts to flood flows, flood storage or groundwater movement are mitigated;
- d) The proposed infrastructure is designed to fully address impacts to the existing hydrological function, hydrological regime and ecological function of the wetland and adjacent lands; and
- e) Infrastructure approved through an environmental assessment process shall require a work permit to develop from the NPCA.

3.3 Regional Policy Context

3.3.1 Niagara Region Official Plan

Niagara Region's newest Official Plan came into effect on November 4, 2022. This plan is Niagara Region's long-term, strategic policy planning framework for managing growth in the Region. The policies of this Plan are intended to guide land use and development thereby influencing economic, environmental, and planning decisions until 2051 and beyond. In simple terms, the Niagara Official Plan identifies: what needs to be protected; how and where growth will occur; and policy tools to manage the same.

In the new plan Chapter 3 and Section 3.1 outlines the objectives and policies for a Regional Natural Heritage System (NHS) and water resource system. The NHS is made up of features such as wetlands, woodlands, valleylands, and wildlife habitat, as well as components such as linkages, buffers, supporting features and areas, and enhancement areas. The water resource system is made up of both groundwater and surface water features and areas. The establishment of these natural systems is required by Provincial policy. These systems have been integrated in this Plan and are known together as the Region's natural environment system.

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Policy 3.1.9.5.3 permits activities that create or maintain infrastructure authorized under an environmental assessment, including a Class Environmental Assessment, completed in accordance with the Environmental Assessment Act.

Policy 5.1.4.1 notes that *“The Niagara Region’s Complete Streets Design Manual and Guidelines shall be used in the design, refurbishment and reconstruction of the Region’s transportation system to ensure the needs and safety of all road users are considered and appropriately accommodated.”*

Applicability to the Project

As discussed above, under the previous Official Plan (2014), public uses of a linear nature including transportation routes may be permitted within the Core Natural Heritage System or adjacent lands where an Environmental Assessment for the proposed use has been approved under Provincial or Federal legislation. In addition, the new Niagara Official Plan (2022) permits activities that create or maintain infrastructure authorized under an environmental assessment, including a Class Environmental Assessment, completed in accordance with the Environmental Assessment Act. This Environmental Impact Study was completed as part of the Municipal Class Environmental Assessment for improvements to Merritt Road and Rice Road. The Municipal Class Environmental Assessment is an approved process under Ontario’s Environmental Assessment Act. Lastly, in accordance with Policy 5.1.4.1, the proposed road improvements were recommended in accordance with Niagara Region’s Complete Streets Design Guidelines to ensure the needs and safety of all road users.

3.3.2 Draft Niagara Indigenous Action Plan

The Niagara Region is committed to meaningful and authentic engagement with the Indigenous Communities to ensure consultation on land use planning and capital works projects (projects, such as this one). The Niagara Region has developed a draft consultation document for the Niagara Indigenous Action Plan (2022). The purpose of this action plan is *“to work towards reconciliation between Niagara Region and First Nations, Métis and Inuit communities”* (Niagara Region, 2022). This action plan identifies five priority areas, each with one goal and multiple actions:

- Advocacy and allyship
- Relationship building
- Education and awareness
- Recruitment and retention
- Service delivery

These priority areas, and associated goals and actions relate to [Truth and Reconciliation Commission of Canada’s Calls to Action](#); [National Inquiry into Missing and Murdered Indigenous Women and Girls’ Calls for Justice](#), or recommendations from Niagara Chapter-Native Women Inc.’s [Creating our way Forward](#), or [Mno Bmaadziwin](#).

The following priority areas and associated goals and actions are of close relevance to this project:

Table 3-1: Draft Niagara Indigenous Action Plan Priority Areas and Action Items

Priority Area	Goal	Action Description
Advocacy and Allyship Goal	Meaningfully advance the interests of Indigenous communities by listening to and taking direction from community itself.	A5. Implement process for consultation with Indigenous communities, including First Nations, to advocate to provincial and federal officials regarding issues that impact Indigenous communities and governments.
Service Delivery	Service delivery that is culturally appropriate, inclusive, fair, equitable, and accessible – reflects no bias or racism towards Indigenous Peoples.	E3. Engage with Indigenous leadership and communities when establishing or reviewing programs.

To meet the requirements for consultation with Indigenous Communities, the Niagara Region has undertaken the following activities to provide the Indigenous Communities with engagement opportunities for this Class EA Study:

- Distribution of Study notices and follow-ups at key project milestones.
- Execution of agreements to provide capacity/funding assistance to the Indigenous Communities to participate in and monitor the environmental and archaeological field assessments and review of associated reports. This was to ensure that Indigenous Communities' perspectives and priorities are considered, and to enable the Indigenous Communities to provide timely and meaningful comment on the Project.
- Invitations to participate in and monitor the environmental and archaeological field assessments.
- Distribution of project reports for review and comments.
- The above outlined activities were undertaken with the following communities:
 - Mississaugas of the Credit First Nation (MCFN),
 - Six Nations of the Grand River (SNGR),
 - Haudenosaunee Confederacy Chiefs Council, as represented by the Haudenosaunee Development Institute (HDI).

A detailed record of consultation with the Indigenous Communities is provided in Section 5.5 and Section 5.6.1 of this report.

3.3.3 Complete Streets Design Manual

The Complete Streets Design Manual (CSDM) (2023) is a design directive for complete streets on the Regional roadway network. It provides Regional staff and practitioners guidance on how to design, implement, and maintain complete streets. Design practice included in the CSDM is based off best practices and updated standards included in the Transportation Association of Canada Geometric Design Guidelines for Canadian Roads and Ontario Traffic Manual.

Regional Road Typologies provide a Complete Streets classification system for roads in the Region with context sensitive planning and design direction. Typologies act as an additional layer to the functional roadway classification system. The typologies reflect aspirational visions for Regional roads and planned rights-of-way. Each typology reflects common operational characteristics, land use, built form and urban design attributes. The typologies included in the CSDM build off the foundational typologies included in the Niagara TMP – Complete Streets Guidelines.

The six original road typologies developed as part of the 2017 TMP were reviewed and refined. Typologies were refined based on principles and values of complete streets, vision zero and other emerging planning and design principles. Regional roads are classified into Main Street, Urban General, Urban Thoroughfare, Rural Thoroughfare, Rural Scenic and Hamlet typologies. The text below provides descriptions of typologies that are relevant to this project.

Rural Scenic Cross Section

Rural Scenic roadways serve a mobility and tourism function with an emphasis on cycling. Many Rural Scenic streets are in agricultural or natural areas throughout the Region, such as adjacent to wineries or along the escarpment. These streets provide an opportunity to enhance cycle tourism throughout the Region. These streets have moderate target speeds and low vehicle volumes. Rural Scenic characteristics include 26.2 meter ROW, 50 – 60 kilometres per hour target speed (50 kilometres per hour typical), maximum 2 travel lanes (median not required), and on-street parking is restricted. A cross-section of this typology is provided in Figure 3-1. This typology was adopted for Segment 1 (Merritt Road from Rice Road to Cataract Road).

Urban General Cross Section

Urban General streets are traditionally found within the Region's largest, mixed-use urban centres. These streets may be within existing and future built-up areas that reflect balanced mobility and place-making priorities. These streets often serve commercial retail and service businesses, connect through residential neighbourhoods within communities and carry medium to large volumes of all modes. Urban General characteristics include 26.2 – 30.5 meter ROW, 40 – 50 kilometres per hour target speed, and typical three-lane configuration, with two-way left turn lane. (Alternative configurations ranging from two to five lanes may be considered.) A cross-section of this typology is provided in Figure 3-2. This typology was adopted for Segment 2 (Merritt Road from Cataract Road to Merrittville Highway/Niagara Street); Segment 3 (Merritt Road from Merrittville Highway / Niagara Street to Highway 406) and Segment 4 (Rice Road from 200 metres north of Merritt Road to Quaker Road).

Figure 3-1: Rural Scenic Cross Section - Complete Streets Design Manual

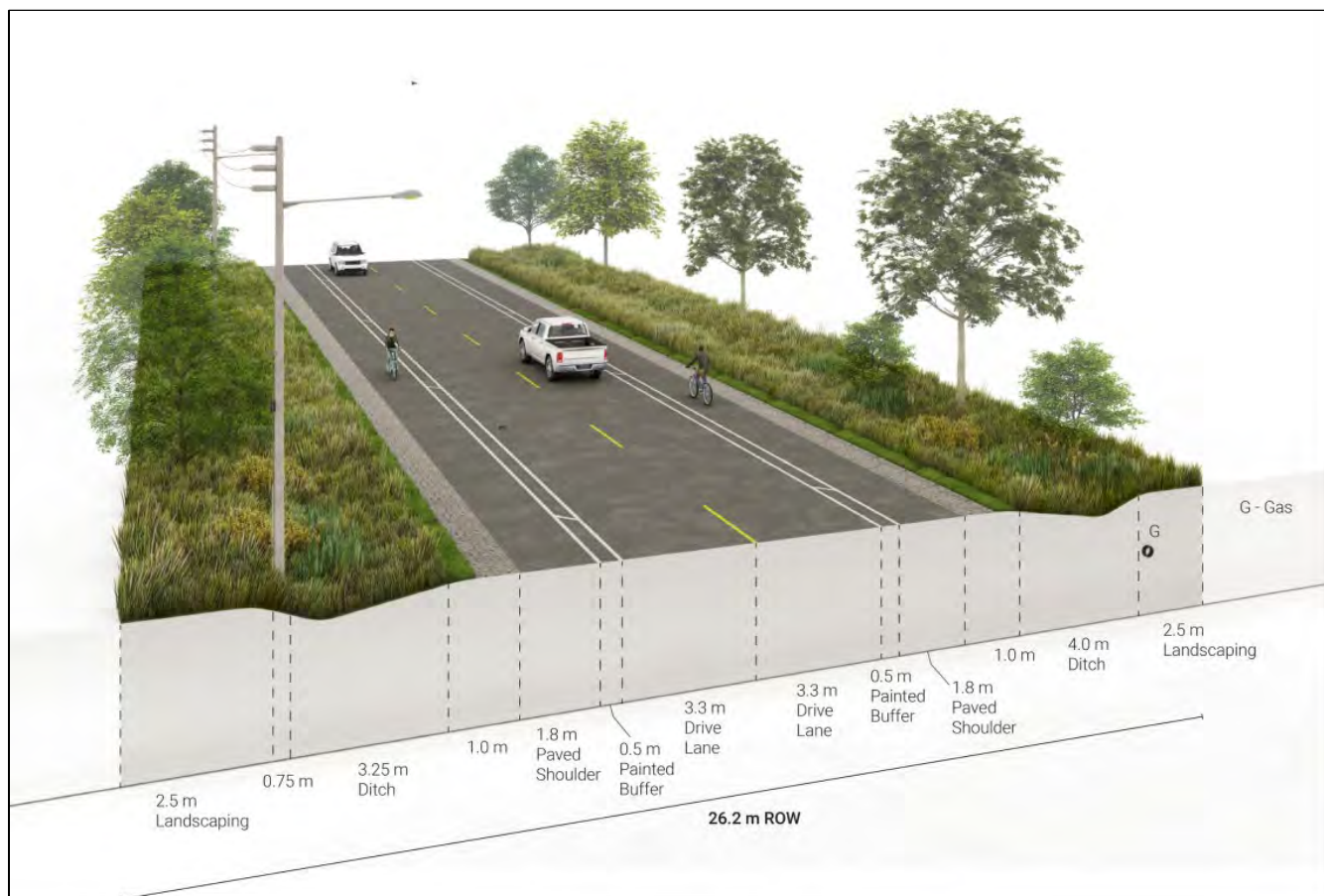
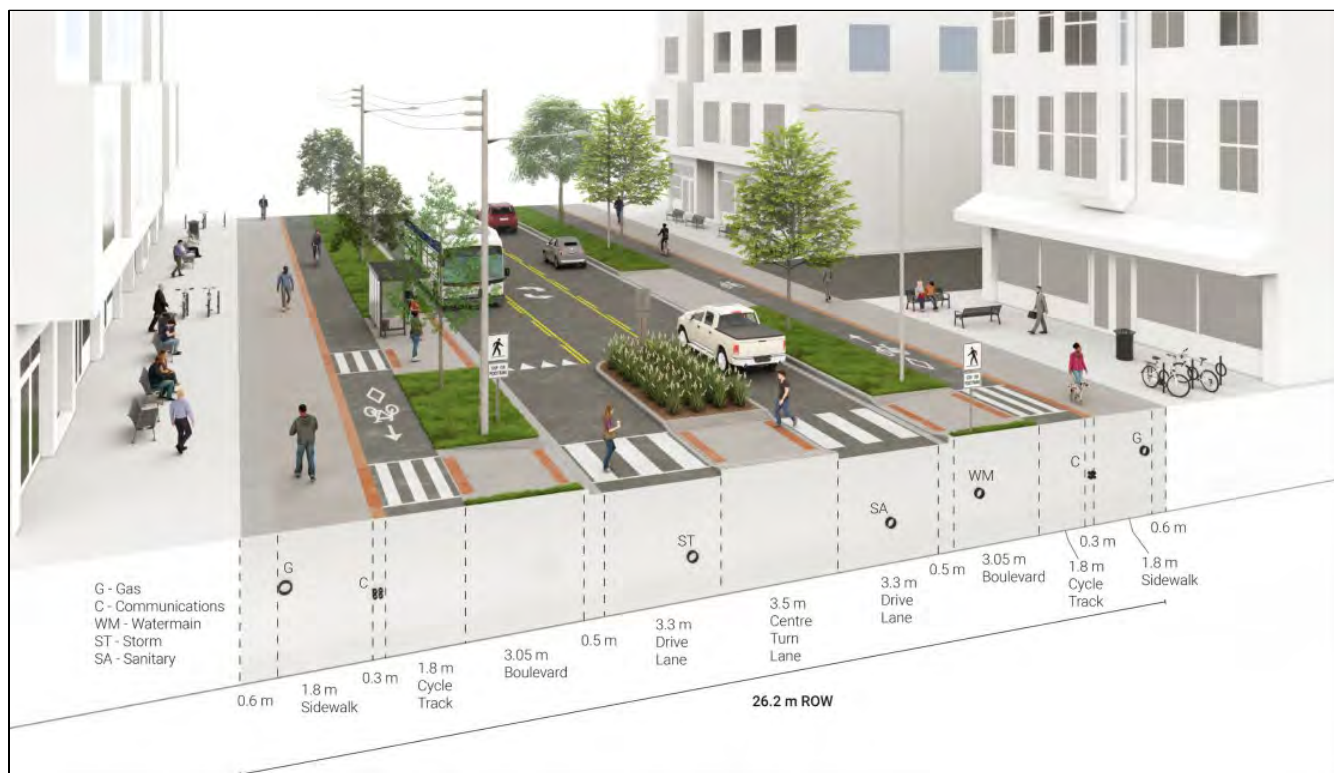


Figure 3-2: Urban General Cross Section - Complete Streets Design Manual



4 Existing and Future Conditions

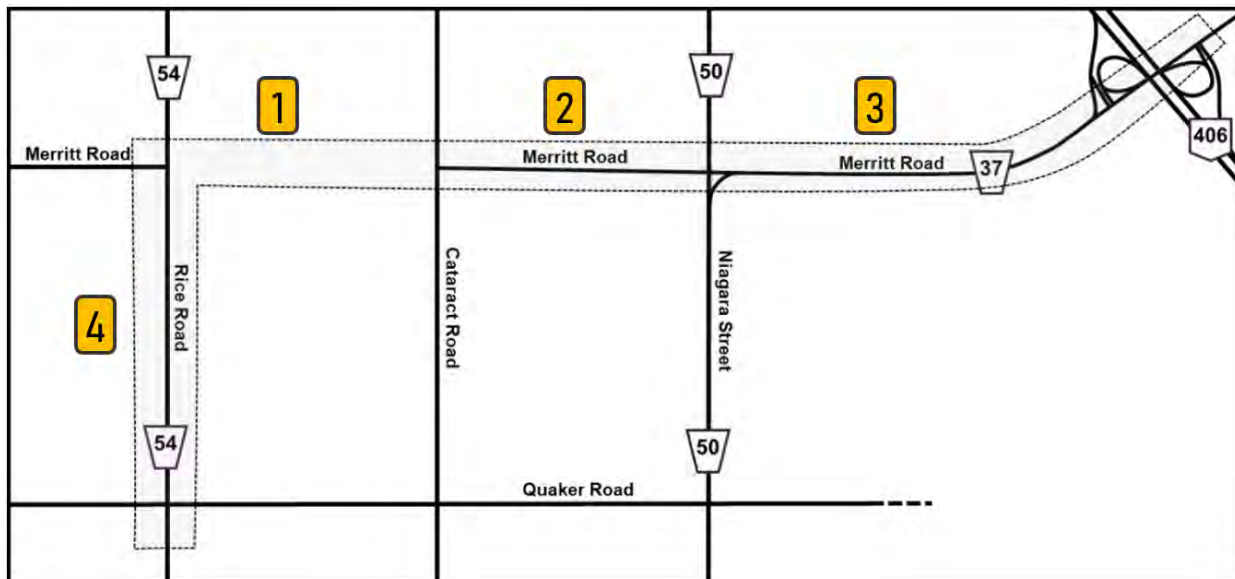
4.1 Transportation Infrastructure

4.1.1 Existing Roadways

As discussed previously, for the purpose of this study, the subject roadways were divided into the following four road segments (as shown in Figure 4-1):

- Segment 1: Merritt Road between Rice Road and Cataract Road
- Segment 2: Merritt Road between Cataract Road and Merrittville Highway / Niagara Street
- Segment 3: Merritt Road between Merrittville Highway / Niagara Street and Highway 406
- Segment 4: Rice Road between 200 metres north of Merritt Road and Quaker Road

Figure 4-1: Existing Roadway Network



Segment 1 – Merritt Road from Rice Road to Cataract Road

This road segment spans an approximate distance of 800 metres in an east-west direction with an approximate right-of-way width of 20 metres. The 200 metres long section of this segment to the east of Rice Road (Regional Road 54) is located within the jurisdiction of the Town of Pelham, while the other 600 metres long segment is located within the jurisdiction of the City of Thorold. This corridor presently functions as an unopened road allowance (meaning that there is currently no existing roadway). Segment 1 is currently under the ownership of the Town of Pelham and the City of Thorold. Following the completion of the Class EA Study, the ownership will need to be transferred to the Niagara Region. There are low-voltage hydro-electric power timber poles running the length of the corridor along the north side.

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To the west of Rice Road, Merritt Road extends approximately 1.20 kilometres where it ends at Pelham Street. The Steve Bauer Trail crosses Merritt Road approximately 831 metres to the west of Rice Road, outside of the Study Area. In a larger geographic context, Port Robinson Road runs parallel to this road segment on the north and Quaker Road runs parallel to this segment on the south side. Photographs of this road segment are provided below.

Figure 4-2: Looking easterly towards Merritt Road Segment 1



Figure 4-3: Looking westerly towards Merritt Road Segment 1



Segment 2 – Merritt Road from Cataract Road to Merrittville Highway / Niagara Street

This road segment spans an approximate distance of 800 metres in an east-west direction with an approximate right-of-way width of 20 metres. This segment is located entirely within the jurisdiction of the City of Thorold. This corridor presently functions as a two-lane, rural, local, undivided roadway with a posted speed limit of 50 kilometres per hour and a five-tonne load restriction. There are no sidewalks or bike lanes for pedestrians and cyclists along this segment. In a larger geographic context, Port Robinson Road runs parallel to this road segment on the north and Quaker Road runs parallel to this segment on the south side. Photographs of this road segment are provided below.

Figure 4-4: Looking easterly towards Merritt Road Segment 2



Figure 4-5: Looking westerly towards Merritt Road Segment 2



Note pedestrian's use of vehicular traffic lanes due the lack of sidewalk(s).

Segment 3 – Merritt Road from Merrittville Highway / Niagara Street to Highway 406

The segment of Merritt Road between Merrittville Highway / Niagara Street and Highway 406 spans an approximate distance of 1.60 kilometres in an east-west direction with an approximate right-of-way width of 30 metres. The 400 metres long section of this road segment to the east of Merrittville Highway / Niagara Street is located within the jurisdiction of the City of Welland, whilst the other 1.20 kilometres long segment to the east is located within the jurisdiction of the City of Thorold. This corridor presently functions as a two-lane, rural, arterial, undivided roadway with a posted speed limit of 60 kilometres per hour. There are no sidewalks or bike lanes for pedestrians and cyclists along this segment.

This road segment is intersected by Eastman Gateway approximately 580 metres to the east of Merrittville Highway / Niagara Street. Eastman Gateway is a local road which provides access to Merritt Meadows subdivision, located on the south side of Segment 3. This road segment is intersected by Grisdale Road approximately 1 kilometre to the east of Merrittville Highway / Niagara Street. Grisdale Road is a local road, which provides access to Towpath Road, which turns into Quaker Road to the west. Grisdale Road is under the ownership of Niagara Region, however, in future there is potential for ownership transfer of this segment to the City of Thorold. East of Grisdale Road, this segment continues across Highway 406 overpass and end at Kottmeier Road.

In a larger geographic context, Port Robinson Road runs generally parallel to this road segment on the north and Merritt Meadows subdivision to the south. To the east of Highway 406, Merritt Road extends approximately 185 metres, where it ends at Kottmeier Road. Photographs of this road segment are provided below.

Figure 4-6: Looking easterly towards Merritt Road Segment 3



Figure 4-7: Looking westerly towards Merritt Road Segment 3



Figure 4-8: Looking easterly towards Highway 406 Interchange / Overpass Segment 3



Segment 4 – Rice Road from 200 metres north of Merritt Road to Quaker Road

The segment of Rice Road between 200 metres north of Merritt Road and Quaker Road spans an approximate distance of 1.20 kilometres with an approximate right-of way width of 20 metres. The 735 metres long northerly section of this road segment is located within the jurisdiction of the Town of Pelham, whilst the other 465 meters long segment to the south is located within the jurisdiction of the City of Welland. There are no sidewalks or bike lanes for pedestrians and cyclists along this segment.

This corridor presently functions as a two-lane, rural, arterial, undivided roadway with a posted speed limit of 60 kilometres per hour within the limits of Town of Pelham, and 50 kilometres per hour within the limits of City of Welland. Approximately 200 metres to the north of Merritt Road, the Rice Road transitions from the aforementioned cross-section to a recently reconstructed two-lane, rural, arterial, undivided roadway with paved shoulders during a previous capital works project undertaken by Niagara Region. In a larger geographic context, Line Avenue and the Steve Bauer Trail run parallel to this road segment on the west side.

Figure 4-9: Looking northerly towards Rice Road Segment 4



Figure 4-10: Looking southerly towards Rice Road Segment 4



Note pedestrians' use of vehicular gravel shoulder due the lack of sidewalk(s).

Table 4-1: Summary of Characteristics of Road Segments within the Study Area

Road Segment	Road Characterization	Existing Right-of-Way	Ultimate Right-of-Way	Posted Speed Limit
Segment 1 - Merritt Rd from Rice Rd to Cataract Rd	Unopened road allowance	20 m	26 m ¹	N/A
Segment 2 – Merritt Rd from Cataract Rd to Niagara St	2 lanes, rural, local, undivided roadway	20 m	26 m ²	50 km/h
Segment 3 – Merritt Rd from Niagara St to Hwy 406	2 lanes, rural, arterial, undivided roadway	30 m	35 m ²	60 km/h
Segment 4 – Rice Rd from Merritt Rd to Quaker Rd	2 lanes, rural, arterial, undivided roadway	20 m (from Quaker Rd to Rosewood Crst) 23 m (from Rosewood Crst to Merritt Rd)	26.2 m ²	60 km/h (Town of Pelham portion) 50 km/h (City of Welland portion)

4.1.2 Street Lighting

There are no streetlights located along Segments 1 and 2, whereas Segment 3 includes streetlights at the intersection of Merritt Road and Niagara Street and on Merritt Road, east of Grisdale Road. In addition, there are some streetlights located along Segment 4.

4.2 Existing and Future Traffic Conditions

A transportation assessment was completed to determine the existing traffic conditions for the existing (base year) and future conditions (horizon years). 2020 was established as the base year (this is when the Class EA Study was initiated), and years 2031 and 2041 were established as future horizon years. The following two scenarios were analyzed for each of the future (2031 and 2041) horizon years:

Scenario 1 – Do Nothing

In this scenario, the traffic assessments were undertaken based on 2031 and 2041 traffic forecasts on the existing road network. The assessments were completed assuming that no improvements were implemented for either future horizon year (i.e., no capacity improvements

1 City of Thorold Official Plan (2016)

2 Niagara Region Official Plan (2022)

were undertaken, and Merritt Road was not extended to provide a connection between Cataract Road and Rice Road).

Scenario 2 – With Improvements

In Scenario 2, the traffic assessments for 2031 and 2041 horizon years were undertaken on the modified road network assuming the implementation of proposed improvements for each horizon year. The proposed improvements included the Merritt Road extension between Rice Road and Cataract Road, intersection control modifications, and geometric improvements along the corridor.

As part of the transportation assessment, a roadway capacity analysis, a multi-modal assessment, and an intersection capacity analysis was completed. The roadway capacity performance metric was the volume-to-capacity (v/c) ratio, and the intersection operations performance metrics were reported in terms of Level of Service (LOS), delays, 95th percentile queue length and v/c ratios.

The Transportation Assessment Report is provided in Appendix A, and a summary of findings is provided in the subsections below.

4.2.1 Existing Conditions (2020) Assessment

4.2.1.1 Existing Travel Demand

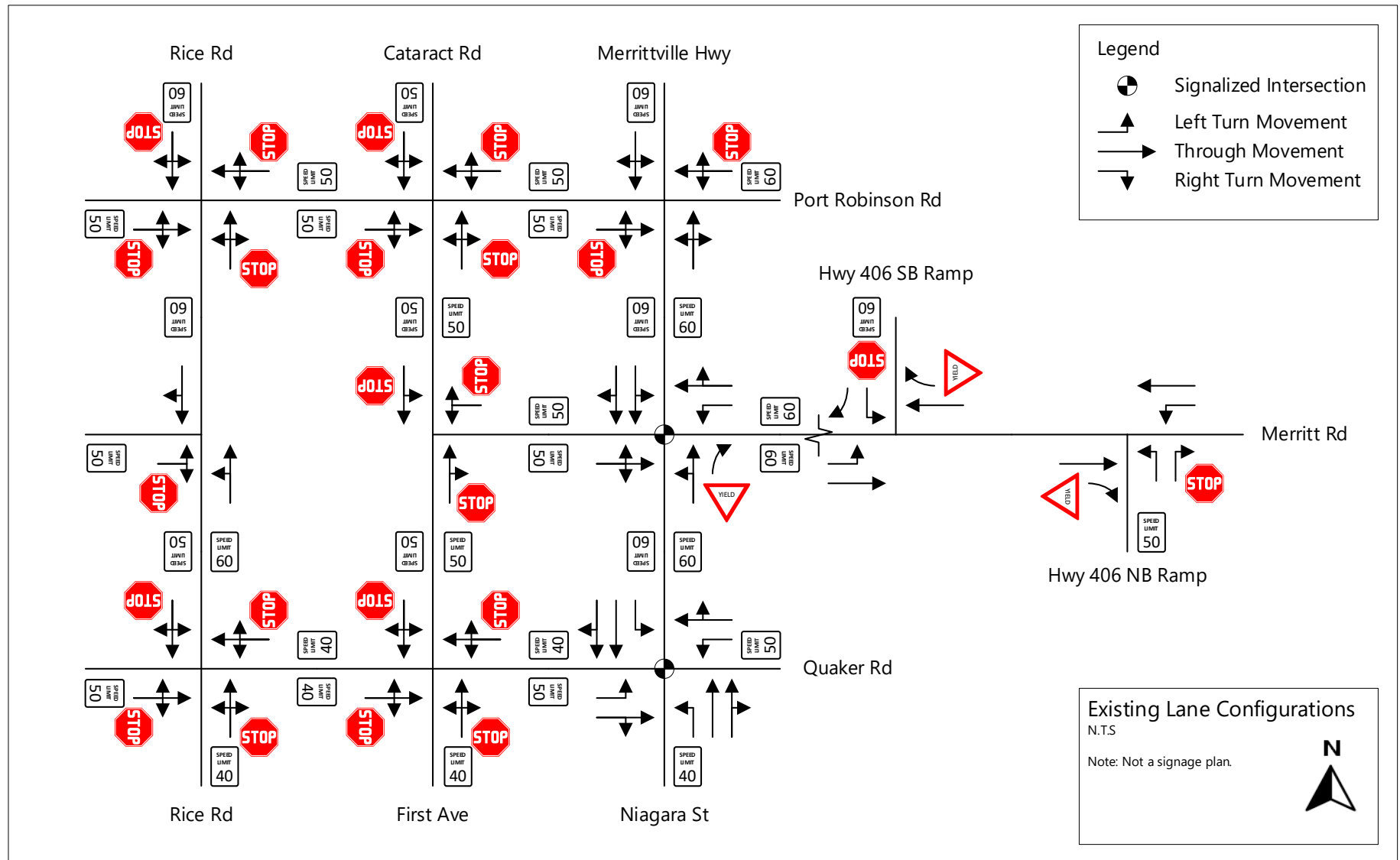
The existing (2020) lane configurations and intersection controls were reviewed using Google Maps, Google Earth, Bing Maps, and Google Street View, as illustrated in Figure 4-11. The existing (2020) balanced traffic volumes are presented in Figure 4-12. Note that since the count data preceded signalization of Rice Road and Port Robinson Road, the existing conditions analysis considered this intersection as all-way stop controlled.

A review of the turning movement counts shows a heavy traffic flow between the Highway 406 ramps (to and from the north), along Merritt Road between the ramps and Merrittville Highway/Niagara Street, along Niagara Street south to Quaker Road and to a lesser degree along Quaker Road. This highlights the importance of this corridor in carrying traffic between Highway 406 (and points north) and the City of Welland.

Rice Road is another key gateway into the study area, carrying a sizable amount of traffic between Highway 20 and the City of Welland.

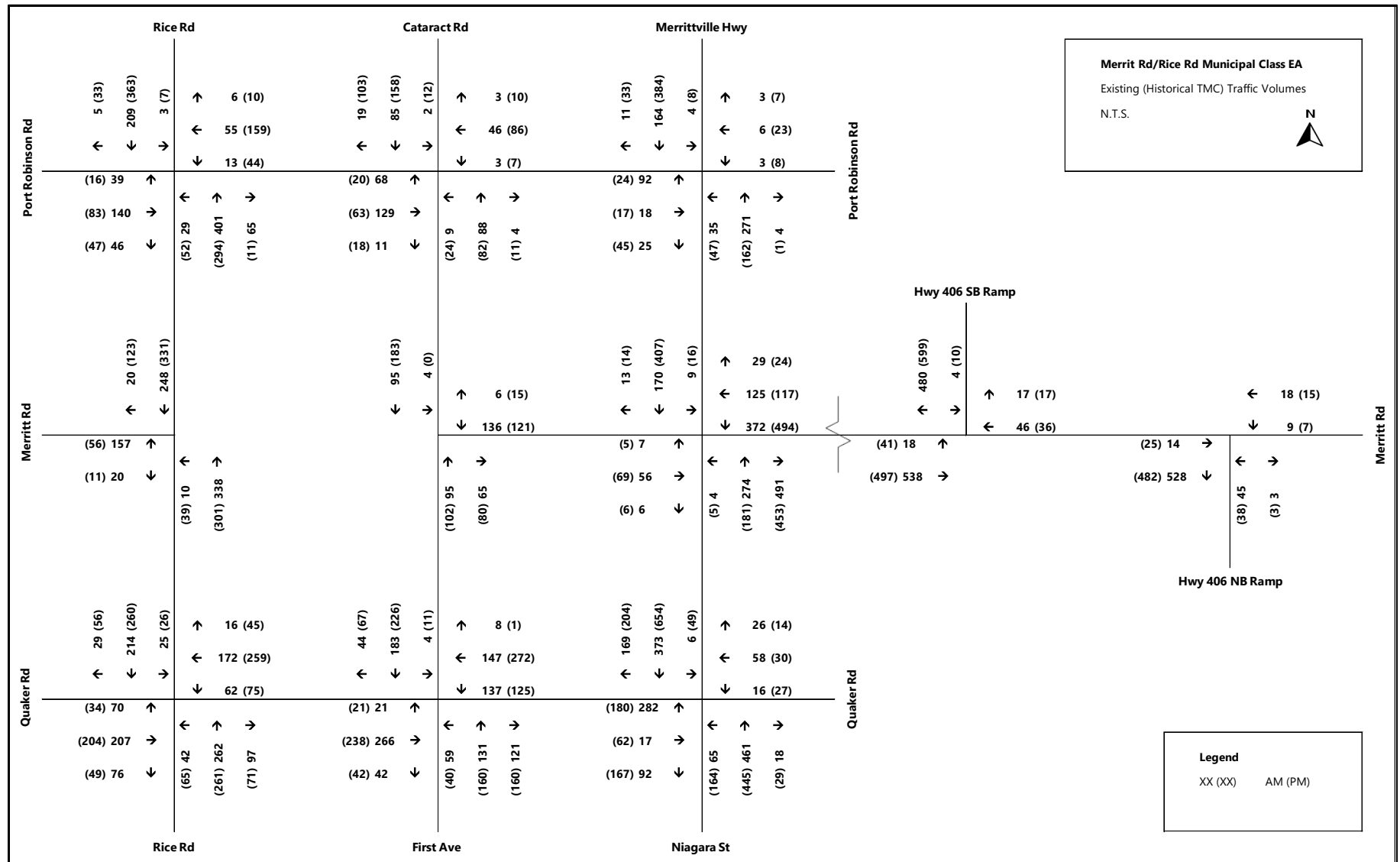
In contrast, Port Robinson Road, which does not have a direct connection to Highway 406, does not carry significant traffic. Merritt Road west of Merrittville Highway/Niagara Street also does not carry significant traffic.

Figure 4-11: Existing (2020) Lane Configurations



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Figure 4-12: Existing (2020) Traffic Volumes



4.2.1.2 Existing (2020) Conditions Link Capacity Analysis

The results summarized in Table 4-2 and Table 4-3 indicate that all the links operate well below capacity under existing conditions. The lane capacity for rural roads within the study area is assumed to be 850 vehicles per hour per lane, with the exception of the Merritt Road from Cataract Road to Merrittville Highway (i.e., Segment 2) due to its cross-section. This segment is a narrow road with speed humps and a lane capacity of 500 Vehicles per hour per lane.

The findings of the assessment indicated that under existing conditions, all links are operating well below capacity, with no volume to capacity ratios above the critical threshold of 0.85.

Table 4-2: Link Capacity Analysis – Existing (2020) AM Peak Hour

Segment	Direction	# Of Lanes	Total Capacity (Vehicle/Hour/lane)	Volume (Vehicle/Hour)	Volume to Capacity Ratio (V/C)
Merritt Road (East of Niagara Street / Merrittville Highway)	EB	1	850	556	0.65
Merritt Road (East of Niagara Street/Merrittville Highway)	WB	1	850	526	0.62
Merritt Road (East of Cataract Road)	EB	1	500	69	0.14
Merritt Road (East of Cataract Road)	WB	1	500	142	0.28
Rice Road (North of Quaker Road)	NB	1	850	348	0.41
Rice Road (North of Quaker Road)	SB	1	850	268	0.32
Rice Road (North of Merritt Road)	NB	1	850	495	0.58
Rice Road (North of Merritt Road)	SB	1	850	268	0.32

Table 4-3: Link Capacity Analysis – Existing (2020) PM Peak Hour

Segment	Direction	# Of Lanes	Total Capacity (Vehicle/Hour/lane)	Volume (Vehicle/Hour)	Volume to Capacity Ratio (V/C)
Merritt Road (East of Niagara Street / Merrittville Highway)	EB	1	850	538	0.63
Merritt Road (East of Niagara Street/Merrittville Highway)	WB	1	850	635	0.75
Merritt Road (East of Cataract Road)	EB	1	500	80	0.16
Merritt Road (East of Cataract Road)	WB	1	500	136	0.27
Rice Road (North of Quaker Road)	NB	1	850	340	0.40
Rice Road (North of Quaker Road)	SB	1	850	342	0.40
Rice Road (North of Merritt Road)	NB	1	850	357	0.42
Rice Road (North of Merritt Road)	SB	1	850	454	0.53

4.2.1.3 Existing (2020) Conditions Intersection Capacity Analysis

As summarized in Table 4-4 and Table 4-5, the signalized intersections operate at an acceptable level of operations.

In addition, the ramp terminals of Highway 406 with Merritt Road operate acceptably with no volume to capacity ratios above MTO thresholds for critical movements. For the unsignalized intersections shown in Table 4-6 through Table 4-14, the northbound movements at Rice Road at Port Robinson Road, all movements at Rice Road at Quaker Road, and at Quaker Road at Cataract Road – First Avenue operate at LOS D or worse in the weekday morning and/or afternoon peak hours. The aforementioned critical movements are illustrated in Figure 4-13.

The intersection at Merrittville Highway at Port Robinson Road is modelled with a highly conservative PHF; the results should be interpreted as such.

Table 4-4: Existing 2020 Signalized Intersection Operations (Niagara St/Merrittville Hwy and Merritt Rd)

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.22	22.7	C	18	0.26	21.9	C	18	832
WBL	0.63	15.8	B	55	0.70	15.2	B	#66	65
WBTR	0.27	11.0	B	22	0.20	8.2	A	17	1297
NBLT	0.54	19.7	B	49	0.44	20.7	C	34	1026
NBR	0.37	0.7	A	0	0.35	0.7	A	0	1026
SBLTR	0.21	13.6	B	15	0.57	20.3	C	35	1027
Overall	-	-	B	-	-	-	B	-	-

Notes

#: 95th percentile volume exceeds capacity, queue may be longer

Table 4-5: Existing 2020 Signalized Intersection Operations (Niagara St and Quaker Rd)

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBL	0.61	25.0	C	#74	0.75	46.3	D	53	80
EBTR	0.17	6.0	A	12	0.58	18.2	B	36	825
WBL	0.04	15.4	B	6	0.16	27.3	C	11	30
WBTR	0.13	12.3	B	16	0.13	19.5	B	13	481
NBL	0.23	12.7	B	11	0.51	13.1	B	25	75

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
NBTR	0.48	18.9	B	44	0.35	13.6	B	42	404
SBL	0.02	10.3	B	2	0.12	7.6	A	9	65
SBTR	0.74	26.9	C	48	0.85	29.3	C	97	1026
Overall	-	-	C	-	-	-	C	-	-

Notes

#: 95th percentile volume exceeds capacity, queue may be longer

Table 4-6: Existing 2020 Unsignalized Intersection Operations (Merritt Rd and Hwy 406 SB Ramp)

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBL	0.01	7.4	A	0	0.03	7.3	A	1	100
EBT	0.39	0	-	0	0.30	0	-	0	1297
WBT	0.03	0	-	0	0.02	0	-	0	340
WBR	0.01	0	-	0	0.01	0	-	0	210
SBL	0.58	13.4	B	29	0.60	13.6	B	14	574
SBR	-	-	-	-	-	-	-	-	150

Table 4-7: Existing 2020 Unsignalized Intersection Operations (Merrittville Hwy and Port Robinson Rd)

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.46	22.4	C	18	0.23	16.7	C	7	834
WBLTR	0.04	15.0	B	1	0.13	17.9	C	3	681
NBLTR	0.04	1.2	A	1	0.05	2.2	A	1	1027
SBLTR	0	0.2	A	0	0.01	0.2	A	0	497

Table 4-8: Existing 2020 Unsignalized Intersection Operations (Cataract Rd and Port Robinson Rd)

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.30	9.7	A	-	0.15	9.0	A	-	839
WBLTR	0.08	8.4	A	-	0.16	9.2	A	-	838
NBLTR	0.15	8.6	A	-	0.17	8.8	A	-	991
SBLTR	0.15	8.6	A	-	0.37	10.1	B	-	524

Table 4-9: Existing 2020 Unsignalized Intersection Operations (Cataract Rd and Merritt Rd)

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
WBLR	0.20	8.9	A	-	0.20	9.2	A	-	832
NBTR	0.20	8.3	A	-	0.23	8.6	A	-	1030
SBLT	0.14	8.3	A	-	0.25	9.0	A	-	991

Table 4-10: Existing 2020 Unsignalized Intersection Operations (First Ave/Cataract Rd and Quaker Rd)

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.77	31	D	-	0.88	51.0	F	-	822
WBLTR	0.71	27.2	D	-	1.15	123.4	F	-	825
NBLTR	0.73	27.7	D	-	0.99	71.0	F	-	402
SBLTR	0.57	20.5	C	-	0.87	49.5	E	-	1030

Table 4-11: Existing 2020 Unsignalized Intersection Operations (Rice Rd and Port Robinson Rd)

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.42	13.6	B	-	0.28	12.4	B	-	431
WBLTR	0.15	11.0	B	-	0.41	14.3	B	-	839
NBLTR	0.79	25.8	D	-	0.63	18.7	C	-	1037
SBLTR	0.38	12.5	B	-	0.69	21.1	C	-	467

Table 4-12: Existing 2020 Unsignalized Intersection Operations (Rice Rd and Merritt Rd)

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLR	0.49	21.8	C	20	0.25	20.0	C	7	435
NBLT	0.01	0.3	A	0	0.04	1.4	A	1	1037
SBTR	0.18	0	-	0	0.31	0.0	-	0	1037

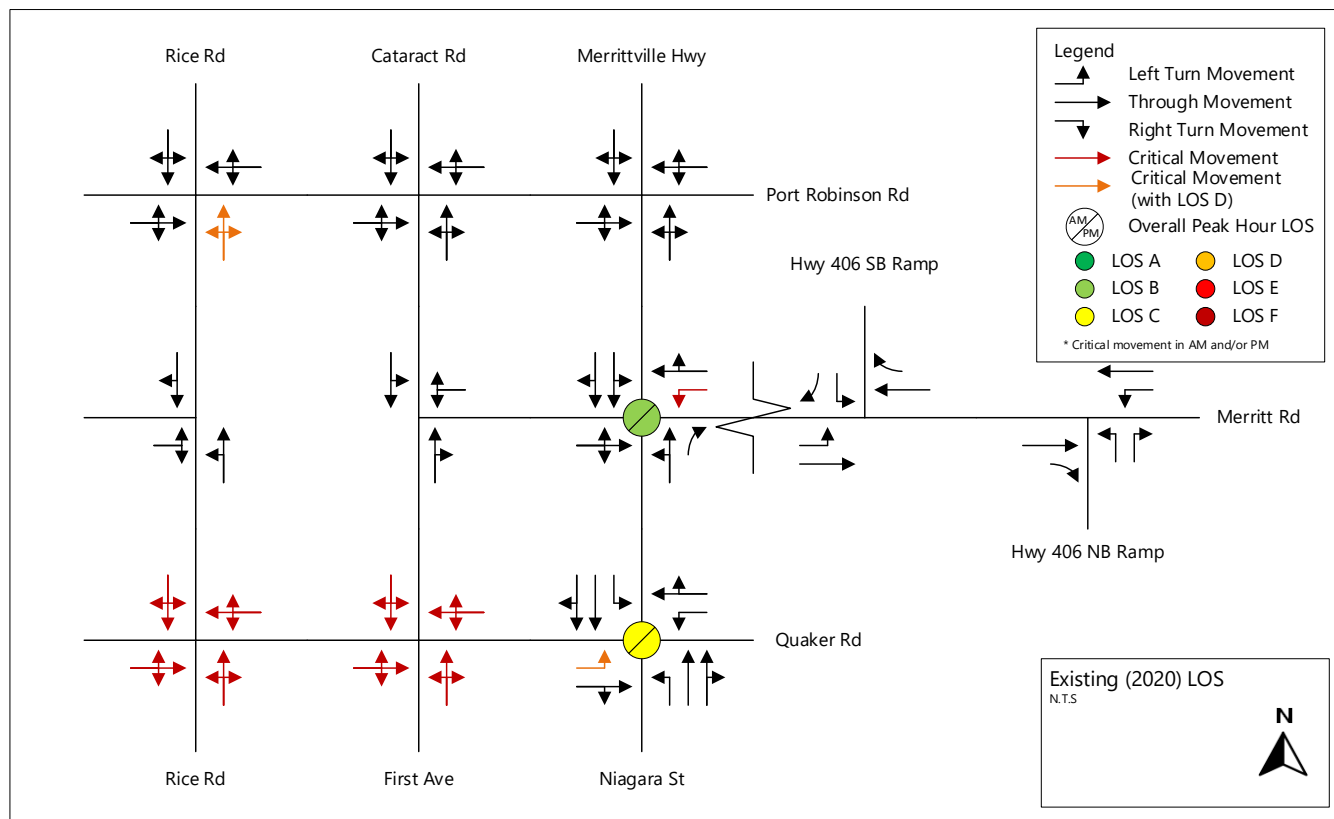
Table 4-13: Existing 2020 Unsignalized Intersection Operations (Rice Rd and Quaker Rd)

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.90	50.5	F	-	0.80	41.3	E	-	441
WBLTR	0.68	28.5	D	-	1.00	75.7	F	-	822
NBLTR	0.99	67.6	F	-	1.07	96.9	F	-	400
SBLTR	0.71	30.3	D	-	0.92	58.8	F	-	1037

Table 4-14: Existing 2020 Unsignalized Intersection Operations (Hwy 406 NB Ramp and Merritt Rd)

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBT	0.01	0	-	-	0.02	0.0	-	-	340
EBR	0.35	0	-	-	0.34	0.0	-	-	200
WBL	0.01	7.2	A	-	0.01	7.3	A	-	65
WBT	0.01	0	-	-	0.01	0.0	-	-	198
NBL	0.05	9	A	-	0.05	9.1	A	-	501
NBR	-	-	-	-	-	-	-	-	180

Figure 4-13: Existing 2020 Intersection Operation Conditions



4.2.2 Future (2031) Assessment

To evaluate the impacts of constructing Merritt Road between Rice Road and Cataract Road, future conditions with no road network improvements and with the road construction and other road network improvements were analyzed. The analysis included separate traffic forecasts for the two network options, road link capacity analysis, traffic signal warrant analysis and intersection capacity analysis. The scenario with no improvements is referred to as Scenario 1 and the scenario with improvements is referred to as Scenario 2.

Under Scenario 1, the assessment for the 2031 horizon year was undertaken on the existing (2020 base year) road network, assuming that no improvements were implemented (i.e., no capacity improvements were undertaken, and Merritt Road was not extended to provide a connection between Cataract Road and Rice Road. This scenario was evaluated to determine how well the existing road network could accommodate the forecasted traffic volumes for 2031 horizon year and identify any deficiencies in the existing road network. Therefore, the road network and lane configurations are consistent with the existing conditions, as illustrated previously in Figure 4-11.

Under scenario 2, the assessment for the 2031 horizon year was undertaken on the modified road network, assuming the inclusion of the Merritt Road extension along Segment 1 and the implementation of signalized and unsignalized intersection control modifications, geometric

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improvements, and signalization where other network improvements would not suffice. To prioritize pedestrian and cyclist safety, it was agreed that the channelized right turns would be removed (at the intersection of Merritt Road / Merrittville Highway – Niagara Street) and replaced with a right turn lane at the stop bar. For the same reason, channelized right turn lanes were not considered for other intersections. For the unsignalized intersections with critical movements, geometric improvements such as adding left turn lanes were tested to address critical movements.

4.2.2.1 2031 Future Traffic Demand – Scenario 1

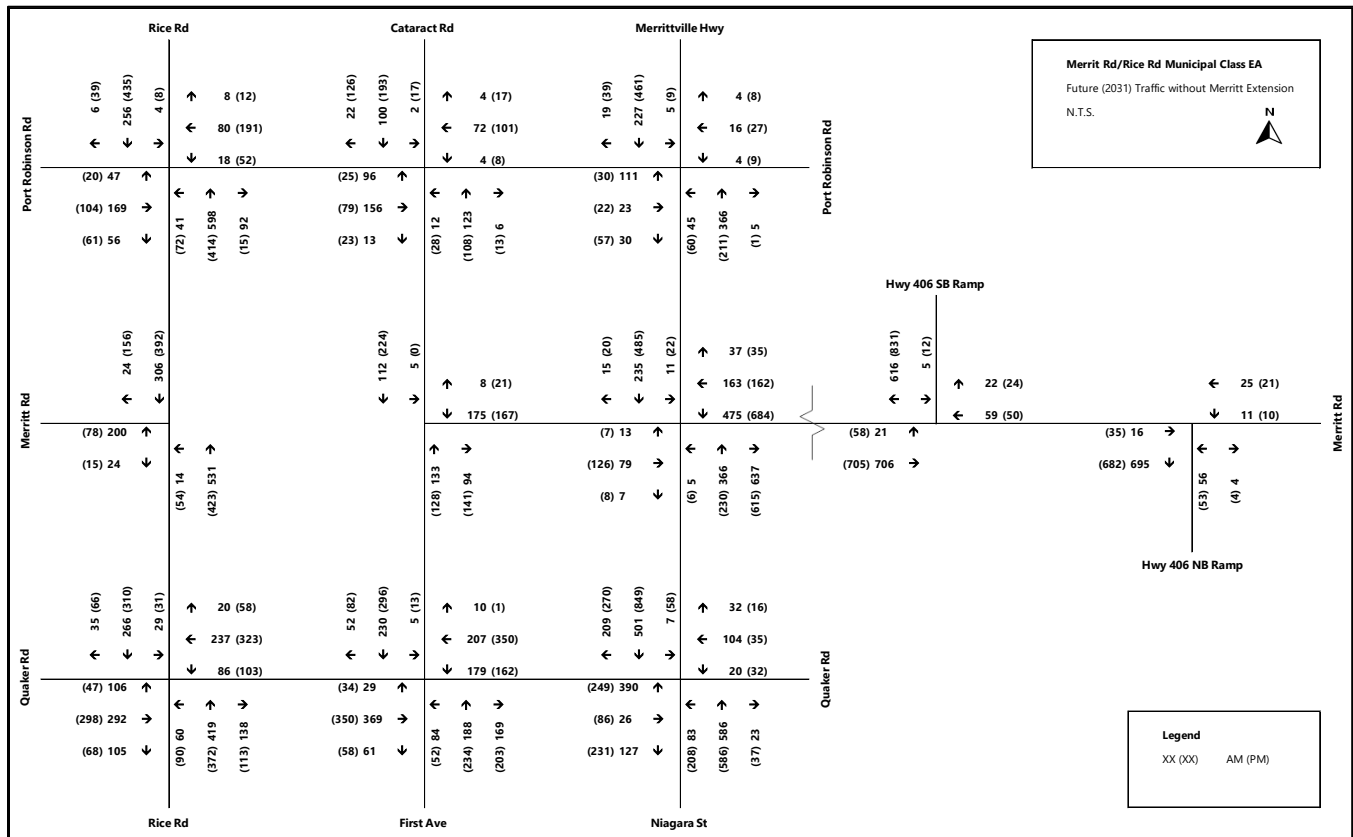
The following table shows the specific annual growth rates applied for each road segment by direction of travel and time of day. The forecasted traffic volumes are illustrated in Figure 4-14.

Table 4-15: Annual Growth Rates (Existing to 2031) – Scenario 1

Segment	AM	PM
Eastbound		
Port Robinson Road	1.7%	2.1%
Merritt Road	1.5%	3.0%
Quaker Road	3.0%	3.0%
Westbound		
Port Robinson Road	3.0%	1.5%
Merritt Road	2.2%	3.0%
Quaker Road	1.9%	1.5%
Northbound		
Rice Road	3.2%	3.0%
Cataract Road	3.0%	1.5%
Niagara Street	2.2%	2.2%
Southbound		
Rice Road	1.5%	1.5%
Cataract Road	1.5%	1.9%
Niagara Street	1.5%	2.0%

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Figure 4-14: Future (2031) Traffic Volumes (Scenario 1)



2031 Conditions Link Capacity Analysis – Scenario 1

The results summarized in Table 4-16 and Table 4-17 demonstrate that the following are expected to approach or exceed capacity by 2031.

- Merritt Road east of Niagara Street/Merrittville Highway in the eastbound direction during the weekday morning peak hour
- Rice Road north of Merritt Road in the northbound direction during the weekday morning peak hour
- Merritt Road east of Niagara Street/Merrittville Highway in the eastbound direction during the weekday afternoon peak hour
- Merritt Road east of Niagara Street/Merrittville Highway in the westbound direction during the weekday afternoon peak hour

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Table 4-16: 2031 Link Capacity Analysis – Scenario 1 – AM Peak Hour

Segment	Direction	# Of Lanes	Total Capacity (Vehicle / Hour/lane)	Volume (Vehicle/Hour)	Volume to Capacity Ratio (V/C)
Merritt Road (East of Niagara Street/Merrittville Highway)	EB	1	850	727	0.86
Merritt Road (East of Niagara Street/Merrittville Highway)	WB	1	850	675	0.79
Merritt Road (East of Cataract Road)	EB	1	500	99	0.20
Merritt Road (East of Cataract Road)	WB	1	500	183	0.37
Rice Road (North of Quaker Road)	NB	1	850	545	0.64
Rice Road (North of Quaker Road)	SB	1	850	330	0.39
Rice Road (North of Merritt Road)	NB	1	850	731	0.86
Rice Road (North of Merritt Road)	SB	1	850	330	0.39

Table 4-17: 2031 Link Capacity Analysis – Scenario 1 – PM Peak Hour

Segment	Direction	# Of Lanes	Total Capacity (Vehicle / Hour/lane)	Volume (Vehicle/Hour)	Volume to Capacity Ratio (V/C)
Merritt Road (East of Niagara Street / Merrittville Highway)	EB	1	850	763	0.90
Merritt Road (East of Niagara Street / Merrittville Highway)	WB	1	850	881	1.04
Merritt Road (East of Cataract Road)	EB	1	500	141	0.28
Merritt Road (East of Cataract Road)	WB	1	500	188	0.38
Rice Road (North of Quaker Road)	NB	1	850	477	0.56

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Segment	Direction	# Of Lanes	Total Capacity (Vehicle / Hour/lane)	Volume (Vehicle/Hour)	Volume to Capacity Ratio (V/C)
Rice Road (North of Quaker Road)	SB	1	850	407	0.48
Rice Road (North of Merritt Road)	NB	1	850	501	0.59
Rice Road (North of Merritt Road)	SB	1	850	548	0.64

2031 Conditions Intersection Analysis – Scenario 1Signal Warrant Analysis:

A signal warrant analysis was conducted for the following four intersections:

- Rice Road / Quaker Road;
- Rice Road / Port Robinsons Road;
- Merrittville Highway / Port Robinson Road; and
- Quaker Road / First Avenue – Cataract Road.

A signal was justified for all four intersections. Capacity analysis for those intersections was based on the existing (2020) traffic control.

Intersection Capacity Analysis:

The results of the traffic operations assessment in Synchro for signalized and unsignalized intersections are summarized in Table 4-18 through Table 4-28.

For the signalized intersections:

- The westbound left movement on Niagara Street – Merrittville Highway at Merritt Road is a critical movement in the afternoon peak hour.
- At Niagara Street at Quaker Road, the eastbound left (in the AM) and southbound through-right movement (in the PM) are identified as critical movements.

For the unsignalized intersections:

- The eastbound movement at Merrittville Highway at Port Robinson Road is a critical movement in the AM. This intersection is modelled with a highly conservative PHF; the results should be interpreted as such.
- All movements at First Avenue/Cataract Road at Quaker Road have volume to capacity ratios greater than 1.00 during one or both peak hours, and LOS E or F during both peak hours.

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- The northbound approach to Rice Road at Port Robinson Road has a volume to capacity ratio greater than 1 during both peak hours and the southbound approach has a volume to capacity ratio of 1.00 during the PM peak hour; these are all in combination with LOS F.
- All approaches to the intersection of Rice Road and Quaker Road have volume to capacity ratios greater than 1.00 during at least one peak hour and all are LOS F during both peak hours.
- The eastbound approach at Rice Road at Merritt Road is critical with LOS F during the AM peak hour and LOS E during the PM peak hour.

For the MTO Highway 406 ramps:

- The southbound left turn movement from the Highway 406 Southbound Ramp to Merritt Road exceeds the MTO thresholds for ramp volume to capacity ratios, with a v/c of 0.76 in the AM peak hour and 0.85 in the PM peak hour.

Figure 4-15 illustrates the critical movements.

Table 4-18: 2031 Signalized Intersection Operations – Scenario 1 – Niagara St/Merrittville Hwy and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.36	29.3	C	28	0.41	25.8	C	33	832
WBL	0.80	27.1	C	#128	1.08	77.3	E	#183	65
WBTR	0.32	14.0	B	36	0.28	10.2	B	28	1297
NBLT	0.68	24.6	C	72	0.51	22.4	C	46	1026
NBR	0.48	1.2	A	0	0.47	1.1	A	0	1026
SBLTR	0.27	15.0	B	21	0.63	21.9	C	47	1027
Overall	-	-	B	-	-	-	C	-	-

Notes

#: 95th percentile volume exceeds capacity, a queue may be longer

Table 4-19: 2031 Signalized Intersection Operations – Scenario 1 – Niagara St and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBL	1.05	87.9	F	#138	0.93	69.5	E	#89	80
EBTR	0.27	7.4	A	17	0.74	27.7	C	62	825
WBL	0.06	20.1	C	8	0.27	32.1	C	13	30
WBTR	0.24	18.9	B	30	0.14	19.6	B	14	481
NBL	0.29	11.0	B	12	0.74	32.2	C	49	75

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
NBTR	0.50	16.1	B	52	0.48	17.2	B	58	404
SBL	0.02	8.1	A	2	0.17	8.6	A	9	65
SBTR	0.79	26.7	C	65	1.05	68.0	E	161	1026
Overall	-		C	-	-	-	D	-	-

Notes

#: 95th percentile volume exceeds capacity, a queue may be longer

Table 4-20: 2031 Unsignalized Intersection Operations – Scenario 1 – Merritt Rd and Hwy 406 SB Ramp

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBL	0.02	7.4	A	0	0.04	7.4	A	1	100
EBT	0.51	0.0	-	0	0.43	0.0	-	0	1297
WBT	0.04	0.0	-	0	0.03	0.0	-	0	340
WBR	0.02	0.0	-	0	0.01	0.0	-	0	210
SBL	0.76	19.2	C	58	0.85	24.7	C	83	574
SBR	-	-	-	-	-	-	-	-	150

Table 4-21: 2031 Unsignalized Intersection Operations – Scenario 1 – Merrittville Hwy and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.85	66.0	F	52	0.38	23.3	C	13	834
WBLTR	0.12	20.7	C	3	0.20	23.5	C	6	681
NBLTR	0.05	1.4	A	1	0.06	2.4	A	2	1027
SBLTR	0.01	0.2	A	0	0.01	0.2	A	0	497

Table 4-22: 2031 Unsignalized Intersection Operations – Scenario 1 – Cataract Rd and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.4	11.2	B	-	0.21	9.9	A	-	839
WBLTR	0.13	9.0	A	-	0.21	10.1	B	-	838
NBLTR	0.22	9.6	A	-	0.23	9.7	A	-	991
SBLTR	0.19	9.3	A	-	0.49	12.2	B	-	524

Table 4-23: 2031 Unsignalized Intersection Operations – Scenario 1 – Cataract Rd and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	
WBLR	0.27	9.8	A	-	0.30	10.5	B	-	832
NBTR	0.30	9.3	A	-	0.36	10.0	A	-	1030
SBLT	0.17	8.8	A	-	0.33	10.2	B	-	991

Table 4-24: 2031 Unsignalized Intersection Operations – Scenario 1 – First Ave/Cataract Rd and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	1.33	193.5	F	-	1.34	196.6	F	-	822
WBLTR	1.17	130.6	F	-	1.56	290.6	F	-	825
NBLTR	1.27	165.2	F	-	1.44	238.6	F	-	402
SBLTR	0.86	49.6	E	-	1.17	129.6	F	-	1030

Table 4-25: 2031 Unsignalized Intersection Operations – Scenario 1 – Rice Rd and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.56	18.2	C	-	0.45	18.0	C	-	431
WBLTR	0.24	13.0	B	-	0.60	22.8	C	-	839
NBLTR	1.31	172.5	F	-	1.05	81.8	F	-	1037
SBLTR	0.52	16.6	C	-	1.00	67.5	F	-	467

Table 4-26: 2031 Unsignalized Intersection Operations – Scenario 1 – Rice Rd and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLR	0.93	78.3	F	67	0.50	37.1	E	19	435
NBLT	0.01	0.4	A	0	0.07	1.8	A	2	1037
SBTR	0.23	0.0	-	0	0.38	0.0	-	0	1037

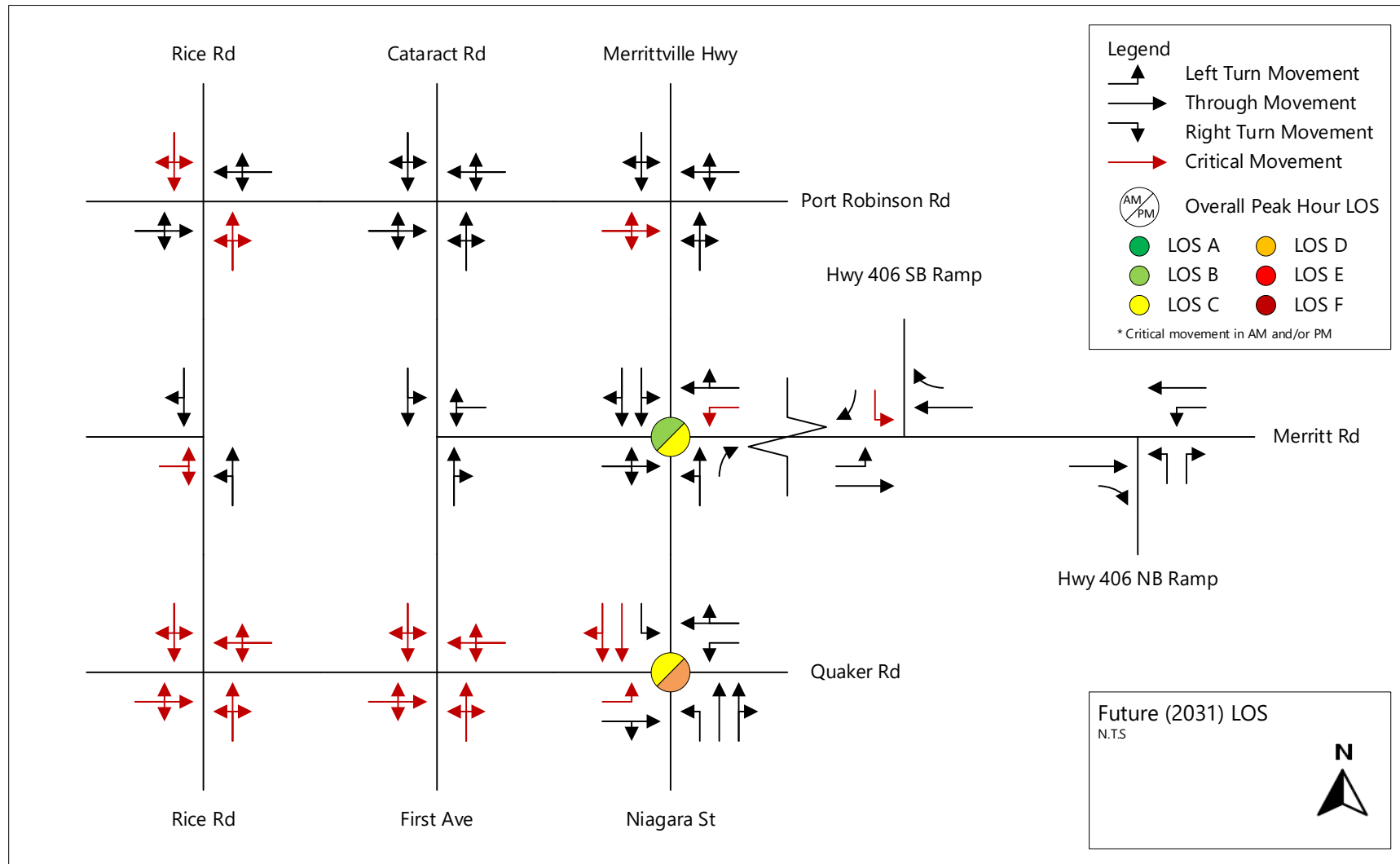
Table 4-27: 2031 Unsignalized Intersection Operations – Scenario 1 – Rice Rd and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	1.48	254.5	F	-	1.18	135.1	F	-	441
WBLTR	1.01	82.1	F	-	1.38	213.4	F	-	822
NBLTR	1.80	393.0	F	-	1.64	323.1	F	-	400
SBLTR	0.98	72.3	F	-	1.16	126.7	F	-	1037

Table 4-28: 2031 Unsignalized Intersection Operations – Scenario 1 – Hwy 406 NB Ramp and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBT	0.01	0.0	-	0	0.02	0.0	-	0	340
EBR	0.46	0.0	-	0	0.48	0.0	-	0	200
WBL	0.01	7.3	A	0	0.01	7.3	A	0	65
WBT	0.02	0.0	-	0	0.01	0.0	-	0	198
NBL	0.07	9.1	A	2	0.07	9.4	A	2	501
NBR	-	-	-	-	-	-	-	-	180

Figure 4-15: 2031 Intersection Operation Conditions – Scenario 1



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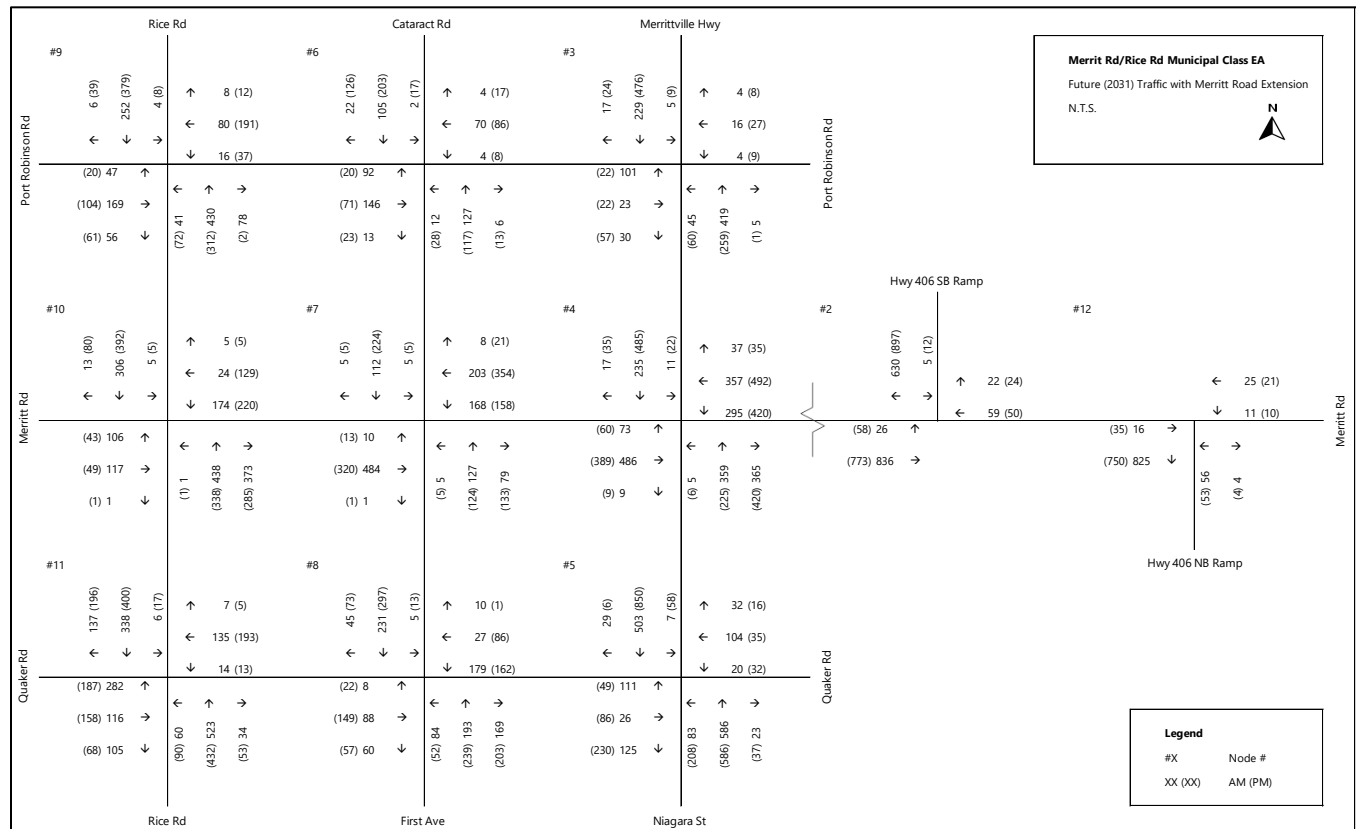
Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)

4.2.2.2 2031 Future Traffic Demand – Scenario 2

With the inclusion of the Merritt Road extension between Rice Road and Cataract Road, there will be a noticeable increase in traffic along Merritt Road from Cataract Road to Merrittville Highway/Niagara Street. There will be a corresponding decrease in traffic along Quaker Road and Niagara Street (compared to Scenario 1).

Travel patterns indicate that most eastbound and westbound traffic along Merritt Road is associated with trips to and from Highway 406. Without the proposed Merritt Road extension, eastbound traffic accessing Highway 406 originating from areas west in the Town of Pelham must travel on Rice Road north to Highway 20 or south via Quaker Road and Niagara Street. Similarly, traffic moving westbound from Highway 406 would use either Highway 20/Rice Road or Niagara Street/Quaker Road to access areas west in the Town of Pelham. The Merritt Road extension offers more direct access, alleviating congestion associated with the above longer routes. The forecasted traffic volumes are illustrated in the following figure.

Figure 4-16: Future (2031) Traffic Volumes (Scenario 2)



2031 Conditions Link Capacity Analysis – Scenario 2

The results of link capacity analysis summarized in Table 4-29 and Table 4-30 demonstrate that with the proposed right of way and geometric improvements, with the widening of Merritt Road to a four-lane cross-section between Merrittville Highway/Niagara Street and the Highway 406 interchange, none of the study area segments will have traffic exceeding capacity by 2031. However, Rice Road between Quaker Road and Merritt Road will approach capacity for northbound movements in the AM peak hour and PM peak hour.

Table 4-29: 2031 Link Capacity Analysis – Scenario 2 – AM Peak Hour

Segment	Direction	Lane Capacity	# Of Lanes	Total Capacity (Vehicle/ Hour/lane)	Volume (Vehicle/ Hour)	Volume to Capacity Ratio (V/C)
Merritt Road (East of Niagara Street / Merrittville Highway)	EB	850	2	1700	862	0.51
Merritt Road (East of Niagara Street / Merrittville Highway)	WB	850	2	1700	689	0.41
Merritt Road (East of Cataract Road)	EB	850	1	850	568	0.67
Merritt Road (East of Cataract Road)	WB	850	1	850	379	0.45
Rice Road (North of Quaker Road)	NB	850	1	850	812	0.96
Rice Road (North of Quaker Road)	SB	850	1	850	481	0.57
Rice Road (North of Merritt Road)	NB	850	1	850	549	0.65
Rice Road (North of Merritt Road)	SB	850	1	850	324	0.38

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Table 4-30: 2031 Link Capacity Analysis – Scenario 2 – PM Peak Hour

Segment	Direction	Lane Capacity	# Of Lanes	Total Capacity (Vehicle/ Hour/lane)	Volume (Vehicle/ Hour)	Volume to Capacity Ratio (V/C)
Merritt Road (East of Niagara Street / Merrittville Highway)	EB	850	2	1700	1097	0.65
Merritt Road (East of Niagara Street / Merrittville Highway)	WB	850	2	1700	1188	0.70
Merritt Road (East of Cataract Road)	EB	850	1	850	549	0.65
Merritt Road (East of Cataract Road)	WB	850	1	850	641	0.75
Rice Road (North of Quaker Road)	NB	850	1	850	722	0.85
Rice Road (North of Quaker Road)	SB	850	1	850	707	0.83
Rice Road (North of Merritt Road)	NB	850	1	850	469	0.55
Rice Road (North of Merritt Road)	SB	850	1	850	566	0.67

2031 Conditions Intersection Analysis – Scenario 2

Signal Warrant Analysis:

Signal warrant analysis was conducted for the following five unsignalized intersections:

- Rice Road and Quaker Road;
- Rice Road and Merritt Road;
- Merritt Road and Cataract Road;
- Merrittville Highway and Port Robinson Road; and
- Quaker Road and First Avenue/Cataract Road

A signal was justified for all the five intersections. As an alternative to installing signals at each of these intersections, lane configuration changes were tested in conjunction with the existing all-way or two-way stop control to determine whether acceptable or tolerable peak hour operation could be achieved without traffic signals. Operation was considered tolerable if only a single movement was critical and/or the volume to capacity ratio remained at or below 1.00.

Highway 406 Interchange Southbound Ramp 2031 Signal Warrant Analysis

At the time of the analysis of these improvements, analysis was limited to 2041 conditions, however it may be desirable to advance the work to 2031 to facilitate construction of active transportation infrastructure east of the Highway 406 southbound off-ramp.

To determine whether traffic signals are expected to be justified in with the recommended changes to lane configuration and 2031 forecast volumes, the weekday afternoon peak hour turning movement volume forecast was considered and Traffic Signal Justification 7 from "Ontario Traffic Manual for Traffic Signals" was applied. This method estimates average hourly volumes for turning movement volumes based on a peak hour forecast.

The following formula was applied:

$$AHV = PHV / 2$$

Where:

AHV = Average hourly volume

PHV = Peak hour volume

To apply this analysis method, the AHV results are compared for the Minimum Vehicular Volume and Delay to Cross Traffic criteria for traffic signal justification. Each of these components have two sub criteria, and if both portions of one component are 100% satisfied, a traffic signal is justified. Alternatively, if each portion of the two components (i.e., all four parts) are satisfied 80% or more, a traffic signal is justified. Calculations and analysis are summarized in the following table.

**Table 4-31: 2031 Signal Warrant Analysis – Merritt Rd & Hwy 406 SB Ramp
Recommended Lane Configuration**

Signal Warrant Component		Applicable Threshold Volume (vehicles/hour)	2031 PM Peak Hour Volume (PHV) (vehicles/hour)	PHV / 2 (vehicles/hour)	% Satisfied
Minimum Vehicular Volume	Total Volume	900	2333	1167	100%
	Crossing Volume	255	1145	573	100%
Delay to Cross Traffic	Main Road	900	1188	594	66%
	Crossing Road	75	1145	573	100%

As the above table indicates, with the change in lane configuration for the Highway 406 southbound off ramp, the Minimum Vehicular Volume justification is expected to be met in 2031, and a signal is therefore expected to be justified.

Roundabout Evaluation

Roundabout operation (as an alternative to traffic signals) was considered at the intersection of Rice Road and Quaker Road, Rice Road and Merritt Road, Cataract Road and Merritt Road, and Merritt Road and Merrittville Highway / Niagara Street. Based on the evaluation in that report, roundabouts were not considered to be suitable for these intersections given the following:

- Significant property impacts as a result of the need to accommodate active transportation around the circulatory roadway;
- Proximity to nearby driveways;
- Inconsistency with adjacent intersections (which are signalized); and
- Higher construction costs.

Based on the analysis, only the following intersections were assumed to be signalized in 2031:

- Rice Road / Quaker Road;
- Rice Road / Merritt Road; and
- Rice Road / Port Robinson Road.

Lane Configurations:

Future (2031) lane configurations and right-of-way for midblock locations were decided based not only on the results of the 2031 intersection and link capacity analyses but also on the 2041 analyses to accommodate staging.

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Following are the notes on the modifications to the future (2031) study area road network, made based on the results of link capacity analyses, intersection capacity analyses, and consultation with the Region/MTO:

Highway 406 SB off-ramp at Merritt Road

- For 2031 conditions, the existing lane configuration and traffic control were retained for the 2031 analysis under Scenario 2. Note that implementation of geometric changes and signalization of this ramp terminal intersection in 2031 would facilitate the transition of Merritt Road improvements east of Niagara Street and Merrittville Highway and the construction of the multi-use path east of Grisdale Road, therefore it may be desirable to consider those improvements in 2031.

Merritt Road between Merrittville Highway/Niagara Street and the Highway 406 interchange

- Merritt Road was widened between Merrittville Highway/Niagara Street and the Highway 406 interchange to four travel lanes (two in each direction) to meet future demand.

Merrittville Hwy/Niagara Street at Merritt Road

- Currently signalized.
- The second westbound through lane will carry through the intersection and terminate on the departing leg.
- The second eastbound through lane was introduced on the west approach.
- A dedicated eastbound left-turn lane was added to relieve noted congestion.
- For this horizon, the southbound approach retained a shared right-turn and through lane and a shared left-turn and through lane.
- The northbound right channelized lane was converted to a regular right turn lane.

Merritt Road at Cataract Road

- Currently under all-way Stop control; and
- Add westbound left turn lane to reduce delay for this high-volume movement and an eastbound left turn lane for good geometric design with aligned left turn lanes.

Merritt Road between Rice Road and Merrittville Hwy/Niagara Street

- Two travel lanes on the newly opened segment of Merritt Road between Rice Road and Cataract Road.

Rice Road between Quaker Road and Merritt Road

- Rice Road between Quaker Road and Merritt Road remains at two travel lanes. However, consideration will be given to implementing active transportation more immediately.

Rice Road at Merritt Road

- Currently, stop-controlled on Merritt Road.

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- Rice Road widened to two lanes in each direction through the intersection. Note that sensitivity testing of only adding left turn lanes northbound and southbound, and not also widening with the second through lane in each direction, was done for this future horizon. It was found that operation without the widening would be very similar to operation with the widening, indicating that deferral of this improvement beyond 2031 would not negatively affect operation.
- Rice Road and Merritt Road meet the warranting conditions for a traffic signal in 2031.
- No geometric improvements could be identified that would continue to accommodate unsignalized operation without critical movements.
- Signalize intersection and add dedicated left-turn lanes on all approaches per the Niagara Region's policy for signalized intersections.

Rice Road at Quaker Road

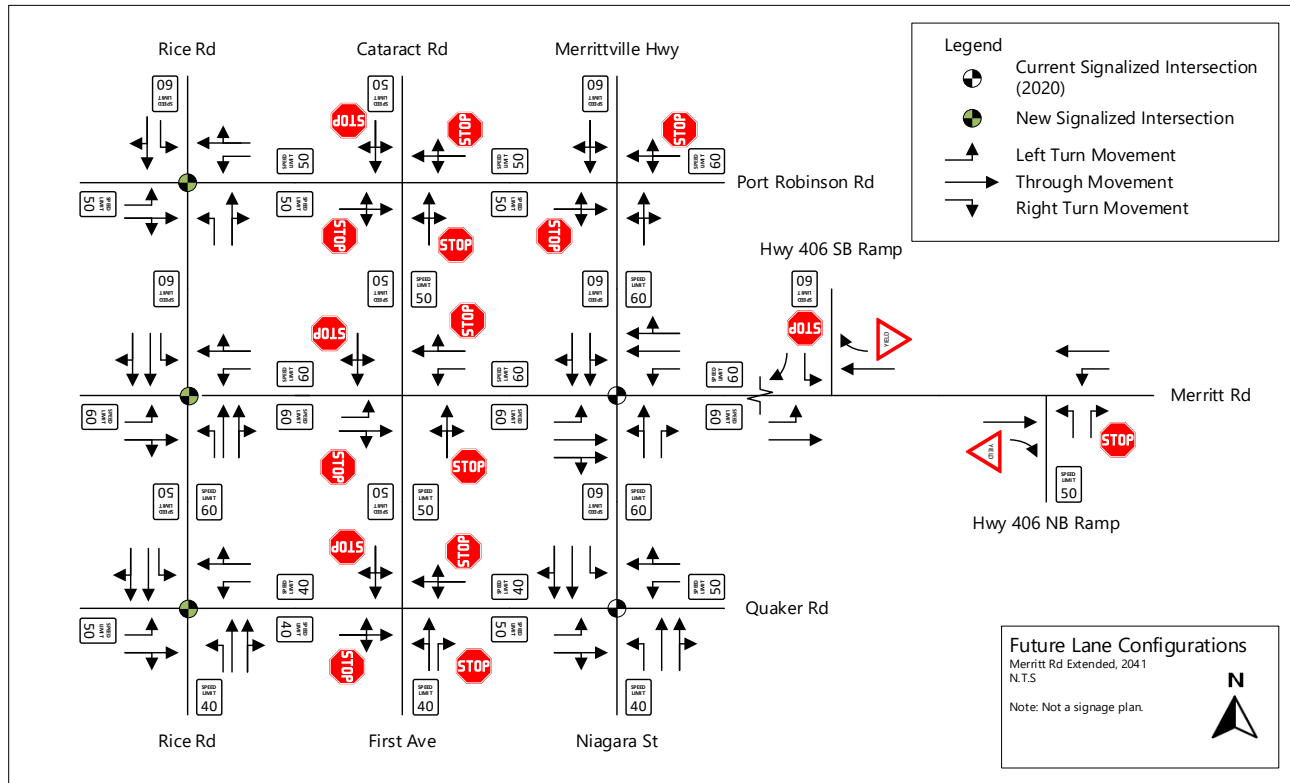
- Currently, all-way Stop controlled.
- Rice Road and Quaker Road meet the warranting conditions for a traffic signal in 2031.
- Rice Road widened to two lanes in each direction through the intersection. Note that sensitivity testing of only adding left turn lanes northbound and southbound, and not also widening with the second through lane in each direction, was done for this future horizon. It was found that operation without the widening would be very similar to operation with the widening, indicating that deferral of this improvement beyond 2031 would not negatively affect operation.
- No geometric improvements could be identified that would continue to permit unsignalized operation.
- Signalize intersection and add dedicated left-turn lanes on all approaches.

First Avenue/Cataract Road and Quaker Road

- Currently all-way stop controlled;
- Signal warrant met for 2031; and
- Northbound right turn lane improves operation and only minor problems remain.

No changes are recommended at any of the remaining intersections. The road network, lane configurations, and intersection controls are illustrated in Figure 4-17.

Figure 4-17: Future (2031) Intersection Operation Conditions (Scenario 2)



Intersection Capacity Analysis:

The results of the traffic operations assessment in Synchro for signalized and unsignalized intersections are summarized in Table 4-32 through Table 4-42. Figure 4-18 illustrates the critical movements.

For the signalized intersections:

- At Niagara Street/Merrittville Highway and Merritt Road, with the widening of Merritt Road and conversion of the northbound channelized right turn lane to a right turn lane at the stop bar, the westbound left movement is expected to have minor queueing problems during the PM peak hour, with 64 meters of available storage and an 81 meter long 95th percentile queue. A minor intersection improvement to increase the available storage length could mitigate this issue.
- At Niagara Street and Quaker Road, the westbound left turn is expected to have a minor delay problem in the PM peak hour, with LOS D.
- At the intersection of Rice Road and Port Robinson Road, the eastbound approach is expected to have LOS D during the AM peak hour and the westbound approach is expected to have LOS D during the PM peak hour.
- At the intersection of Merritt Road and Rice Road, the westbound left turn is expected to have minor delays with a LOS D during the AM peak hour and during the PM peak hour.

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- At Rice Road and Quaker Road, the westbound left turn is expected to have minor delays during the AM peak hour, with LOS D.

For the unsignalized intersections:

- At Merrittville Highway and Port Robinson Road, the eastbound left-through-right movement is critical in the AM peak hour with a volume to capacity ratio of 0.87 (LOS F). This intersection is modelled with a highly conservative PHF; in future, the PHF may be higher, resulting in a better volume to capacity ratio and LOS. The westbound approach is expected to experience minor delays during the PM peak hour with LOS D.
- No issues were identified at the intersection of Cataract Road and Port Robinson Road.
- Cataract Road and Merritt Road satisfies the warrant for a signal in 2031, however the addition of a westbound left turn lane and retention of the all-way stop control was tested to determine whether deferral of traffic signal control would result in tolerable operation. With this improvement, minor problems are expected with a volume to capacity ratio of 0.96 and LOS F during the AM peak hour and a volume to capacity ratio of 0.86 and average delay of 40.2 seconds per vehicle for the westbound left turn in the PM peak hour. In addition, the eastbound through and right and westbound left are expected to have LOS D in the PM peak hour. These are relatively minor operating problems that could be accepted as an interim operation.
- First Avenue and Quaker Road is also expected to satisfy a traffic signal warrant in 2031. With the existing all-way stop control and addition of a northbound right turn lane, minor operating problems including LOS D for the westbound approach during the PM peak hour and a volume to capacity ratio of 0.92 and LOS F for the southbound approach, also in the PM peak hour, are expected. These are relatively minor problems that could be tolerated for an interim period.
- No issues were identified at the Merritt Road and Highway 406 Northbound Ramp.

For the MTO Highway 406 ramps:

- At Merritt Road and Highway 406 southbound ramp, the southbound left-right movement is critical based on MTO criteria in the AM peak hour with the volume to capacity ratio of 0.78 and in the PM peak hour with a v/c ratio of 0.92 and LOS D.

Table 4-32: 2031 Signalized Intersection Operations – Scenario 2 – Niagara St/Merrittville Hwy and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBL	0.37	33.5	C	25	0.36	32.1	C	21	90
EBTR	0.67	32.8	C	61	0.56	28.3	C	47	150
WBL	0.70	24.4	C	#61	0.74	20.7	C	#81	65
WBTR	0.29	14.2	B	34	0.34	11.2	B	40	1297
NBLT	0.67	26.4	C	74	0.52	25.3	C	49	1026
NBR	0.50	4.4	A	15	0.62	6.2	A	18	1026
SBLTR	0.27	16.7	B	23	0.67	26.0	C	53	1027
Overall	-	-	C	-	-	-	B	-	-

Notes

#: 95th percentile volume exceeds capacity, a queue may be longer

Table 4-33: 2031 Signalized Intersection Operations – Scenario 2 – Niagara St and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBL	0.45	24.6	C	26	0.22	27.6	C	17	80
EBTR	0.35	8.6	A	15	0.82	33.5	C	62	825
WBL	0.08	18.7	B	7	0.35	36.2	D	13	30
WBTR	0.35	18.9	B	26	0.16	19.8	B	14	481

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
NBL	0.20	6.6	A	9	0.62	18.4	B	38	75
NBTR	0.50	11.9	B	45	0.48	15.8	B	58	404
SBL	0.02	5.7	A	2	0.16	7.8	A	9	65
SBT-TR	0.58	17.6	B	43	0.84	29.8	C	99	1026
Overall	-	-	B	-	-	-	C	-	-

Table 4-34: 2031 Signalized Intersection Operations – Scenario 2 – Rice Rd and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBL	0.22	29.7	C	15	0.14	30.4	C	9	30
EBTR	0.75	44.6	D	55	0.55	31.5	C	37	431
WBL	0.13	28.8	C	7	0.21	32.0	C	13	30
WBTR	0.30	29.1	C	24	0.70	45.5	D	52	839
NBL	0.08	8.2	A	8	0.14	7.6	A	12	30
NBTR	0.52	11.8	B	88	0.30	8.1	A	42	887
SBL	0.01	8.0	A	2	0.01	6.9	A	2	30
SBTR	0.26	8.6	A	38	0.40	8.9	A	59	467
Overall	-	-	B	-	-	-	B	-	-

Table 4-35: 2031 Signalized Intersection Operations – Scenario 2 – Rice Rd and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBL	0.44	31.2	C	27	0.18	23.2	C	12	41
EBTR	0.34	27.6	C	28	0.13	21.6	C	13	435
WBL	0.74	46.5	D	44	0.77	44.7	D	53	80
WBTR	0.08	20.1	C	9	0.34	25.5	C	29	824
NBL	0.00	9.0	A	1	0.00	11.0	B	1	80
NBTR	0.48	7.1	A	41	0.38	6.5	A	29	1037
SBL	0.02	10.0	A	m2	0.01	10.6	B	m1	50.5
SBTR	0.20	10.1	B	31	0.31	11.8	B	44	1037
Overall	-	-	B	-	-	-	B	-	-

Table 4-36: 2031 Signalized Intersection Operations – Scenario 2 – Rice Rd and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBL	0.64	22.3	C	48	0.86	60.7	E	50	90
EBTR	0.34	10.4	B	27	0.55	27.7	C	44	441
WBL	0.10	31.6	C	8	0.07	20.6	C	5	40
WBTR	0.63	45.7	D	42	0.48	29.1	C	42	822
NBL	0.25	21.9	C	19	0.24	11.9	B	20	90

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
NBTR	0.45	19.9	B	60	0.27	9.0	A	37	400
SBL	0.03	18.2	B	4	0.04	9.8	A	5	70
SBTR	0.40	16.7	B	46	0.34	8.0	A	40	1037
Overall	-	-	C	-	-	-	B	-	-

Table 4-37: 2031 Unsignalized Intersection Operations – Scenario 2 – Merritt Rd and Hwy 406 SB Ramp

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBL	0.02	7.4	A	1	0.04	7.4	A	1	1297
EBT	0.60	0.0	-	0	0.47	0.0	-	0	1297
WBT	0.04	0.0	-	0	0.03	0.0	-	0	340
WBR	0.02	0.0	-	0	0.01	0.0	-	0	210
SBL	0.78	20.1	C	62	0.92	32.2	D	108	574/150
SBR	-	-	-	-	-	-	-	-	150

Table 4-38: 2031 Unsignalized Intersection Operations – Scenario 2 – Merrittville Hwy and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.87	76.0	F	54	0.36	23.3	C	12	838
WBLTR	0.13	22.6	C	3	0.22	25.5	D	6	681
NBLTR	0.05	1.4	A	1	0.06	2.2	A	2	1027
SBLTR	0.01	0.2	A	0	0.01	0.2	A	0	497

Table 4-39: 2031 Unsignalized Intersection Operations – Scenario 2 – Cataract Rd and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.38	10.9	B	-	0.19	9.7	A	-	839
WBLTR	0.12	9.0	A	-	0.19	9.9	A	-	838
NBLTR	0.22	9.5	A	-	0.24	9.7	A	-	991
SBLTR	0.20	9.3	A	-	0.49	12.2	B	-	524

Table 4-40: 2031 Unsignalized Intersection Operations – Scenario 2 – Cataract Rd and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBL	0.02	9.1	F	-	0.03	10.5	D	-	30
EBTR	0.96	54.2	F	-	0.77	31.6	D	-	824
WBL	0.37	13.5	B	-	0.39	15.1	D	-	30
WBTR	0.44	13.8	B	-	0.86	40.7	D	-	681
NBLTR	0.44	15.0	C	-	0.59	20.8	C	-	1030
SBLTR	0.27	13.2	B	-	0.55	20.2	C	-	991

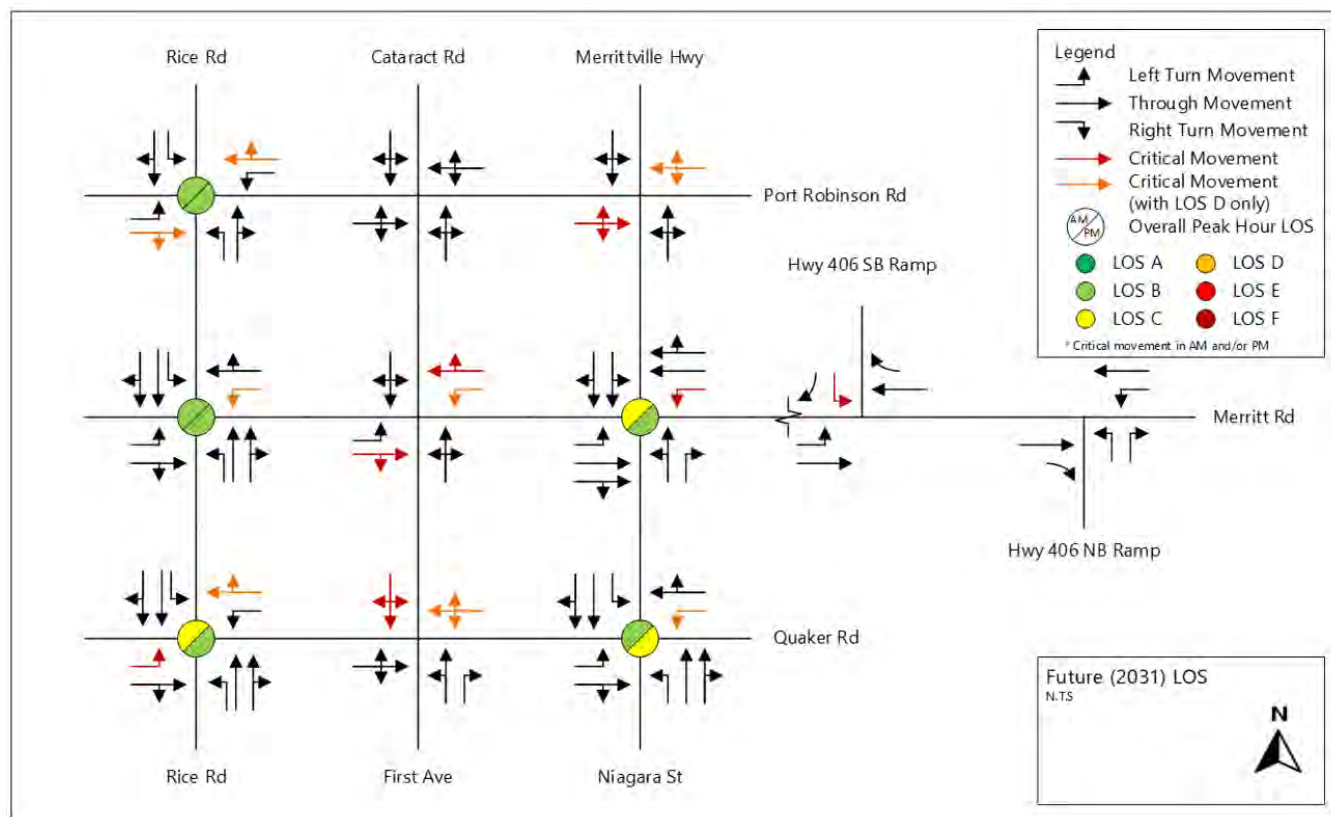
Table 4-41: 2031 Unsignalized Intersection Operations – Scenario 2 – First Ave/Cataract Rd and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBLTR	0.34	13.2	B	-	0.60	23.2	C	-	822
WBLTR	0.47	16.1	C	-	0.66	26.4	D	-	825
NBLT	0.60	18.3	C	-	0.75	31.0	C	-	402
NBR	0.32	10.5	-	-	0.47	15.7	-	-	20
SBLTR	0.57	17.4	C	-	0.92	52.2	F	-	1030

Table 4-42: 2031 Unsignalized Intersection Operations – Scenario 2 – Hwy 406 NB Ramp and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meters)	
EBT	0.01	0.0	-	0	0.02	0.0	-	0	340
EBR	0.55	0.0	-	0	0.53	0.0	-	0	200
WBL	0.01	7.3	A	0	0.01	7.3	A	0	65
WBT	0.02	0.0	-	0	0.01	0.0	-	0	198
NBLR	0.07	9.1	A	2	0.07	9.4	A	2	501/180

Figure 4-18: Future (2031) Intersection Operation Conditions (Scenario 2)



4.2.3 Future (2041) Assessment

Under Scenario 1, the assessment for the future 2041 horizon year was undertaken on the existing (2020 base year) road network, assuming that no improvements were implemented (i.e., no capacity improvements were undertaken, and Merritt Road was not extended to provide a connection between Cataract Road and Rice Road. This scenario was evaluated to determine how well the existing road network could accommodate the forecasted traffic volumes for 2041 horizon year as well as to determine deficiencies in the road network. Therefore, the road network and lane configurations are consistent with the existing conditions, as illustrated previously in Figure 4-11.

Under scenario 2, the assessment for the 2041 horizon year built on the 2031 Scenario 2 road network. The implementation of additional traffic signal phases, geometric improvements, and signalization was considered, as was discussion with the Region and MTO.

4.2.3.1 2041 Future Traffic Demand – Scenario 1

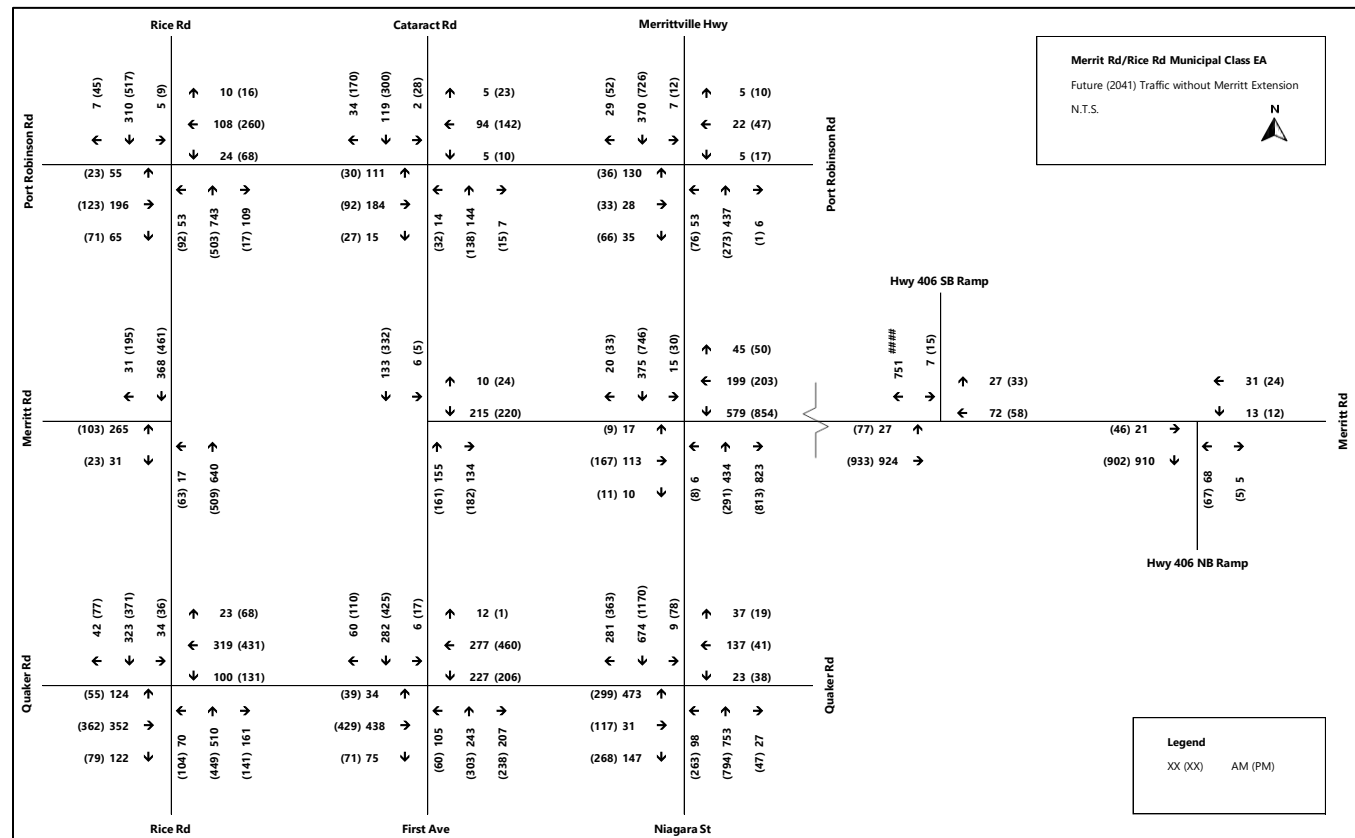
The following table shows the annual growth rates applied for each road segment by direction of travel and time of day. The future (2041) traffic volumes are illustrated in Figure 4-19.

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Table 4-43: Annual Growth Rates (2031 to 2041) – Scenario 1

Segment	AM	PM
Eastbound		
Port Robinson Road	1.5%	1.5%
Merritt Road	2.7%	2.8%
Quaker Road	1.5%	1.5%
Westbound		
Port Robinson Road	2.7%	2.7%
Merritt Road	2.0%	1.5%
Quaker Road	1.5%	1.6%
Northbound		
Rice Road	1.5%	1.5%
Cataract Road	1.7%	1.5%
Niagara Street	1.7%	2.4%
Southbound		
Rice Road	1.7%	1.5%
Cataract Road	1.5%	3.0%
Niagara Street	3.0%	3.0%

Figure 4-19: Future (2041) Traffic Volumes (Scenario 1)



2041 Conditions Link Capacity Analysis – Scenario 1

As shown in Table 4-44 and Table 4-45, the results demonstrate that the following links will be near or exceed capacity.

- Merritt Road east of Niagara Street – Merrittville Highway for eastbound and westbound traffic in the AM and PM peak hours
- Rice Road north of Merritt Road for northbound traffic in the AM

Table 4-44: 2041 Link Capacity Analysis – Scenario 1 – AM Peak Hour

Segment	Direction	# Of Lanes	Total Capacity (Vehicle/Hour/ lane)	Volume (Vehicle/Hour)	Volume to Capacity Ratio (V/C)
Merritt Road (East of Niagara Street / Merrittville Highway)	EB	1	850	951	1.12
Merritt Road (East of Niagara Street / Merrittville Highway)	WB	1	850	823	0.97
Merritt Road (East of Cataract Road)	EB	1	500	140	0.28
Merritt Road (East of Cataract Road)	WB	1	500	225	0.45
Rice Road (North of Quaker Road)	NB	1	850	657	0.77
Rice Road (North of Quaker Road)	SB	1	850	399	0.47
Rice Road (North of Merritt Road)	NB	1	850	905	1.06
Rice Road (North of Merritt Road)	SB	1	850	399	0.47

Table 4-45: 2041 Link Capacity Analysis – Scenario 1 – PM Peak Hour

Segment	Direction	# Of Lanes	Total Capacity (Vehicle/Hour/lane)	Volume (Vehicle/Hour)	Volume to Capacity Ratio (V/C)
Merritt Road (East of Niagara Street/Merrittville Highway)	EB	1	850	763	0.90
Merritt Road (East of Niagara Street/Merrittville Highway)	WB	1	850	1107	1.30
Merritt Road (East of Cataract Road)	EB	1	500	141	0.28
Merritt Road (East of Cataract Road)	WB	1	500	244	0.49
Rice Road (North of Quaker Road)	NB	1	850	477	0.56
Rice Road (North of Quaker Road)	SB	1	850	484	0.57
Rice Road (North of Merritt Road)	NB	1	850	501	0.59
Rice Road (North of Merritt Road)	SB	1	850	656	0.77

2041 Intersection Analysis – Scenario 1

Signal Warrant Analysis:

Signal warrant analysis was conducted for the following four unsignalized intersections:

- Rice Road / Quaker Road;
- Rice Road / Port Robinson Road;
- Merrittville Highway / Port Robinson Road; and
- Quaker Road / First Avenue – Cataract Road.

The analysis found that signals are expected to be justified for all four intersections. This scenario did not include evaluation of signalization of these intersections since it is the base condition evaluation. Signal warrant analysis results for this scenario are provided for information only. Other traffic volume related and signal timing inputs were unchanged from the existing conditions analysis.

Intersection Capacity Analysis:

The results of the traffic operations assessment in Synchro for signalized and unsignalized intersections are summarized in Table 4-46 through Table 4-56, respectively.

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For the signalized intersections:

- The westbound left movement on Niagara Street – Merrittville Highway at Merritt Road is a critical movement with a volume to capacity ratio of 1.06, LOS E and a 95th percentile queue length of 188 meters versus 66 meters of storage during the AM peak hour, and a volume to capacity ratio of 1.66, LOS F and a queue length of 313 meters in the PM peak hour. The eastbound approach is expected to have LOS D during the PM peak hour.
- At Niagara Street at Quaker Road, the eastbound left has a volume to capacity ratio of 1.49, a LOS F and a 95th percentile queue length of 182 meters versus 80 meters of available storage in the AM, and a volume to capacity ratio of 0.90 and LOS D in the PM. The northbound left has a volume to capacity ratio of 0.90, LOS D and a 95th percentile queue length of 77 meters versus 75 meters of storage in the PM. The southbound through-right lane group in the PM is identified as critical with a volume to capacity ratio of 0.87 in the AM and a volume to capacity ratio of 1.48 and LOS F in the PM.

For the unsignalized intersections:

- For the intersection of Merrittville Highway at Port Robinson Road, the eastbound approach is expected to have a volume to capacity ratio of 1.76 and LOS F during the AM peak hour and a volume to capacity ratio of 1.01 and LOS F in the PM peak hour. The westbound approach is expected to have LOS E in the PM peak hour and LOS F in the PM peak hour. This intersection is modelled with a highly conservative PHF; the future PHF may be higher, resulting in slightly better operating conditions, however it is unlikely that a higher PHF would result in acceptable operation for 2041 Scenario 1 conditions.
- For the intersection of Cataract Road at Port Robinson Road, minor operating problem, LOS D during the PM peak hour, is expected for the southbound approach.
- The intersection of Cataract Road at Merritt Road is expected to operate acceptably in this scenario and horizon year.
- At First Avenue/Cataract Road at Quaker Road, all movement have volume to capacity ratios greater than 1.0 during one or both peak hours, and LOS F during both peak hours. During the AM peak hour, the EB volume to capacity ratio is 1.65, the westbound volume to capacity ratio is 1.59, the northbound volume to capacity ratio is 1.65 and the southbound volume to capacity ratio is 1.04. During the PM peak hour, the eastbound volume to capacity ratio is 1.63, the westbound volume to capacity ratio is 2.03, the northbound volume to capacity ratio is 1.77 and the southbound volume to capacity ratio is 1.65.
- Rice Road at Port Robinson Road has LOS D for the eastbound approach during the AM peak hour and LOS E for the westbound approach during the PM peak hour. The northbound approach has a volume to capacity ratio of 1.84 and LOS F in the AM peak hour and a volume to capacity ratio of 1.44 and LOS F during the PM peak hour. The southbound approach has a volume to capacity ratio of 1.33 and LOS F during the PM peak hour.
- The eastbound approach at Rice Road at Merritt Road is critical with a volume to capacity ratio of 1.65 and LOS F during the AM peak hour and a volume to capacity ratio of 0.92 and LOS E during the PM peak hour.

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- All approaches to the intersection of Rice Road and Quaker Road have volume to capacity ratios greater than 1 during at least one peak hour and all are LOS F during both peak hours. The eastbound approach has volume to capacity ratios of 1.77 during the AM peak hour and 1.42 during the PM peak hour, the westbound approach has a volume to capacity ratio of 1.32 during the AM peak hour and 1.80 during the afternoon peak hour, the northbound approach has a volume to capacity ratio of 2.18 during the AM peak hour and 1.98 during the PM peak hour and the southbound approach has a volume to capacity ratio of 1.18 during the AM peak hour and 1.38 during the PM peak hour.
- The intersection of Merritt Road at the Highway 406 Northbound ramp is expected to operate acceptably in this scenario.

For the MTO Highway 406 ramps:

- The southbound left turn at the intersection of Merritt Road at the Highway 406 Southbound ramp is expected to have a volume to capacity ratio of 0.95 and LOS E in the AM peak hour, and a volume to capacity ratio of 1.08 and LOS F in the PM peak hour.

As these points indicate, with 2041 forecast traffic, the existing road network is expected to have several operating problems due to increased travel demand from/to the Highway 406 ramps combined with high volumes along the Niagara Street – Merrittville Highway corridor and high travel demand between Quaker Road and Highway 406 ramps via Niagara Street.

The critical movements are illustrated in Figure 4-20.

Table 4-46: 2041 Signalized Intersection Operations – Scenario 1 – Niagara Street/Merrittville Hwy and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meter)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meter)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th percentile queue length (meter)	
EBLTR	0.49	34.0	C	39	0.59	35.9	D	52	832
WBL	1.06	76.5	E	#188	1.66	326.8	F	#313	65
WBTR	0.37	16.3	B	47	0.37	16.1	B	49	1297
NBLT	0.77	29.7	C	95	0.53	21.5	C	60	1026
NBR	0.61	2.0	A	0	0.62	2.1	A	0	1026
SBLTR	0.41	17.4	B	36	0.77	25.8	C	81	1027
Overall	-	-	C	-	-	-	F	-	-

Notes

#: 95th percentile volume exceeds capacity, a queue may be longer

Table 4-47: 2041 Signalized Intersection Operations – Scenario 1 – Niagara St and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBL	1.49	262.9	F	#182	1.09	111.0	F	#113	80
EBTR	0.33	8.5	A	19	0.90	46.5	D	103	825
WBL	0.07	23.7	C	9	0.49	49.2	D	#19	30
WBTR	0.35	24.2	C	41	0.16	19.6	B	15	481
NBL	0.40	12.4	B	13	0.90	52.8	D	#77	75

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
NBTR	0.56	16.0	B	70	0.65	21.1	C	87	404
SBL	0.03	7.6	A	2	0.29	10.1	B	11	65
SBT-TR	0.87	31.0	C	#100	1.48	247.1	F	254	1026
Overall	-	-	E	-	-	-	F	-	-

Notes

#: 95th percentile volume exceeds capacity, a queue may be longer

Table 4-48: 2041 Unsignalized Intersection Operations – Scenario 1 - Merritt Rd and Hwy 406 SB Ramp

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length	
EBL	0.02	7.5	A	1	0.05	7.4	A	1	100
EBT	0.66	0.0	-	0	0.57	0.0	-	0	1297
WBT	0.05	0.0	-	0	0.04	0.0	-	0	340
WBR	0.02	0.0	-	0	0.02	0.0	-	0	210
SBL	0.95	38.2	E	119	1.08	72.7	F	201	574
SBR	-	-	-	-	-	-	-	-	150

Table 4-49: 2041 Unsignalized Intersection Operations – Scenario 1 - Merrittville Hwy and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBLTR	1.76	421.9	F	141	1.01	136.7	F	57	834
WBLTR	0.26	35.2	E	7	0.72	94.6	F	29	681
NBLTR	0.07	1.8	A	2	0.10	3.2	A	3	1027
SBLTR	0.01	0.3	A	0	0.01	0.3	A	0	497

Table 4-50: 2041 Unsignalized Intersection Operations – Scenario 1 - Cataract Rd and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBLTR	0.49	13.2	B	-	0.29	12.1	B	-	839
WBLTR	0.18	9.8	A	-	0.34	12.8	B	-	838
NBLTR	0.27	10.5	B	-	0.34	12.0	B	-	991
SBLTR	0.25	10.2	B	-	0.80	26.5	D	-	524

Table 4-51: 2041 Unsignalized Intersection Operations – Scenario 1 - Cataract Rd and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
WBLR	0.35	11.0	B	-	0.43	13.1	B	-	832
NBTR	0.40	10.5	B	-	0.51	13.1	B	-	1030
SBLT	0.21	9.4	A	-	0.54	14.2	B	-	991

Table 4-52: 2041 Unsignalized Intersection Operations – Scenario 1 - First Ave/Cataract Rd and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBLTR	1.65	329.7	F	-	1.63	319.8	F	-	822
WBLTR	1.59	300.9	F	-	2.03	495.5	F	-	825
NBLTR	1.65	329.0	F	-	1.77	380.1	F	-	402
SBLTR	1.04	90.2	F	-	1.65	326.4	F	-	1030

Table 4-53: 2041 Unsignalized Intersection Operations – Scenario 1 - Rice Rd and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBLTR	0.70	25.6	D	-	0.57	23.1	C	-	431
WBLTR	0.35	15.7	C	-	0.84	43.2	E	-	839
NBLTR	1.84	402.9	F	-	1.44	234.5	F	-	1037
SBLTR	0.69	24.9	C	-	1.33	188.8	F	-	467

Table 4-54: 2041 Unsignalized Intersection Operations – Scenario 1 - Rice Rd and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBLR	1.65	351.8	F	172	0.92	107.4	F	51	435
NBLT	0.02	0.5	A	1	0.09	2.2	A	2	1037
SBTR	0.27	0.0	-	0	0.45	0.0	-	0	1037

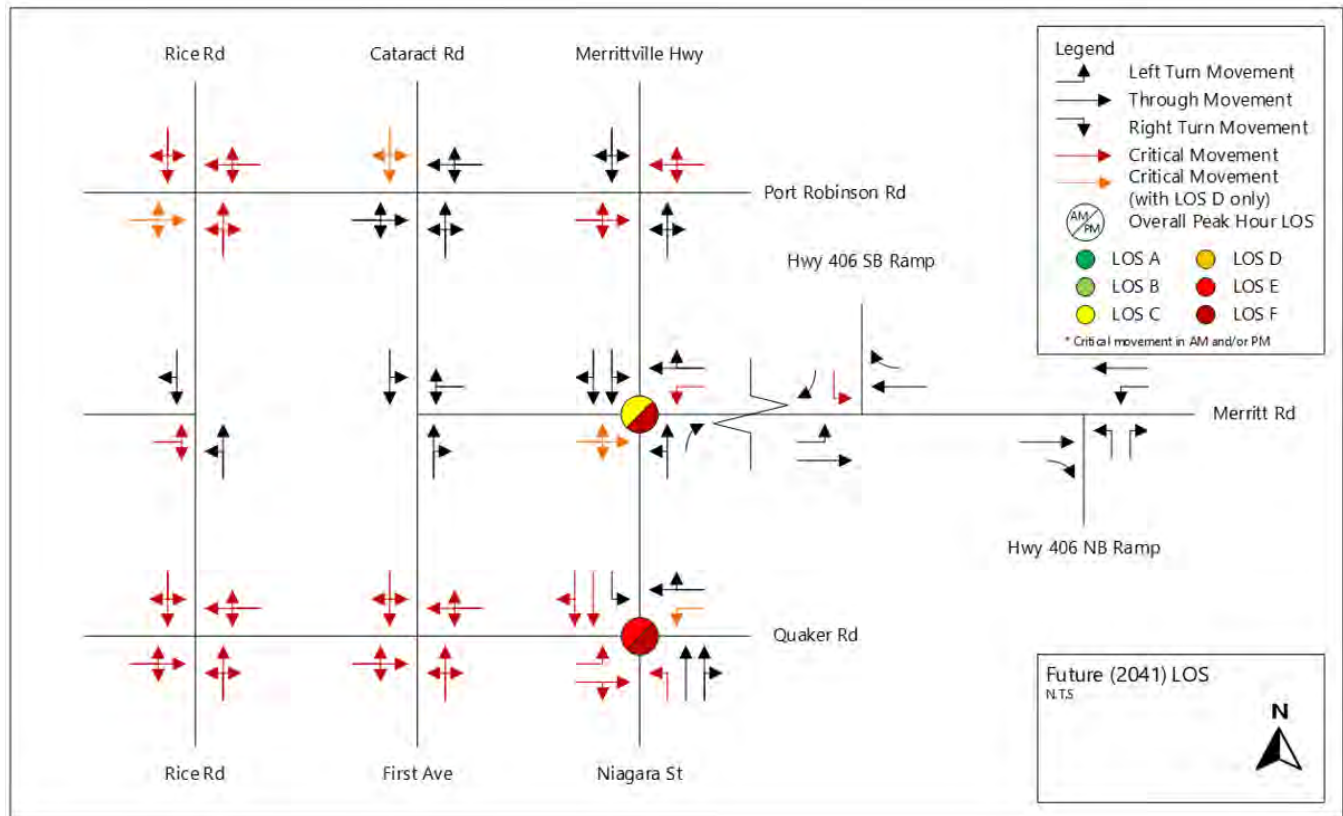
Table 4-55: 2041 Unsignalized Intersection Operations – Scenario 1 - Rice Rd and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBLTR	1.77	381.0	F	-	1.42	228.5	F	-	441
WBLTR	1.32	187.7	F	-	1.80	392.4	F	-	822
NBLTR	2.18	560.1	F	-	1.98	471.1	F	-	400
SBLTR	1.18	135.5	F	-	1.38	212.9	F	-	1037

Table 4-56: 2041 Unsignalized Intersection Operations – Scenario 1 - Hwy 406 NB Ramp and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBT	0.01	0.0	-	0	0.03	0.0	-	0	340
EBR	0.61	0.0	-	0	0.63	0.0	-	0	200
WBL	0.01	7.3	A	0	0.01	7.3	A	0	65
WBT	0.02	0.0	-	0	0.02	0.0	-	0	198
NBL	0.09	9.3	A	2	0.09	9.6	A	2	501
NBR	-	-	-	-	-	-	-	-	180

Figure 4-20: Future (2041) Intersection Operation Conditions (Scenario 1)



4.2.3.2 2041 Future Traffic Demand – Scenario 2

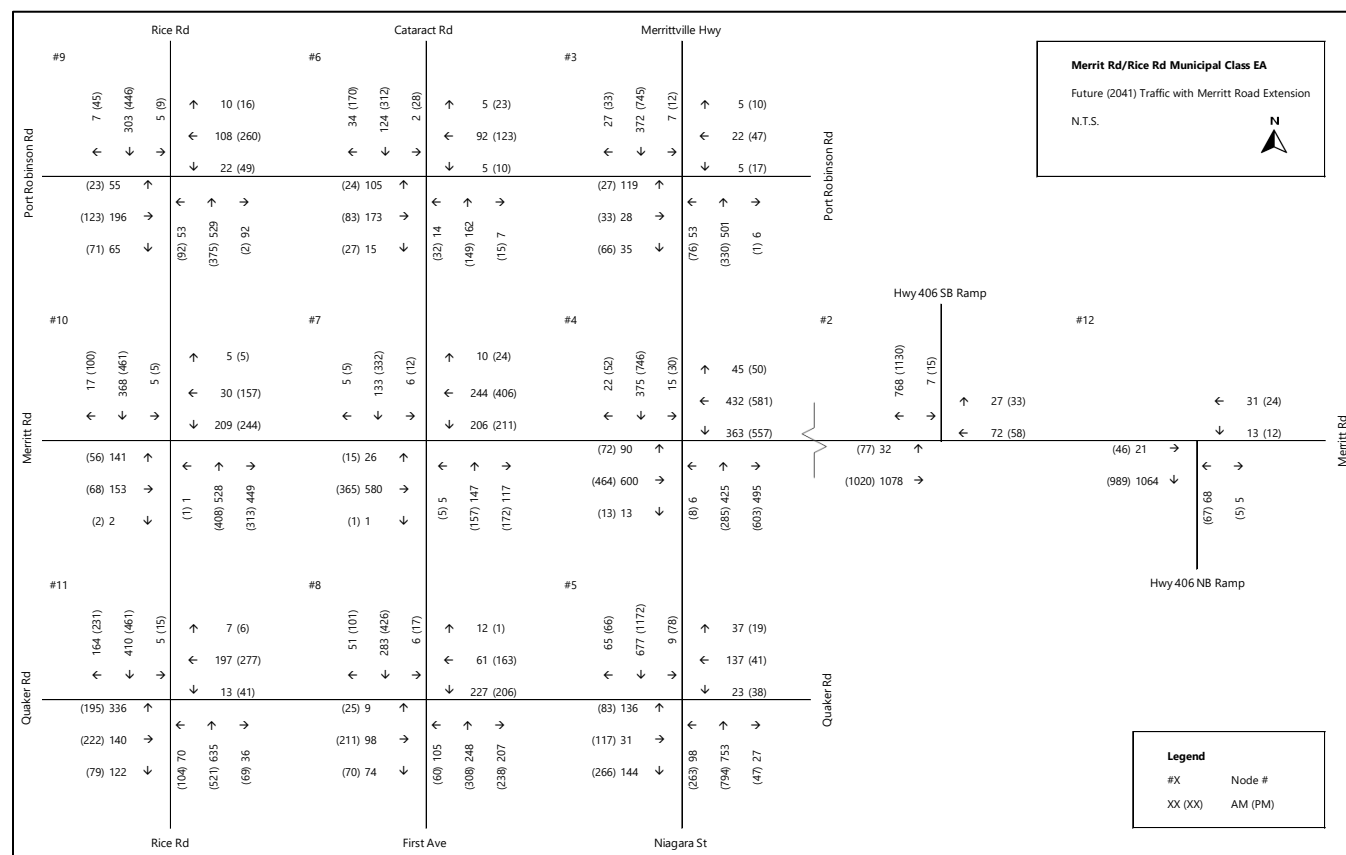
The inclusion of the Merritt Road extension between Cataract Road and Rice Road results in a further increase in traffic along Merritt Road from east of Rice Road to Highway 406. However, there will be a significant decrease in traffic along Quaker Road and with Niagara Street / Merrittville Highway compared to Scenario 1.

The Merritt Road extension offers more direct access to Highway 406, thereby alleviating congestion issues associated with the detoured turning movements.

The forecasted traffic volumes are illustrated in the following figure.

Niagara Region
Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37)
and Rice Road (Regional Road 54)

Figure 4-21: Future (2041) Traffic Volumes (Scenario 2)



2041 Conditions Link Capacity Analysis – Scenario 2

The results of link capacity analysis summarized in Table 4-57 and Table 4-58 demonstrate that with the proposed right of way and geometric improvements, none of the study area segments will have traffic exceeding capacity by 2041, assuming that Rice Road is widened to four lanes between Quaker Road and Merritt Road.

Table 4-57: 2041 Link Capacity Analysis – Scenario 2 – AM Peak Hour

Segment	Direction	Lane Capacity	# Of Lanes	Total Capacity (Vehicle/Hour/lane)	Volume (Vehicle/Hour)	Volume to Capacity Ratio (V/C)
Merritt Road (East of Niagara Street / Merrittville Highway)	EB	850	2	1700	1110	0.65
Merritt Road (East of Niagara Street / Merrittville Highway)	WB	850	2	1700	840	0.49
Merritt Road (East of Cataract Road)	EB	850	1	850	703	0.83
Merritt Road (East of Cataract Road)	WB	850	1	850	460	0.54
Rice Road (North of Quaker Road)	NB	850	2	1700	978	0.58
Rice Road (North of Quaker Road)	SB	850	2	1700	579	0.34
Rice Road (North of Merritt Road)	NB	850	1	850	674	0.79
Rice Road (North of Merritt Road)	SB	850	1	850	390	0.46

Table 4-58: 2041 Link Capacity Analysis – Scenario 2 – PM Peak Hour

Segment	Direction	Lane Capacity	# Of Lanes	Total Capacity (Vehicle/Hour/lane)	Volume (Vehicle/Hour)	Volume to Capacity Ratio (V/C)
Merritt Road (East of Niagara Street / Merrittville Highway)	EB	850	2	1700	1097	0.65
Merritt Road (East of Niagara Street / Merrittville Highway)	WB	850	2	1700	1188	0.70
Merritt Road (East of Cataract Road)	EB	850	1	850	549	0.65
Merritt Road (East of Cataract Road)	WB	850	1	850	641	0.75
Rice Road (North of Quaker Road)	NB	850	2	1700	722	0.42
Rice Road (North of Quaker Road)	SB	850	2	1700	707	0.42
Rice Road (North of Merritt Road)	NB	850	1	850	469	0.55
Rice Road (North of Merritt Road)	SB	850	1	850	566	0.67

2041 Intersection Capacity Analysis – Scenario 2

Signal Warrant Analysis:

Signal warrant analyses were conducted for the following five intersections:

- Rice Road / Quaker Road;
- Rice Road / Merritt Road;
- Merritt Road / Cataract Road;
- Merrittville Highway / Port Robinson Road; and
- First Avenue/Cataract Road at Quaker Road.

A signal was justified for all the five intersections. Installation of traffic signals was assumed for 2031 at Rice Road at Quaker Road, Rice Road at Merritt Road and Rice Road at Port Robinson Road, therefore these three intersections are also assumed to have traffic signals in 2041. Similarly, to the analysis for Scenario 2 for 2031, for the intersections of First Avenue/Cataract Road and Quaker Road, retention of the existing all-way stop control with lane configuration improvements was tested to determine if acceptable operation would result, however it was found that acceptable operation could not be achieved. Therefore, the following two intersections are recommended for signalization by 2041:

- First Avenue / Cataract Road/Quaker Road; and
- Cataract Road / Merritt Road.

Lane Configurations:

Following are the modifications to the Future (2041) road network, made based on the results of the signal warrant analysis, link capacity analyses, intersection capacity analyses, and consultation with the Region:

Rice Road between Quaker Road and Merritt Road

- Rice Road widened between Quaker Road and Merritt Road to four travel lanes to meet travel demand

Rice Road and Merritt Road

- Add a protected-permitted traffic signal phase for westbound left turns

Rice Road and Quaker Road

- Add a protected-permitted left turn phase for eastbound left turns

First Avenue/Cataract Road and Quaker Road

- Signalize intersection and add dedicated left turn lanes on each approach
- Provide a protected-permitted traffic signal phase for eastbound left turns

Cataract Road and Merritt Road

- Signalize intersection and add dedicated left-turn lanes at all approaches (or convert to a roundabout)

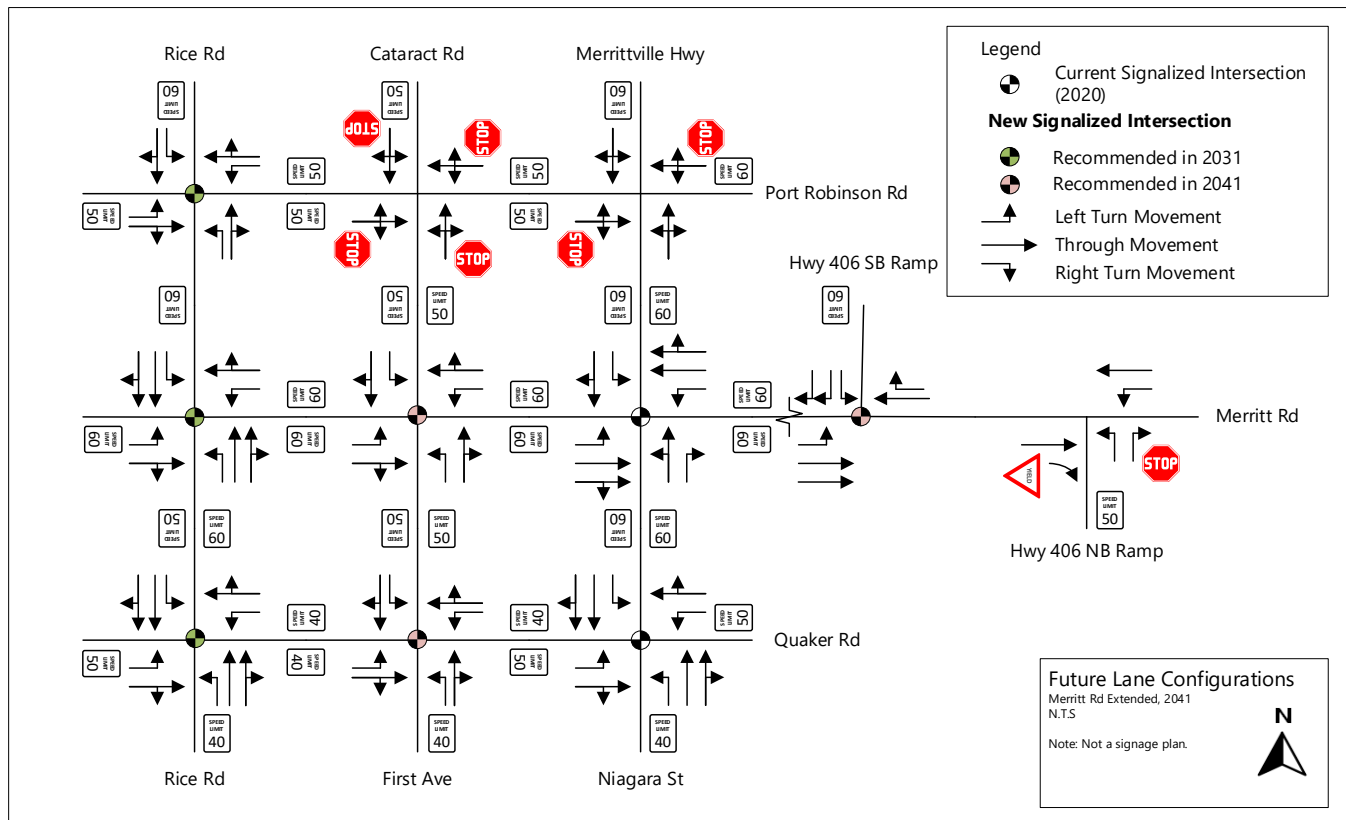
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and Rice Road (Regional Road 54)

Merritt Road and Highway 406 Southbound ramp

- Discussed in Section 8.3.3.

The road network, along with lane configurations and intersection controls, is illustrated in the following figure, assuming traffic signals are implemented.

Figure 4-22: Future (2041) Lane Configurations and Intersection Controls (Scenario 2)



Intersection Capacity Analysis:

The results of the traffic operations assessment in Synchro for signalized and unsignalized intersections are summarized in Table 4-59 through Table 4-69.

For the signalized intersections:

- At Niagara Street/Merrittville Highway and Merritt Road, the westbound left turn is expected to have minor operating problems during the AM peak hour, with a volume to capacity ratio of 0.93 and LOS D. With optimized splits during the PM peak hour, the westbound left turn is expected to have a volume to capacity ratio of 1.06, LOS E and a queue length of 149 meters. Since the westbound left turn volume is forecast to be 557 vehicles per hour for 2041, a second left turn lane may be considered to mitigate this issue in the future. Eastbound left turns, northbound through movements and southbound through and right turn movements are expected to have minor delays with LOS D during one of the peak hours.

Niagara Region

Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)

- At Merritt Rd and Hwy 406 SB Ramp, and Merritt Road and Grisdale Avenue, volume to capacity ratios are below the MTO threshold of 0.75 for all movements, and delays are acceptable.
- At Niagara Street and Quaker Road, with optimized splits, minor operating problems are expected for the PM peak hour, with the eastbound through and right turn lane group having a volume to capacity ratio of 1.02 and LOS E, the westbound left turn having LOS E, the northbound through movement having a volume to capacity ratio of 1.07, LOS F and a 95th percentile queue length of 88 meters versus 75 meters of storage and the southbound through movement having a volume to capacity ratio of 1.00 and LOS D. Given the high volume of southbound through vehicles and high demand for northbound left turns, addition of a southbound through lane through the intersection may be beneficial in future.
- If Cataract Road and Merritt Road is signalized by 2041, minor operating problems are expected, including an eastbound volume to capacity ratio of 0.91 and LOS D during the AM peak hour and LOS D during the afternoon peak hour.
- First Avenue/Cataract Road and Quaker Road would need to be signalized by 2041 with left turn lanes for each approach. With longer storage of 50 meters for the westbound left turn lane, and an eastbound protected-permitted left turn phase, all volume to capacity ratios will be below 1.00. The eastbound volume to capacity ratio will be slightly above the threshold of 0.85, at 0.87 during the PM peak hour, and the approach will have LOS D during both peak hours.
- With signalization and left turn lanes on each approach at Rice Road and Port Robinson Road, all volume to capacity ratios will be below 0.85 during each of the peak hours. The westbound approach is expected to have LOS D in the PM peak hour and the eastbound approach is expected to have LOS D during the AM peak hour.
- At the intersection of Rice Road and Merritt Road, the westbound left turn is expected to have minor delays with LOS D during the AM peak hour, and the eastbound left, eastbound through/right and westbound left and westbound left turn movements are expected to have minor delays with LOS D in the PM peak.
- Rice Road and Quaker Road minor delays are expected for the westbound through and right turn with LOS D in the AM and PM peak hours.
- The Merritt Road and Highway 406 southbound ramp was analyzed based on alternative traffic control. This analysis is discussed in detail in Section 10 of the Transportation Assessment Report provided in Appendix A.

Figure 4-23 illustrates the critical movements for this scenario.

Table 4-59: 2041 Signalized Intersection Operations – Scenario 2 – Niagara St / Merrittville Hwy and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBL	0.40	30.2	C	27	0.47	38.8	D	25	90
EBTR	0.67	30.3	C	67	0.65	33.1	C	56	150
WBL	0.93	46.9	D	#89	1.06	71.9	E	#149	65
WBTR	0.32	13.1	B	35	0.40	12.8	B	46	1297
NBL	0.02	19.3	B	3	0.09	23.9	C	5	30
NBT	0.81	39.1	D	#117	0.58	29.4	C	68	1000
NBR	0.68	10.6	B	48	0.78	11.8	B	54	40
SBL	0.10	21.4	C	7	0.18	24.4	C	11	40
SBTR	0.40	22.1	C	40	0.84	35.3	D	93	1000
Overall	-	-	C	-	-	-	C	-	-

Notes

#: 95th percentile volume exceeds capacity, a queue may be longer

Table 4-60: 2041 Signalized Intersection Operations – Scenario 2 – Merritt Rd and Hwy 406 SB Ramp, and Merritt Rd and Grisdale Ave

Intersection	Weekday Morning Peak Hour Performance Measures			Weekday Afternoon Peak Hour Performance Measures		
	Maximum Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	Maximum Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service
Merritt Road & Hwy 406 Southbound Ramp	0.71	21.3	C	0.69	22.0	C
Merritt Road & Grisdale Road	0.53	2.2	C	0.51	1.8	A

Table 4-61: 2041 Signalized Intersection Operations – Scenario 2 – Niagara St and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBL	0.57	33.7	C	38	0.36	33.9	C	27	80
EBTR	0.40	9.6	A	19	1.02	75.5	E	#114	825
WBL	0.10	22.7	C	9	0.59	66.5	E	#22	30
WBTR	0.46	24.9	C	41	0.18	22.1	C	16	481
NBL	0.28	8.2	A	13	1.07	98.5	F	#88	75
NBTR	0.55	13.0	B	70	0.58	16.2	B	73	404
SBL	0.02	6.7	A	2	0.28	8.4	A	10	65
SBTR	0.72	22.1	C	74	1.00	49.3	D	#166	1026
Overall	-	-	B	-	-	-	E	-	-

Notes: #: 95th percentile volume exceeds capacity, a queue may be longer

Table 4-62: 2041 Signalized Intersection Operations – Scenario 2 – Cataract Rd and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBL	0.07	15.4	B	8	0.07	15.1	B	m4	30
EBTR	0.91	43.7	D	157	0.81	37.4	D	94	824
WBL	0.78	31.0	C	#36	0.65	22.1	C	31	40
WBTR	0.30	11.6	B	36	0.63	22.3	C	76	681
NBL	0.01	28.0	C	m1	0.02	19.8	B	3	30
NBTR	0.564	31.0	C	m48	0.53	21.3	C	73	1030
SBL	0.03	24.0	C	4	0.04	20.0	B	6	30
SBTR	0.30	26/6	C	36	0.54	24.5	C	84	991
Overall	0.76-	-	C	-	-	-	C	-	-

Notes

#: 95th percentile volume exceeds capacity, a queue may be longerm: Volume for the 95th percentile queue is metered by an upstream signal

Table 4-63: 2041 Signalized Intersection Operations – Scenario 2 – First Ave/Cataract Rd and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBL	0.05	33.2	C	m4	0.11	24.3	C	m9	30
EBTR	0.73	45.3	D	45	0.87	50.5	D	#86	822

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
WBL	0.72	32.5	C	47	0.73	31.4	C	#42	30
WBTR	0.13	14.1	B	15	0.26	17.4	B	32	825
NBL	0.33	17.6	B	26	0.34	22.4	C	19	30
NBTR	0.63	18.9	B	94	0.79	28.0	C	#141	402
SBL	0.02	10.7	B	m1	0.10	11.5	B	m3	30
SBTR	0.45	13.5	B	m53	0.76	24.1	C	#140	1030
Overall	-	-	C	-	-	-	C	-	-

Notes

#: 95th percentile volume exceeds capacity, a queue may be longerm: Volume for the 95th percentile queue is metered by an upstream signal

Table 4-64: 2041 Signalized Intersection Operations – Scenario 2 – Rice Rd and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBL	0.23	27.7	C	16	0.15	27.3	C	9	30
EBTR	0.77	43.8	D	62	0.52	28.6	C	40	431
WBL	0.18	28.3	C	9	0.24	28.7	C	15	30
WBTR	0.35	28.6	C	29	0.75	43.9	D	65	839
NBL	0.11	9.8	A	11	0.22	20.3	C	27	30

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
NBTR	0.67	17.0	B	135	0.39	20.2	C	84	887
SBL	0.02	9.4	A	2	0.02	9.1	A	3	30
SBTR	0.33	10.6	B	51	0.51	12.9	B	86	467
Overall	-	-	C	-	-	-	C	-	-

Table 4-65: 2041 Signalized Intersection Operations – Scenario 2 – Rice Rd and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBL	0.50	30.0	C	33	0.50	49.4	D	21	41
EBTR	0.38	25.8	C	33	0.37	39.2	D	23	435
WBL	0.78	46.2	D	51	0.78	49.5	D	73	80
WBTR	0.09	18.3	B	9	0.39	33.0	C	53	824
NBL	0.00	11.0	B	1	0.00	7.0	A	m0	80
NBTR	0.61	10.8	B	67	0.45	7.0	A	56	
SBL	0.03	11.8	B	m2	0.02	11.4	B	2	50.5
SBTR	0.25	11.6	B	40	0.37	11.7	B	45	
Overall	-	-	B	-	-	-	B	-	-

Notes

m: Volume for the 95th percentile queue is metered by an upstream signal

Table 4-66: 2041 Signalized Intersection Operations – Scenario 2 – Rice Rd and Quaker Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBL	0.74	24.7	C	60	0.68	29.3	C	37	90
EBTR	0.37	10.5	B	34	0.51	20.9	C	55	441
WBL	0.08	28.2	C	m2	0.20	27.9	C	14	40
WBTR	0.75	41.7	D	m40	0.78	46.3	D	72	822
NBL	0.40	30.0	C	25	0.45	23.8	C	31	90
NBTR	0.60	24.9	C	77	0.42	15.6	B	53	
SBL	0.4	20.2	C	3	0.05	15.7	B	m5	70
WBTR	0.53	21.1	C	59	0.46	15.2	B	64	
Overall	-	-	C	-	-	-	C	-	-

Notes

m: Volume for the 95th percentile queue is metered by an upstream signal

Table 4-67: 2041 Unsignalized Intersection Operations – Scenario 2 – Merrittville Hwy and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBLTR	1.89	488.6	F	142	0.98	134.2	F	53	838
WBLTR	0.29	40.8	E	9	0.81	120.9	F	34	681
NBLTR	0.07	1.8	A	2	0.10	3.0	A	3	1027
SBLTR	0.01	0.3	A	0	0.01	0.3	A	0	497

Table 4-68: 2041 Unsignalized Intersection Operations – Scenario 2 – Cataract Rd and Port Robinson Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBLTR	0.47	12.9	B	-	0.26	11.5	B	-	839
WBLTR	0.17	9.9	A	-	0.30	12.2	B	-	838
NBLTR	0.30	10.8	B	-	0.34	11.8	B	-	991
SBLTR	0.26	10.3	B	-	0.80	25.7	D	-	524

Table 4-69: 2041 Unsignalized Intersection Operations – Scenario 2 – Hwy 406 NB Ramp and Merritt Rd

Lane	Weekly Morning Peak Hour Performance Measures				Weekly Afternoon Peak Hour Performance Measures				Storage (meters)
	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	Volume to Capacity Ratio	Average Vehicle Delay (seconds)	Level of Service	95 th Percentile Queue Length (meters)	
EBT	0.01	0.0	-	0	0.03	0.0	-	0	340
EBR	0.71	0.0	-	0	0.69	0.0	-	0	200
WBL	0.01	7.3	A	0	0.01	7.3	A	0	65
WBT	0.02	0.0	-	0	0.02	0.0	-	0	198
NBLR	0.09	9.3	A	2	0.09	9.6	A	2	501/180

For the remaining unsignalized intersections:

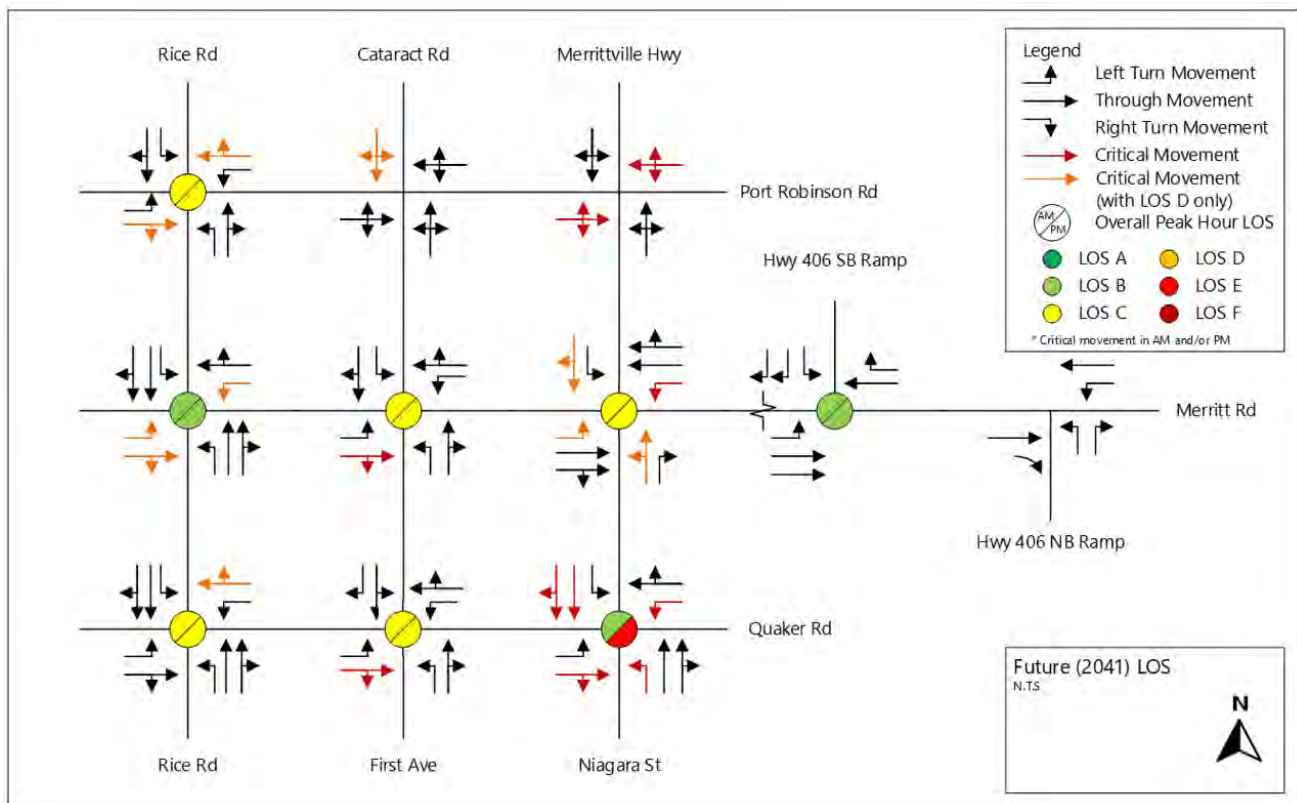
- At Merrittville Highway and Port Robinson Road, the eastbound left-through-right movement is critical in the AM and PM peak hours (v/c 1.89 and 0.98, LOS F). The Westbound left-through-right movement is also a critical movement in the AM peak hour with LOS E and in the PM peak hour with LOS F. This intersection is modelled with a highly conservative PHF; performance may be better than forecast with a higher PHF in future. However, it is expected that additional improvements such as signalization will be required at this intersection to manage traffic demand acceptably in the future.
- For the intersection of Cataract Road and Port Robinson Road, with existing traffic control, minor delays are expected for the southbound approach, with LOS D in the PM peak hour.

For the MTO Highway 406 ramps:

- The Merritt Road and Highway 406 southbound ramp was analyzed based on alternative traffic control. This analysis is discussed in detail in Section 12.1 of the Transportation Assessment Report provided in Appendix A.
- No issues were identified at the Merritt Road and Highway 406 Northbound Ramp.

The results reflect that the extension of Merritt Road between Cataract Road and Rice Road would allow rerouting the high travel demand from Quaker Road to Merritt Road. In addition, the extension would allow vehicles to access the Highway 406 ramps directly via Merritt Road in addition to via Niagara Street.

Figure 4-23: Future (2041) Intersection Operation Conditions (Scenario 2)



Turn Lane Storage – Scenario 2

Based on the 95th percentile queues calculated by Synchro, storage requirements are recommended for left and right turn lanes at the study intersections, reflective of anticipated traffic needs in the 2041 horizon year in the following table. Per Regional practice, a minimum of 30 meter was used. In addition to the storage, a 10:1 taper is recommended.

Table 4-70: Left and Right Turn Lane Storage Requirements

Intersection	95 th percentile queue	Recommended Storage
Rice Road / Quaker Road	EBL – 60 m WBL – 14 m NBL – 31 m SBL – 5 m	EBL – 60 m WBL – 30 m NBL – 40 m SBL – 30 m
Rice Road / Merritt Road	EBL – 33 m WBL – 73 m NBL – 1 m SBL – 45 m	EBL – 40 m WBL – 80 m NBL – 30 m SBL – 50 m
Cataract Road / Merritt Road	EBL – 8 m WBL – 36 m NBL – 3 m SBL – 6 m	EBL – 30 m WBL – 40 m NBL – 30 m SBL – 30 m
Niagara Street / Merrittville Highway / Merritt Road	EBL – 27 m WBL – 149 m NBL – 5 m NBR – 48 m SBL – 11 m	EBL – 30 m WBL – 150 m NBL – 30 m NBR – 50 m SBL – 30 m

4.3 Social Environment

4.3.1 Land-use

Existing land-uses to the north and south of Segment 1 are predominantly provincially significant wetlands and woodlands with residences and agricultural land-uses along the Rice Road intersection.

Figure 4-24: Land-uses Along Segment 1



Niagara Region

Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)

Existing land-uses along Segment 2 are predominantly residential on the north side and predominantly provincially significant wetlands and woodlands on the south side. There are commercial land-uses along the Merrittville Highway / Niagara Street intersection.

Figure 4-25: Land-uses Along Segment 2



Existing land-uses along Segment 3 are predominantly provincially significant wetlands and woodlands on the north side, and predominantly residential on the south side (Merritt Meadows subdivision with access via Eastman Gateway and Grisdale Road).

Figure 4-26: Land-uses Along Segment 3



Land-uses on the east and west side of Rice Road are predominantly residential and agricultural. In addition, Niagara Catholic District School Board building is located on the southwest quadrant of Rice Road and Quaker Road intersection.

Figure 4-27: Land-uses Along Segment 4



4.4 Cultural Environment

4.4.1 Built Heritage Resources and Cultural Heritage Landscapes

A Cultural Heritage Assessment Report was prepared by WSP to establish the historical context of the Study Area, identify protected and potential built heritage resources and cultural heritage landscapes, and complete an impact assessment to identify anticipated impacts of the project to identified heritage properties. Where impacts were anticipated, mitigation measures were prepared as part of the Cultural Heritage Assessment Report.

The Ministry of Citizenship and Multiculturalism's (MCM) "Ontario Heritage Toolkit" gives guidance and information on the heritage conservation process in Ontario. Specifically, the information sheets contained in the "Heritage Resources in the Land Use Planning Process: Cultural Heritage and Archaeology Policies of the Ontario Provincial Policy Statement, 2005" were used to guide the general preparation of Cultural Heritage Assessment Report.

The City of Thorold, City of Welland, Town of Pelham, Ontario Heritage Trust, and MCM were contacted directly via email to gather information regarding protected and potential heritage properties within, and adjacent to the Study Area. In addition, to identify properties with potential cultural heritage value, the following online sources were reviewed:

- Ontario Heritage Act Register (Ontario Heritage Trust 2019)
- Plaques Database (Ontario Database 2019)
- Heritage Welland Designations (2021)
- Welland Heritage Place of Interest (2021)
- Heritage Thorold Designated Properties (2018)
- Canadian Heritage Rivers System (2017)
- Designated Heritage Railway Stations in Ontario (2017)
- National Historic Sites, Designated Lighthouses, Ontario (2019)
- Canada, Properties inscribed on the World Heritage List (UNESCO 2021)
- Northwest Welland Secondary Plan Cultural Heritage Resource Assessment Study Existing Conditions Report, City of Welland, Ontario (ASI 2018)

As part of background research, various information sources, historical maps, and aerial photographs were consulted, as appropriate, to identify historical themes relevant to the Study Area. Specifically, research regarding the physiography, survey and settlement, 19th century land use, and 20th century land use of the Study Area was completed. A review of historical mapping and aerial photographs was also conducted to identify settlements, structures, and landscape features within, and adjacent to, the Study Area. Historical maps from 1906, 1907, 1908, 1915, 1920, 1925, 1928, 1930, 1938, 1939, and 1942 were reviewed. In addition, recent aerial photographs and Google Earth imagery were reviewed to identify changes within, and adjacent to, the Study Area.

Niagara Region

Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)

A field review of the Study Area was completed by WSP's Cultural Heritage Specialist, on February 3, 2021, to identify protected or potential heritage properties, including both built heritage resources and cultural heritage landscapes. During the field review, the 40-year 'rule of thumb' was used to identify properties with the potential to have *Cultural Heritage Value or Interest* (CHVI). The 40-year rule is generally accepted by federal and provincial agencies as a preliminary screening measure for CHVI. It should be noted, however, that the 40-year threshold is a guide only and does not imply that all properties of 40 years of age have CHVI. Nor does it exclude properties that are less than 40 years of age and exhibit Cultural Heritage Value or Interest. The professional judgement of WSP's Cultural Heritage Specialist was used during the field review to apply the 40-year rule and identify properties with potential CHVI.

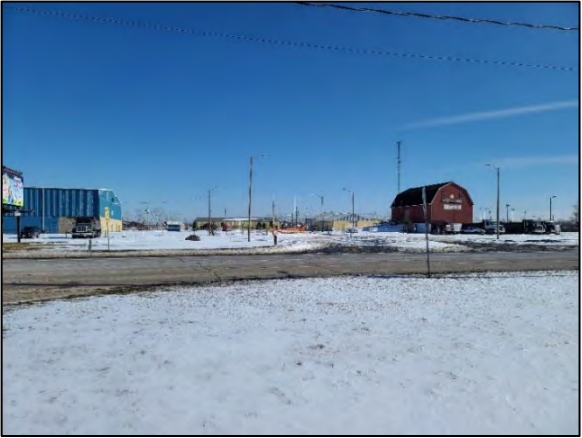
Following the completion of background research, consultation, and a field review, it was determined that there are three built heritage resources and five cultural heritage landscapes within, or adjacent to, the Study Area. Identified built heritage resources and cultural heritage landscapes are listed in Table 4-71.

Cultural Heritage Assessment Report was shared with the local Indigenous Communities and the MCM staff for review and comment. The Cultural Heritage Assessment Report is provided in Appendix B.

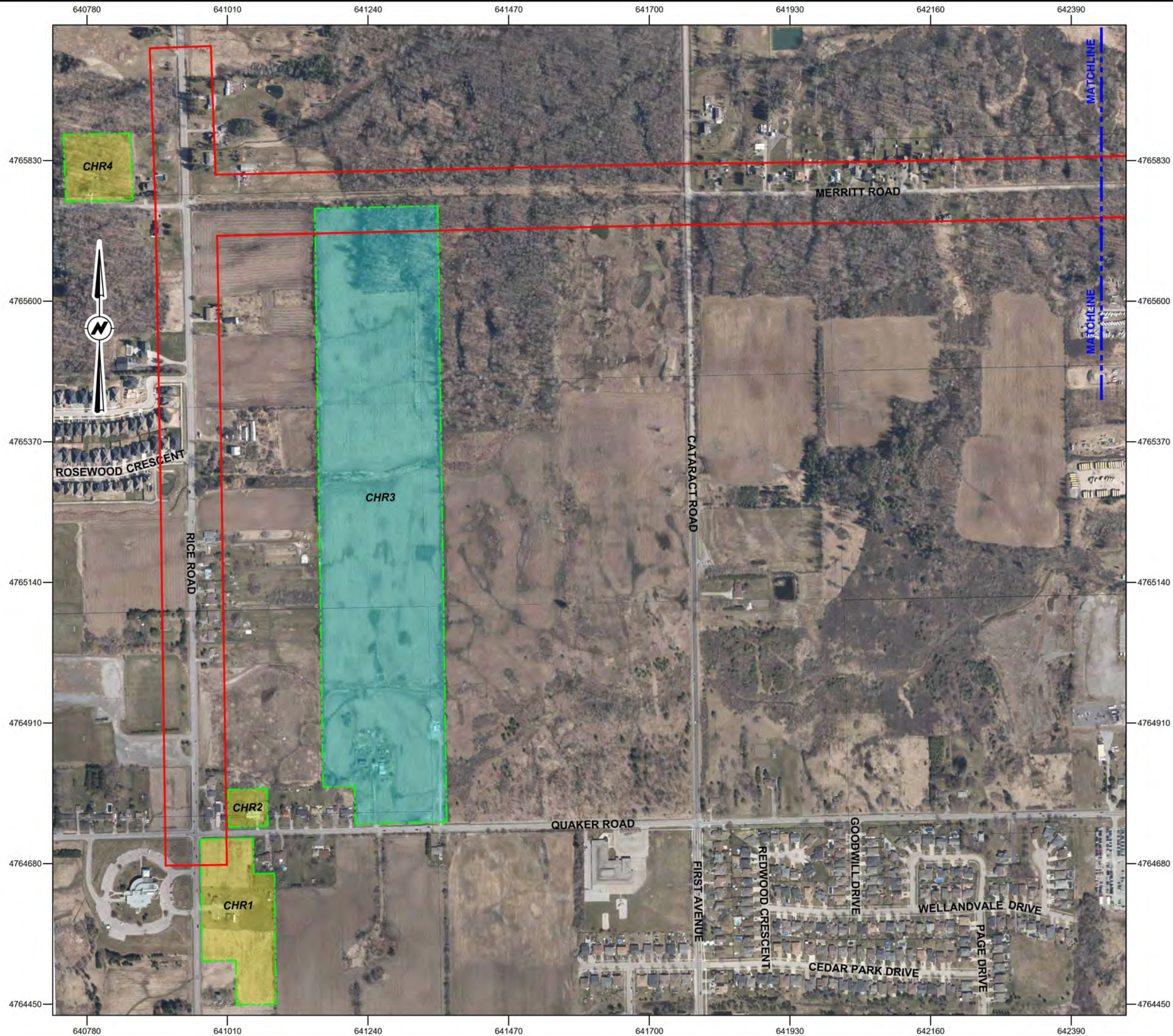
Table 4-71: Identified Built Heritage Resources and Cultural Heritage Landscapes

CHR No.	Type	Location	Heritage Recognition	Description of Property	Photographs/Digital Image
CHR1	-CHL -Farm Complex	402 Rice Road (Regional Road 54)	-Identified during field review	This property landscape contains a one-storey residence Bungalow style residence that was constructed between 1934 and 1954/55. This property also contains a one-and-a-half-storey barn with a gambrel roof. The residence is clad in clapboard-style siding and has a gable roof with projecting eaves. The front façade (east elevation) is asymmetrically arranged with an offset (right) multilight bay window with a gable roof and shaped transom with a single armed Victorian style lantern and three six over six sash windows. The front entrance is not visible from Rice Road (Regional Road 54). Landscape elements includes mature trees and a signpost. Located on the property is a one-and-a-half-storey gambrel barn clad in clapboard siding with a shed style addition on the west elevation. The windows, which are a mix of sash one-over one, single pane, and sash four over one, all appear to have an original wood trim.	
CHR2	-BHR -Residence	484 Quaker Road	-Identified during field review	This property contains a one-and-a-half and two-and-a-half split-storey residence that was first constructed between 1876 and 1934 with a later addition built between 2000 and 2002. The residence is clad in clapboard siding with a cross gable roof and features an irregular plan with pronounced, projecting eaves. The original one-and-a-half-storey structure is located on the left and is symmetrically arranged with the front entrance centered and covered by a bracketed shed style portico. The front façade also features a pair of three casement windows (lower level) and a shed style dormer with a single two casement window (upper). An interior brick chimney is visible from Quaker road. The front façade of the addition (right) features a gable roof, a gable style dormer (upper level) with a drop bay roof, a gable roofed garage and a second entrance with a gable style portico supported by piers. The front façade of the addition includes two multi-light semi-circular windows and three square multi-light windows (one sash eight over eight, two sash four over four) located on the bay style dormer. Landscape elements include a mix of mature and young trees and ground floor steps with a metal railing.	
CHR3	-BHR -Farm Complex	436 Quaker Road	-Identified during field review -Previously identified as potential cultural heritage landscape by ASI (2018)	This property landscape contains a one-and-a-half-storey residence constructed between 1862 and 1876 with Ontario Vernacular influences. Other buildings on the property include a barn with a gambrel roof, and a shed with a gable roof The residence is clad in clapboard siding with a cross gable roof and L-shaped plan with pronounced, projecting eaves. The front façade (north elevation) features one sash one-over-one window, one triple sash one over one windows (lower level), and a dormer with a paired sash one over one window with a gable roof and clapboard siding. A shed style portico is located on the left (west elevation) supported by two piers. An interior brick chimney is visible from Quaker Road. There is no front entrance visible from Quaker Road. Landscape elements include mature trees, and the complex is significantly setback from the road.	

CHR No.	Type	Location	Heritage Recognition	Description of Property	Photographs/Digital Image
CHR4	-BHR -Residence	225 Merritt Road	-Identified during field review	This property was identified during field review. The property description provided below is based on field observations. Property Description This property contains a one-storey Bungalow style residence that was likely built pre-1934. The construction date is unknown at this time due to heavy foliage in historic aerials. The residence is clad in clapboard siding with a gable roof and rectangular plan with pronounced, projecting eaves. The front façade (north elevation) is asymmetrically arranged with the front entrance offset to the left (east). The front façade also features one sash four over four window, one sash one over one and one multilight three casement window. An interior chimney is visible form Merritt Road. Landscape elements includes mature trees and ground floor steps with a metal railing.	
CHR5	-CHL -Farm Complex	1173 Merrittville Highway	-Identified during field review	This property landscape contains a one-and-a-half-storey Cottage Bungalow style residence likely constructed in the mid-20th century based on architectural style and materials. The residence is clad in clapboard siding with a gable roof and rectangular shaped plan with pronounced, projecting eaves. The front façade (east elevation) is asymmetrically arranged with the front entrance offset to the right (north). The windows are a mix of triple sash one over one windows (upper level), and one single pane window with wooden shutters (lower level). The front door has a decorative trim, and the front entrance is covered by a shed style portico awning supported by a pair of plain columns. A shed style dormer located on the left (north elevation) is visible from and an interior brick chimney is visible from Merrittville Highway. Landscape elements include mature trees, and the complex is significantly setback from the road.	
CHR6	-CHL -Farm Complex	1321 Hansler Road	-Identified during field review	This property landscape contains a two-storey residence that was likely constructed in the mid-20th century based on architectural style and materials. The residence features two additions including a gable style garage addition (left) and a gable style greenhouse (right). Other buildings on the property include a one-and-a-half-storey gambrel style barn, two one-storey buildings with rectangular plans and low gable roofs and one shed with a saltbox style roof and rectangular plan. The residence is clad in brick (lower level) and clapboard siding (upper level) with a gable roof with pronounced, projecting eaves. The front façade (west elevation) is symmetrically arranged with the front entrance centered and four two over two sash windows (upper and lower) and a one over one sash window (upper). The front entrance is covered by a shed style portico supported by three piers and gingerbread trim. Landscape elements includes mature trees, ground floor steps to the front railing and two brick piers with lamps and a metal fence.	

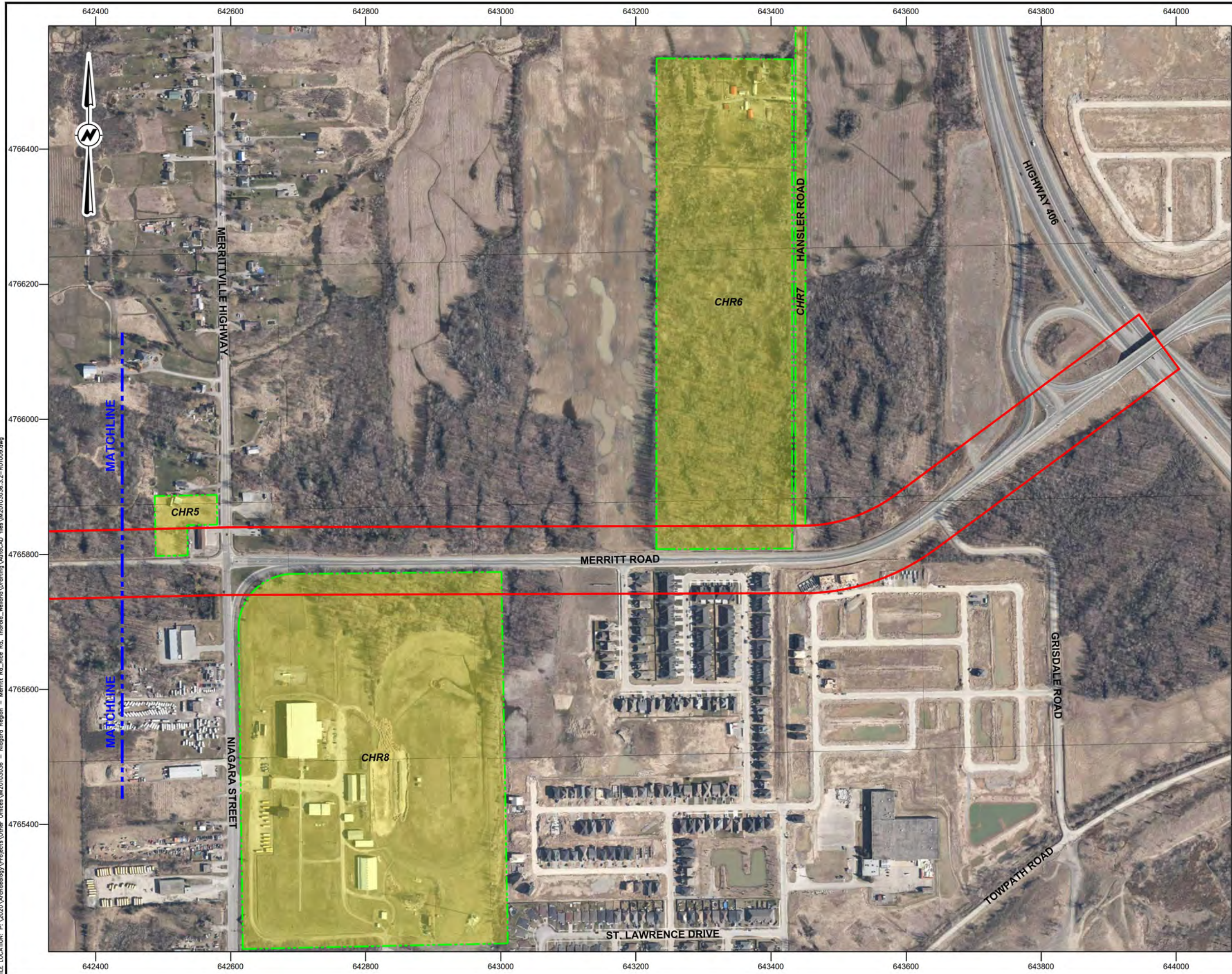
CHR No.	Type	Location	Heritage Recognition	Description of Property	Photographs/Digital Image
CHR7	-CHL -Roadscape	Hansler Road	-Identified during field review	Hansler Road is a historically surveyed road first depicted on 1862 mapping. It is presently a gravel road lined by mature trees with no lane markers which does not appear to have been widened in recent years. Portions of the road located south of 1321 Hansler Road are overgrown from disuse.	
CHR8	-CHL -Niagara Regional Agricultural Society	1100 Niagara Street	-Identified during field review	The Niagara Regional Exhibition property landscape features two buildings, a barn, grandstands and infield, a horseshow ring, poultry building, and a camping area (Niagara Regional Exhibition 2021). The main building (east elevation) has a rectangular plan and a low gable roof with a mural and sign reading 'Niagara Regional Exhibition'. The one-and-a-half-storey barn structure (east elevation) has a rectangular plan with a gambrel roof clad in red shingle siding and a pair of two double hung windows (upper level). Visible from Niagara Street are three outbuildings with rectangular plans and low gable roofs and the grandstands. Currently owned and operated by the Niagara Regional Agricultural Society the exhibition had its beginnings in 1832 when it was first located at Ephriam Hopkins' farm and has remained in operation for over 100 years. When the fair reached its limitation on their 16 acres the Welland County Agricultural Society, on May 31, 1967, purchased 75 acres at the junction of highways 406 and 58 (Niagara Regional Exhibition 2021).	 

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PROJECT: CULTURAL HERITAGE ASSESSMENT EXISTING CONDITIONS AND IMPACT ASSESSMENT SCHEDULE C MCEA REGIONAL ROAD 37 (MERRITT ROAD) AND REGIONAL ROAD 54 (RICE ROAD) TOWN OF PELHAM, CITY OF THOROLD, AND CITY OF WELLAND, ONTARIO		
TITLE: IDENTIFIED CULTURAL HERITAGE RESOURCES		
LEGEND: - STUDY AREA - PROPERTY LINE - PREVIOUSLY IDENTIFIED (ASI 2018) - IDENTIFIED DURING FIELD REVIEW		
Figure 4-28		
NOTES: THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. IM20103036.3.2. ALL LOCATIONS ARE APPROXIMATE. ORIGINAL PAPER SIZE: 11 x 17. REFERENCES: 2018 AERIAL PHOTOGRAPHS BY THE REGION OF NIAGARA; CANMAP STREETFILES V2008.4.		
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Wood Environment & Infrastructure Solutions 3450 HARVESTER ROAD, SUITE 100 BURLINGTON, ONTARIO, L7N 3W5 905-335-2353 		
DWN BY: SJL	CHK'D BY: CD	DATE: FEB. 6, 2021
DATUM: NAD83	PROJECTION: UTM Zone 17	PROJECT No: IM20103036.3.2
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PROJECT: CULTURAL HERITAGE ASSESSMENT
EXISTING CONDITIONS AND IMPACT ASSESSMENT SCHEDULE C MCEA
REGIONAL ROAD 37 (MERRITT ROAD) AND
REGIONAL ROAD 54 (RICE ROAD)
TOWN OF PELHAM, CITY OF THOROLD,
AND CITY OF WELLAND, ONTARIO

TITLE:
IDENTIFIED CULTURAL HERITAGE RESOURCES

LEGEND:
[Red outline] STUDY AREA
[Green outline] PROPERTY LINE
[Yellow outline] PREVIOUSLY IDENTIFIED (ASI 2018)
[Yellow fill] IDENTIFIED DURING FIELD REVIEW

Figure 4-29

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wood.

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4.4.2 Archaeological Resources

Two separate archaeological assessments were completed by WSP as part of this Class EA Study. A summary of findings from both reports is provided below.

Stage 1 Archaeological Assessment for Segments 1 – 4

A Stage 1 Archaeological Assessment was completed to identify any areas of archaeological potential along all four road segments. The Stage 1 Archaeological Assessment was carried out in accordance with the MCM' "2011 Standards and Guidelines for Consultant Archaeologists". The project information was acknowledged by MCM on January 25, 2021 with the issuance of PIF number P354-0061-2021 (Stage 1).

As part of the Stage 1 Archaeological Assessment, WSP (previously Wood E&I) queried the Ontario Archaeological Sites Database, maintained by MCM to determine if archaeological sites were previously registered within 1 kilometre of the Study Area. The Ontario Public Register of Archaeological Reports was also queried to determine whether any archaeological assessments were previously carried out within the Study Area, or within a 50 meter radius of the Study Area. Secondly, the principal determinants of archaeological potential, namely proximity to water, topography, drainage, soils, and proximity to important resources and historical transportation routes and settlements, were examined to evaluate the Study Area's general archaeological potential. Thirdly, the specific potential for post-contact period archaeological resources was assessed through an examination of available historical maps and other archival sources. And lastly, a property inspection was conducted to confirm the desktop evaluation of archaeological potential and identify areas where recent land use has impacted or removed that potential.

In keeping with Niagara Region's Indigenous engagement process for this Class EA Study, WSP provided information sharing letters (via email on February 1, 2021) to three Indigenous Communities: Mississaugas of the Credit First Nation; Six Nations of the Grand River First Elected Council; and the Haudenosaunee Development Institute of the Haudenosaunee Confederacy of Chiefs Council. Information sharing letters included project details along with an invitation to participate.

The Stage 1 Archaeological Assessment indicated that the Study Area along all four road segments has general archaeological potential and requires Stage 2 Archaeological Assessment. Areas of archaeological potential are shown in Figure 4-30 and Figure 4-31.

Draft Stage 1 Archaeological Assessment Report was shared with the Indigenous Communities for review and comment. Final report was submitted to the Ministry of Heritage, Sport, Tourism and Culture Industries for review. On February 23, 2022, the Ministry issued a letter noting that the Ministry completed their review of the Stage 1 Archaeological Assessment Report and entered into the Ontario Public Register of Archaeological Report. The Stage 1 Archaeological Assessment Report is provided in Appendix C.

Stage 2 Archaeological Assessment for Segment 1 was completed as part of this Class EA Study. Stage 2 Archaeological Assessment for Segments 2, 3, and 4 will be completed as part of detailed design phase.

Stage 2 Archaeological Assessment for Segment 1

A Stage 2 Archaeological Assessment was completed along Segment 1 of Merritt Road between Rice Road and Cataract Road. The Stage 2 archaeological assessment was conducted in accordance with the MCM 2011 Standards and Guidelines for Consultant Archaeologists under Project Information Form number P327-0026-2022 (Stage 2). As part of review of the draft Environmental Study Report, the Ministry of Citizenship and Multiculturalism confirmed that the Stage 2 Archaeological Assessment Report (PIF# P327-0026-2022) for Segment 1 is now complete, and the report has been accepted onto the Ontario Public Register of Archaeological Reports.

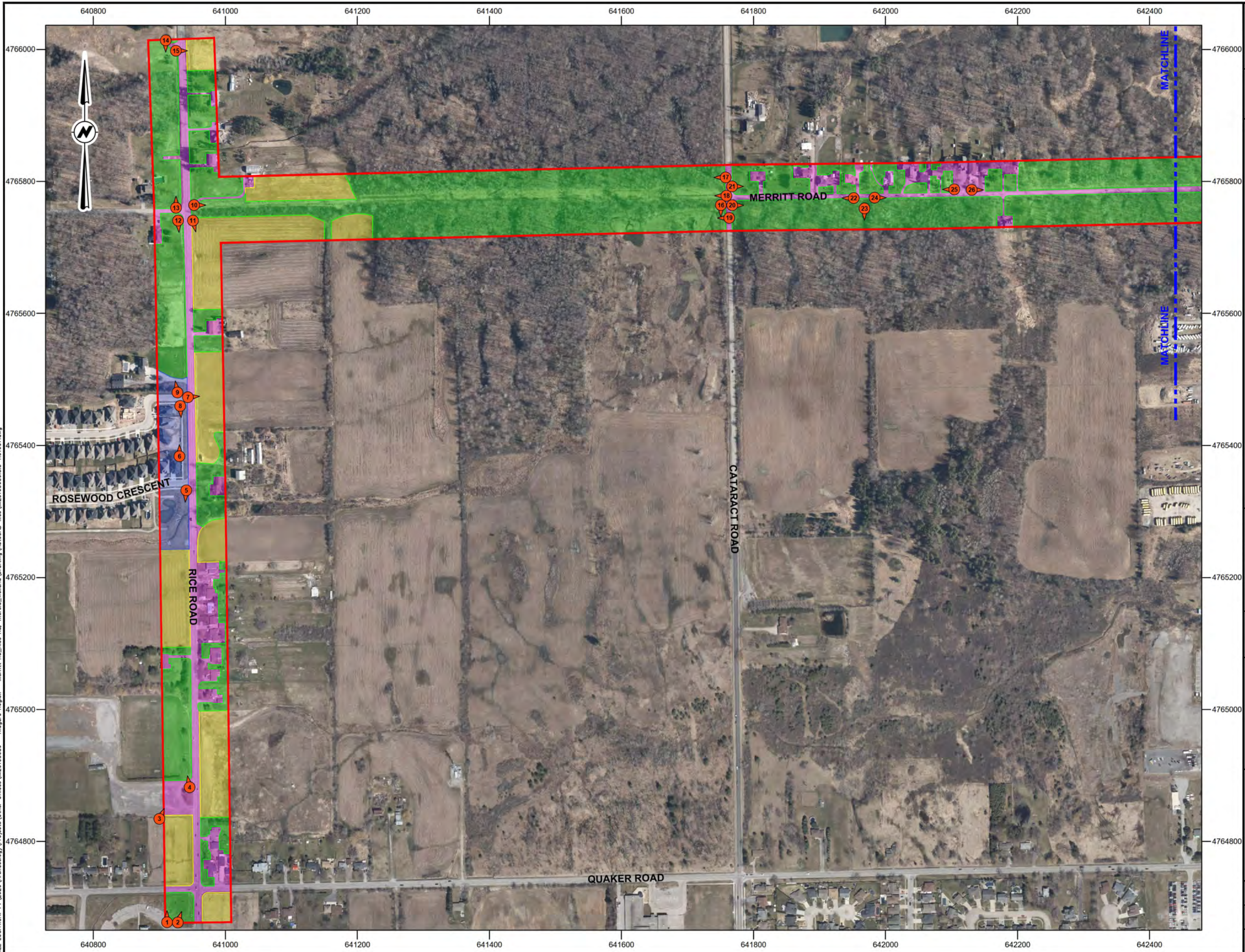
In keeping with the Region's Indigenous engagement policies, representatives of the Mississaugas of the Credit First Nation, Six Nations of the Grand River First Elected Council, and Haudenosaunee Development Institute of the Haudenosaunee Confederacy of Chiefs Council were invited to participate in the field work and review the draft Stage 2 Archaeological Assessment Report.

Fieldwork for the Stage 2 archaeological assessment between June 20, 2022 and October 3, 2022 determined that approximately 0.17 ha (8%) of the Study Area was exempt from Stage 2 test pit survey as it is permanently wet with no or low archaeological potential. Additionally, 0.06 ha (3%) was exempt from Stage 2 test pit survey due to disturbance caused by deep land alterations that would have severely damaged the integrity of any archaeological resources. A further 0.02 ha (1%) of the Study Area investigated with Stage 2 test pits placed at 10-m intervals also had evidence extensive and deep land alterations that would have severely damaged the integrity of any archaeological resources. No archaeological resources were found during Stage 2 test-pit survey at 5-m intervals in the remaining 1.73 ha (87%) of the Study Area.

Based on the results of the Stage 2 archaeological assessment of the Study Area, the Study Area (i.e., Segment 1) requires no further archaeological assessment. Results of Stage 2 Archaeological Assessment are shown in Figure 4-32.

The Stage 2 Archaeological Assessment Report is provided in Appendix D.

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PROJECT: STAGE 1 ARCHAEOLOGICAL ASSESSMENT
PORTIONS OF REGIONAL ROAD 37 (MERRITT ROAD) AND
REGIONAL ROAD 54 (RICE ROAD)
TOWN OF PELHAM, CITY OF THOROLD AND CITY OF WELLAND
COUNTY OF WELLAND
REGIONAL MUNICIPALITY OF NIAGARA, ONTARIO

TITLE:
STAGE 1 RESULTS WITH PHOTOGRAPH
LOCATIONS AND DIRECTIONS

LEGEND:

- STUDY AREA
- PHOTOGRAPH LOCATION, VIEWING DIRECTION, AND IDENTIFICATION
- AREA OF ARCHAEOLOGICAL POTENTIAL
 - UNPLOUGHABLE LAND - TO BE TEST PIT SURVEYED AT 5m INTERVALS
 - PLOUGHABLE LAND - TO BE PEDESTRIAN SURVEYED AT 5m INTERVALS
- AREA OF NO/LOW ARCHAEOLOGICAL POTENTIAL
 - DISTURBED - ROADWAYS, DRIVEWAYS, ROADSIDE DITCH AND EXISTING BUILDINGS: NO FURTHER ASSESSMENT REQUIRED
 - DISTURBED - RECENT LAND DEVELOPMENT: NO FURTHER ASSESSMENT REQUIRED
 - PREVIOUSLY ASSESSED: NO FURTHER ASSESSMENT REQUIRED

Figure 4-30

NOTES:
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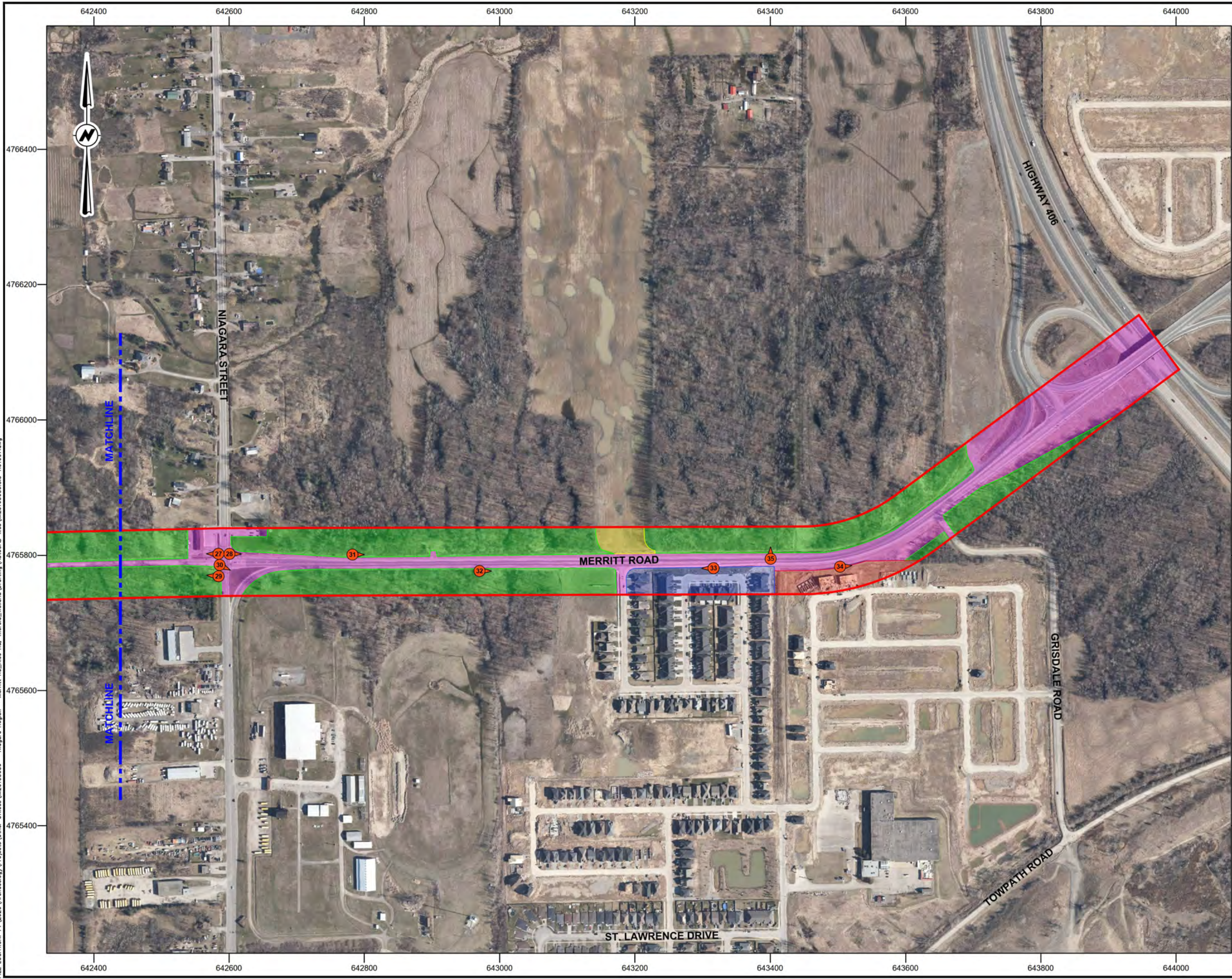
Niagara Region

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905-335-2353

wood.

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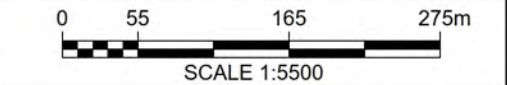
PROJECT: STAGE 1 ARCHAEOLOGICAL ASSESSMENT
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REGIONAL ROAD 54 (RICE ROAD)
TOWN OF PELHAM, CITY OF THOROLD AND CITY OF WELLAND
COUNTY OF WELLAND
REGIONAL MUNICIPALITY OF NIAGARA, ONTARIO

TITLE:
STAGE 1 RESULTS WITH PHOTOGRAPH
LOCATIONS AND DIRECTIONS

- LEGEND:
- STUDY AREA
 - PHOTOGRAPH LOCATION, VIEWING DIRECTION, AND IDENTIFICATION
- AREA OF ARCHAEOLOGICAL POTENTIAL
- UNPLOUGHABLE LAND - TO BE TEST PIT SURVEYED AT 5m INTERVALS
 - PLOUGHABLE LAND - TO BE PEDESTRIAN SURVEYED AT 5m INTERVALS
- AREA OF NO/LOW ARCHAEOLOGICAL POTENTIAL
- DISTURBED - ROADWAYS, DRIVEWAYS, ROADSIDE DITCH AND EXISTING BUILDINGS: NO FURTHER ASSESSMENT REQUIRED
 - DISTURBED - RECENT LAND DEVELOPMENT: NO FURTHER ASSESSMENT REQUIRED
 - PREVIOUSLY ASSESSED: NO FURTHER ASSESSMENT REQUIRED

Figure 4-31

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE
WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS
REPORT No. IM20103036.3.3.
ALL LOCATIONS ARE APPROXIMATE.
ORIGINAL PAPER SIZE: 11 x 17.
REFERENCES:
2018 AERIAL PHOTOGRAPHS BY THE REGION OF NIAGARA;
CANMAP STREETFILES V2008.4.



Niagara Region
1815 SIR ISAAC BROCK WAY, P.O. BOX 1042
THOROLD, ONTARIO, L2V 4T7

Wood
Environment & Infrastructure Solutions
3450 HARVESTER ROAD, SUITE 100
BURLINGTON, ONTARIO, L7N 3W5
905-335-2353

wood.

DWN BY:	CHK'D BY:	DATE:
SJL	JS	MAR. 15, 2021
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	IM20103036.3.3
REV No:		FIGURE No:
0		7B

DATE PLOTTED: 12/6/2022 1:28:00 PM
FILE LOCATION: P:\2020\Archaeology\Projects\Other Offices\IM20103036 - Niagara Region - Merritt Rd_Rice Rd, Thorold, Welland\Drawing\AutoCAD files\IM20103036.6.1 - R01010.dwg



PROJECT: STAGE 2 ARCHAEOLOGICAL ASSESSMENT
REGIONAL ROAD 37 (MERRITT ROAD) IMPROVEMENTS
SCHEDULE C MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT
AND DETAILED TRANSPORTATION ASSESSMENT
RIGHT-OF-WAY AND PART OF LOTS 169, 170, 174 AND 228
THOROLD TOWNSHIP, WELLAND COUNTY
NOW TOWN OF PELHAM AND CITY OF THOROLD
REGIONAL MUNICIPALITY OF NIAGARA, ONTARIO

TITLE:
STAGE 2 ARCHAEOLOGICAL RESULTS WITH
PHOTOGRAPH LOCATIONS AND DIRECTIONS

LEGEND:

STUDY AREA

PHOTOGRAPH LOCATION, VIEWING DIRECTION, AND IDENTIFICATION

AREA OF ARCHAEOLOGICAL POTENTIAL

UNPLOUGHABLE LAND - TEST PIT SURVEYED AT 5m INTERVALS: NO FURTHER ASSESSMENT REQUIRED

UNPLOUGHABLE LAND - JUDGMENTAL TEST PIT SURVEYED AT 10m INTERVALS TO DETERMINE EXTENT OF LAND DISTURBANCE: NO FURTHER ASSESSMENT REQUIRED

AREA OF NO/LOW ARCHAEOLOGICAL POTENTIAL

LOW AND WET: NO FURTHER ASSESSMENT REQUIRED

DISTURBED: NO FURTHER ASSESSMENT REQUIRED

Figure 4-32

NOTES:

THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WSP E&I CANADA LIMITED REPORT No. IM20103036.6.1.

ALL LOCATIONS ARE APPROXIMATE.

ORIGINAL PAPER SIZE: 11 x 17.

REFERENCES:

2018 AERIAL PHOTOGRAPHS BY THE REGION OF NIAGARA;
CANMAP STREETFILES V2008.4.

0 30 90 150m
SCALE 1:3000

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1815 SIR ISAAC BROCK WAY, P.O. BOX 1042
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wsp

DWN BY:	CHK'D BY:	DATE:
SJL	JD	NOV. 18, 2022
DATUM:	PROJECTION:	PROJECT No:
NAD83	UTM Zone 17	IM20103036.6.1
REV No:		FIGURE No:
0		10

4.5 Natural Environment

The existing natural environment conditions within the Study Area were identified through the completion of an Environmental Impact Study (EIS). The EIS was completed in accordance with the Terms of Reference developed in consultation with the Niagara Peninsula Conservation Authority (NPCA) and in accordance with Niagara Region's Environmental Impact Study Guidelines (Niagara Region, 2018). The EIS was shared with the NPCA on April 28, 2023, for their review. The EIS was accepted by the Authority on June 15, 2023.

The purpose of the EIS was to document existing natural environment conditions in the Study Area and to objectively assess the environmental impacts of the proposed preferred design and proposed mitigation measures. This report also provided a summary of the environmental legislations, plans, and policies applicable to the project.

It is important to note that the Indigenous Communities were invited to engage their Field Liaison Representatives in the monitoring of the natural environment fieldwork completed for the EIS. Field Liaison Representatives were invited from the following Indigenous Communities:

- Mississaugas of the Credit First Nation
- Six Nations of the Grand River (Elected Council)
- Haudenosaunee Confederacy Chiefs Council as represented by the Haudenosaunee Development Institute

A summary of background review, field investigations and results are provided in the following sections. Please refer to Environmental Impact Study provided in Appendix E for detailed information.

4.5.1 Methodology

4.5.1.1 Desktop Screening and Secondary Source Review

Screening of available background information from existing studies, plans, databases, and other sources was completed. The desktop screening assisted in the preliminary determination of existing natural heritage features and candidate features, additional sensitivities, and to ascertain potential species at risk plant and animal species present, and to contribute to the understanding of watercourses within the Study Area. Data also included potential occurrences of species of conservation concern, including species at risk and provincially rare species, and whether any locally or provincially protected features are known within or near the Study Area. The following resources were reviewed:

- Regulatory and policy documents;
- Ministry of Natural Resources and Forestry's Natural Heritage Information Centre (NHIC) database squares encompassing the Study Area (MNRF, 2022);
- eBird (eBird, 2022), no hotspot locations were found for the Study Area, but it was still searched for SAR;
- iNaturalist (iNaturalist, 2022) as a 500 meter buffer from the site;

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- The Second Atlas (2001 to 2005) of Breeding Birds of Ontario (Ontario Breeding Bird Atlas; OBBA) (Cadman, Sutherland, Beck, Lepage, & Couturier, 2007);
- The Atlas of the Mammals of Ontario range maps (Dobbyn, 1994);
- Mammals of the Great Lakes Region range maps (Kurta, 1995);
- The Ontario Reptile and Amphibian Atlas (ORAA) (Ontario Nature, 2022);
- The Ontario Butterfly Atlas (OBA) (MacNaughton, 2021);
- Natural Heritage data extracted from Land Information Ontario (LIO)/GeoHub (MNRF, 2022);
- Online DFO Aquatic SAR map (Fisheries and Oceans Canada, 2022);
- ELC data from the NPCA (Natural Areas Inventory (NAI) Ecological Land Classification (ELC) Community Series (CS) level DRAFT) (NPCA, 2019);
- Natural Areas Inventory – Study Site PL -10 Rose Little Woods – Merritt Road Swamp (Niagara Peninsula Conservation Authority, 2010);
- Port Robinson West Scoped Subwatershed Update and Servicing Plan (Aquafor Beech Limited, 2014);
- Port Robinson West Subwatershed Study Final Report (Totten Sim Hubicki Associates, Ray Blackport, Natural Resource Solutions, Hynde Paul, 1999);
- Town of Pelham's East Fonthill Secondary Plan (EFSP) (The Planning Partnership, 2015);
- City of Thorold's Port Robinson Secondary Plan (PRSP);
- City of Welland Northwest Welland Secondary Plan (NWWSP);
- Merritt Meadows subdivision EIS (provided by the Region if available);
- Stormwater Management Plan Hansler Heights City of Thorold; and
- Where applicable hydrologic and hydraulic assessments (including stormwater management assessment) and hydrogeological assessment completed for the project, were reviewed and incorporated to characterize the hydrology of the wetlands.

Note: The NHIC database utilizes a 1 kilometre x 1 kilometre system, while the OBBA, ORAA, and OBA, utilize a 10 kilometre x 10 kilometre system. Both systems generate a list of species that are documented within the specific square. It is important to note that the recorded presence of a specific species must be viewed in conjunction with existing habitat conditions (e.g., watercourses that are now dry or ephemeral cannot be expected to support the same fisheries community that they may have in the past). Likewise, the 10 kilometre grid encompasses an area larger than the Study Area. Species of conservation concern, including SAR, have been considered in the SAR screening as habitat may not occur in the Study Area (i.e., the record comes from anywhere in the 10 kilometre square). As such, records/element occurrences do not confirm or necessarily indicate species presence within the Study Area.

4.5.1.2 Field Investigations

Following the desktop-based review of secondary source information resources, various field investigations were completed. These field investigations were completed in accordance with applicable standards, guidelines and procedures, as outlined below:

- **Aquatic Habitat Assessments** were completed following the Ministry of Transportation (MTO) Environmental Guide for Fish and Fish Habitat (Ministry of Transportation Ontario, 2013).
- **Ecological Land Classification/vegetation communities** were delineated using aerial photography and ground-truthing in spring, summer, and fall seasons. Ecological Land Classification was completed following the First Approximation and Second Approximation Ecological Land Classification (Lee, et al., 1998) and (Lee H., 2008). The occurrence of Ecological Land Classification communities was cross-referenced with provincially significant vegetation communities as identified in the Significant Wildlife Habitat Technical Guide (Ontario Ministry of Natural Resources, 2000). Vegetation communities were also used to screen for significant wildlife habitat using the Significant Wildlife Habitat Criteria Schedule for Ecoregion 7E (Ontario Ministry of Natural Resources and Forestry, 2015).
- **Breeding Bird Surveys** were completed following the Forest Bird Monitoring Protocol (Ralph, Sauer, & Droege, 1995). Guidelines for dates of breeding bird surveys from Environment and Climate Change Canada were used. Activity seen and heard directly relates to breeding evidence described in the Ontario Breeding Bird Atlas Guide for Participants (2020).
- **Amphibians/Anuran Call Surveys** were completed at aquatic habitats in the Study Area, based on the protocol outlined in the Marsh Monitoring Program Participant's Handbook for Surveying Amphibians (Bird Studies Canada, 2009 Edition).
- **Incidental Wildlife Surveys** comprised of documenting any wildlife sightings, evidence or signs of wildlife use, or other things of note during the species-specific surveys listed above.

The table below lists the field investigations completed as part of the development of the EIS.

Table 4-72: Natural Environment Field Investigations

Field Survey Type	Date	General Weather
Fall Plant Inventory and ELC	September 30, 2020	10°C, no wind, cloudy, rainy
Amphibians / Anuran Call Survey 1	April 13, 2021	6°C, low wind, no clouds, no rain
Amphibians / Anuran Call Survey 2	May 13, 2021	12°C, light wind, no clouds, no rain
Amphibians / Anuran Call Survey 3	June 9, 2021	27°C, no wind, no clouds, no rain
Breeding Bird Survey 1	June 10, 2021	16°C, no wind, no clouds, no rain
Breeding Bird Survey 2	June 30, 2021	27°C, mostly cloud, no wind, no rain

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Field Survey Type	Date	General Weather
Aquatic Habitat Assessments	July 21, 2021	18°C, no wind, partly overcast, no rain
Summer Plant Inventory and ELC	July 29, 2021	23°C, partly cloudy, light wind, no rain
Summer Plant Inventory and ELC	July 30, 2021	18°C, partly cloudy, light wind, no rain
Fall Plant Inventory and ELC	September 15, 2021	25°C, no clouds, light wind, no rain
Fall Plant Inventory and ELC	September 16, 2021	20°C, partly cloudy, light wind, no rain
Spring Plant Inventory	May 6, 2022	10°C, partly cloudy, windy, no rain
Spring Plant Inventory	May 20, 2022	18°C, partly cloudy, windy, no rain

4.5.2 Fish and Fish Habitat

The Study Area is located within Port Robinson West Subwatershed. This subwatershed is drained by Singer's Drain, which outlets to the Welland Canal. Singer's Drain has two main tributaries that drain the north and south sections of the Port Robinson West Watershed. The current predominant land use along the Study Area is agriculture, with some rural, residential, and urban developments, suggesting Singer's Drain has been impacted by past and present land uses with high sediment deposits that choke aquatic habitat (Totten Sim Hubicki Associates, Ray Blackport, Natural Resource Solutions, Hynde Paul, 1999). Singer's drain is identified as a warmwater creek with Type II habitat (MNRF, Appendix C of EIS). Type I habitat contains sensitive fish species and/or habitat while Type II habitat is important to the fish community, but it is below its productive capacity. The fish community in this creek is comprised of species that are tolerant of the creek's warmwater thermal regime. Water quality monitoring completed by the NPCA for this creek found the water quality to be poor, containing exceedances of several indicators, including chloride, copper, E. coli, lead, total phosphorus, total suspended solids, and zinc (Niagara Peninsula Conservation Authority, 2021).

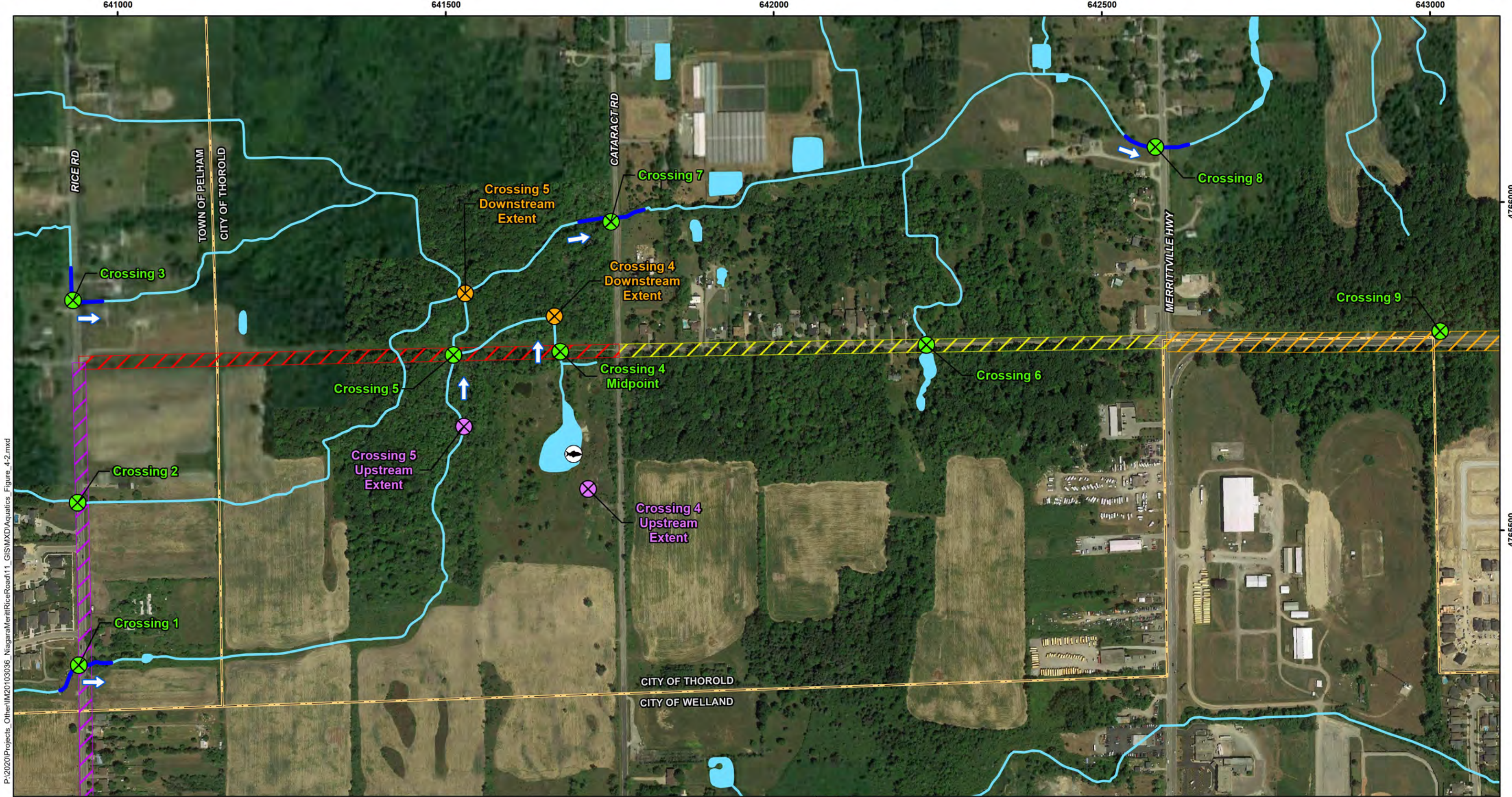
Sampling data provided in the Port Robinson West Subwatershed Study indicated that fish surveys in 1999 captured six species (Central Mudminnow, Brook Stickleback, Brown Bullhead, Pearl Dace, Fathead Minnow, and Pumpkinseed). MNRF indicates that Singer's Drain supports a low-quality warm water fishery comprised of Brook Stickleback, Central Mudminnow, and Fathead Minnow. The MNRF did not identify the presence of provincially rare aquatic species or aquatic SAR within the Study Area. In addition, DFO SAR mapping (2021) did not identify any SAR in the Singer's Drain System or Study Area.

A review of the NPCA Watershed Explorer online mapping tool was used to identify watercourses within the Study Area that could constitute fish habitat. A total of nine watercourse crossings were identified within the Study Area from aerial interpretation and field visits. The following descriptions are based on field investigations completed in the summer of 2021, the MTO Environmental Guide for Fish and Fish Habitat, and a review of online imagery. Figure 4-33 show the watercourses as mapped, and the table below provides a summary of habitat conditions of the watercourses.

Table 4-73: Summary of Aquatic Habitat Conditions

Watercourse Crossing	Location	Summary of Aquatic Habitat Conditions
Watercourse Crossing 1	Located on Rice Road, approximately 550 m north of Quaker Road	This watercourse crossing is comprised of a Corrugated Steel Pipe (CSP) culvert under Rice Road. Within the assessed upstream reach, this watercourse is representative of an anthropogenically altered system. It receives water from a nearby SWM facility and roadside drainage features running parallel to Rice Road. No fish were observed during the assessment.
Watercourse Crossing 2	Located along Rice Road, approximately 210 m south of Merritt Road.	This watercourse crossing is a drainage conveyance feature that takes roadside runoff west to east under Rice Road through a small CSP (equalization culvert). Habitat conditions were insufficient to support fish and/or their life processes.
Watercourse Crossing 3	Located along Rice Road, approximately 90 m north of Merritt Road.	Within the upstream reach, this watercourse is representative of an anthropogenically altered system. Roadside drainage contributes to flows under the road via a CSP. No fish were observed during the assessment.
Watercourse Crossing 4	Located along Merritt Road Unopened Road Allowance, approximately 240 m west of Cataract Road.	No actual road crossing is present at this location. Merritt Road Unopened Road Allowance (Segment 1) was used as the defining point in assessing the upstream and downstream reaches. A series of low-lying depressions were identified within the upstream section of this watercourse. Patches of watercress were observed within the depressions, as were Centrarchids and Brook Stickleback. A slight depression conveys the flows through the Merritt Road Unopened Road Allowance. Within the initial 20 m of the downstream reach, the watercourse continues in a similar channel to the upstream reach; however, a large pooled-area appeared to contain the flows with small channels running west. At the time of assessment, these channels were dry, but evidence of flows was observed. No fish were observed within this section.
Watercourse Crossing 5	Located along Merritt Road Unopened Road Allowance, approximately 350 m west of Cataract Road.	Within this crossing location, a dilapidated concrete structure was present under the Merritt Road Unopened Road Allowance. Watercourse banks were mostly unstable, with signs of slumping and erosion. The surrounding area was heavily wooded with overhanging grasses and the riparian vegetation. No fish were observed within this section.

Watercourse Crossing	Location	Summary of Aquatic Habitat Conditions
Watercourse Crossing 6		A large pond was identified through aerial imagery, and NPCA mapping identifies the feature as watercourse crossing under Merritt Road; however, no physical connection was observed. A large pond is present on private lands and behind a fence, and as such, it was not possible to determine the source of features of this pond.
Watercourse Crossing 7	Located along Cataract Road, approximately 200 m north of Merritt Road.	Within the assessed upstream reach, this watercourse is representative of a naturalized but also anthropogenically altered system. Watercourse banks were mostly stable yet mowed within the road ROW. A roadside drainage feature runs parallel to the road and contributes flows through a large CSP under the road. No fish were observed during the assessment.
Watercourse Crossing 8	Located along Merrittville Highway, approximately 290 m north of Merritt Road.	Within the assessed upstream reach, this watercourse is representative of a naturalized but also anthropogenically altered system. Watercourse banks were mostly stable yet mowed within the assessed reach. A roadside drainage feature runs parallel to the road and contributes flows through a large concrete culvert under the road. Centrarchids, cyprinids and turtles were observed within the upstream reach. No fish were observed in the downstream reach.
Watercourse Crossing 9	Located along Merritt Road, approximately 425 m east of Merrittville Highway.	Within the assessed upstream section, a large pond was identified through aerial imagery and NPCA mapping. At the time of assessment, the large pond was present but behind a fence and as such, was assessed from the roadside. No fish were observed within this section. NPCA mapping does not identify connectivity between the upstream and downstream reaches; however, a CSP was observed under Merritt Road. Within the 15 m downstream section, the assessed area constituted a phragmites choked pond. Habitat conditions within this section did not appear conducive to supporting fish; however, conditions further downstream may provide habitat. No fish were observed within this section.



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LEGEND

Municipal Boundaries	Road Segments	Crossing (labelled with ID number)	Assessed Area
1: Unopened Road Allowance (Merritt Rd)	2: Merritt Rd	Downstream Extent (labelled with ID number)	Waterbody
3: Merritt Rd	4: Rice Rd	Upstream Extent (labelled with ID number)	Watercourse
		Fish Observations	Direction of Flow



NOTES:
- Imagery from Google, 2018
- Waterbody and Watercourse Information retrieved from LIO, 2022

Datum: NAD83
Projection: UTM Zone 17N

NIAGARA MERRITT-RICE ROAD	
Aquatic Habitat Assessment Areas	
PROJECT N°: IM20103036	FIGURE: 4-33
SCALE: 1:5,500	DATE: September 2022

4.5.3 Terrestrial Resources

4.5.3.1 Vegetation Communities

A total of 11 vegetation communities were identified within the Study Area. A summary of characteristics of vegetation communities within the Study Area is provided below. Figure 4-34 shows the location of vegetation communities.

Deciduous Forest (FOD) and Woodland (WOD)

Dry - Fresh Sugar Maple - Oak Deciduous Forest (FODM5-3)

These forest communities were found along all four road segments. As the name suggests, these communities were dominated by Sugar Maple and Red Oak in the canopy. Other tree species in the canopy included American Beech, and Black Cherry. The sub-canopy was dominated by Sugar Maple, Eastern Hop-Hornbeam and Green Ash, and the understory was comprised of Green Ash, Sugar Maple, and Riverbank Grape. The ground layer within this community was dominated by Large-leaved Aster, sedges, and sapling Sugar Maple, and Green Ash.

A wide range of tree sizes were found in high abundances in this community. The vegetation type of this community was very variable due to changes in topography impacting water flow. A few of this community parcels had experienced selective logging. Tracks and trails only occurred locally and were well marked. Flooding was a disturbance that has had a heavy impact on this community.

Species at risk plant communities identified within this community included Round-leaved Greenbrier (Threatened), Eastern Flowering Dogwood (Endangered), and White Wood Aster (Endangered).

Deciduous Forest (FOD)

The NPCA's Natural Areas Inventory 2006-2009 mapped forest/thicket communities in two locations within the Study Area. Both locations occur along Segment 2, one location is north of a residence adjacent to Merrittville Highway and one location is to the south along the Study Area between two agricultural fields. These communities were not directly investigated during fieldwork as they are not anticipated to be impacted by the project and access was limited.

Dry – Fresh Deciduous Woodland (WODM4)

This community was found along Segment 3, generally near Merritt Road and Highway 406 ramp.

Trees in the canopy and sub-canopy included Trembling Poplar, Shagbark Hickory, Swamp Pin Oak, and a willow hybrid. The understory was dominated in equal amounts of Red-osier Dogwood and Glossy Buckthorn. European Buckthorn (an invasive plant species) in high abundance and regenerating Green Ash were also found in this layer. The ground layer was dominated by Rough-stemmed Goldenrod, Thicket Creeper, Broad-leaved Enchanter's Nightshade, and Spotted Jewelweed.

Based on the size of the trees, the abundant number of standing snags, and deadfall (10 to 24 cm DBH), this community appears to be young. The changes and increase in snags and deadfall are thought to be a factor of Emerald Ash Borer.

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Wind throw was also apparent and widespread, a possible result of the increased development and removal of edge habitat. Due to the location and influences of development around the community, the area is disturbed by human use and non-native species are widespread. Inclusions in this community were wetlands and pools.

Species at risk plant communities identified within this community included White Wood Aster (Endangered).

Deciduous Swamp

Swamp Maple Mineral Deciduous Swamp Type (SWDM3-3)

This community was found along Segments 1, 2, and 3. This community was dominated by hydrophytic shrubs (wetland vegetation) and tree species and were typically fern and sedge rich. These communities have variable flooding regimes and water depth less than 2 m. Standing water or vernal pooling is greater than 20% of ground cover in the spring but flooding duration is short, and the substrate is aerated by early to mid-summer.

These communities had a canopy of a hybrid maple (*Acer rubrum* X *Acer saccharinum*). Trees found in lower amounts in the canopy included White Elm, Bur Oak, and Shagbark Hickory. White Elm was found more often than the Bur Oak and Shagbark Hickory. Bur Oak and Shagbark Hickory were found in the same abundances. Trees in the subcanopy reflected those found in the canopy; with most abundant species being the hybrid Maple, followed by the White Elm. Green Ash was also found in the sub-canopy. In the understory, there was more of the hybrid Maple, Northern Spicebush, Green Ash, and the invasive Glossy Buckthorn. In the ground layer, there were Panicked Aster, Poison Ivy, sedges, and grasses.

Very few trees were found dead and standing, but there were a lot of small logs (0-24 cm DBH) on the ground. The SWDM3-3 was complex with small marsh communities being found within the swamp where large enough gaps in the canopy occurred. Tracks and trails occurred in a few locations and were well worn. Diseased and dead trees were found to be in a high abundance throughout the whole swamp. The diseases that have injured or killed trees in the swamp are Emerald Ash Borer, and Dutch Elm disease. Another disturbance found in the community was flooding of the vernal pools. Flooding was found to be heavy and widespread within the community. The area close to Merritt Road is more disturbed than the other forest and swamp communities described here

Species at risk plant communities identified within this community included White Wood Aster (Endangered).

Meadow Marsh

Graminoid Mineral Meadow Marsh (MAM2)

This community is interspersed within the swamp/forest area on the north side of Segment 2. In some areas the bordering Red and Freemans Maple form a canopy. Shrubs standing 1-2 meter tall, such as White Meadowsweet and Red-osier Dogwood, were sporadic. Largely, Dark-green Bulrush, Rough-stemmed Goldenrod, White Meadowsweet, and Reed Canary Grass dominate. Like the SWDM3-3, flooding was a large disturbance to the plants in this community. Another disturbance was deer browse. Deer browse was found to be light and local.

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Meadow Marsh (MAM)

The NPCA's Natural Areas Inventory 2006-2009 mapped this community behind a residence on the south side of Segment 2. Based on a desktop review and general assessments in the field, these areas have been delineated as meadow marsh (MAM). Further, in Segment 2 on the south side, there is a complex of impacted wet meadow and thicket around industrial and agricultural land uses. These impacted areas have been grouped as a wet meadow thicket (MAM/THD) complex.

Inclusion - Cattail Graminoid Mineral Meadow Marsh Type (MAMM1-2)

This community was found in two locations along Segment 1 within the swamp and forest communities. These MAMM1-2 communities are inclusions and are too fine scale to map. These Cattail Marshes were linear and followed the utility corridor in Segment 1. Pooling water and the open conditions kept for the transmission utility allowed for the establishment of these Cattail Marshes.

The canopy of this community was dominated by Narrow-leaved Cattail with a bit of Rough Cocklebur. The subcanopy had a species of lady's thumb and Sensitive Fern. This community was only found in Segment 1.

Successional Communities

Successional Communities are often complexed together as they change in short timeframes and with stochastic environmental events (e.g., flooding can drastically change an ecosystem within five years).

Meadow (ME)

The Meadow (ME) communities are heavily influenced by humans and are not natural occurring meadows. Disturbance in this community was high from ambient noise, non-native and invasive species, and dumping. Many of the meadows in the Study Area are generally thin and near roadways. In Segments 3 and 4, meadow communities occur on their own (i.e., not complexed) as a result of development and areas left fallow. These Meadows were kept at a high level because they were highly variable. Generally, there is no community structure and the species in the meadows consist of Garden Bird's-foot Trefoil, Canada Bluegrass, Tall Goldenrod, and Common Teasel.

In some cases, meadow thicket (ME/THD) complexes occur. These areas are equally influenced by disturbance and have abundant and extensive non-native/introduced species. In Segment 4, the ME/THD community contains some plantings, well-marked trails crossed, disturbance from Rice Road, and hedgerows which contribute to the thicket (THD) complex. The ME/THD in Segment 4 additionally has a highly impacted watercourse. Similarly, a ME/THD community follows the watercourse in Segment 1, north of the unopened road allowance but within residential property. This meadow thicket complex appears to be successional from the forest/swamp community adjacent. This community is still heavily influenced by the anthropogenic uses.

Inclusion - Dry – Fresh Forb meadow Ecosite (MEFM1)

This community was a similar location and shape as the MAMM1-2 community. This community was narrow and followed the utility corridor in Segment 1. The community was not

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mapped as it is an inclusion to the overall swamp community. The canopy was populated with White Ash, Gray Dogwood, and Bebb's Willow. The plants in the sub-canopy were Canada Goldenrod, and Lance Leaved Goldenrod. covered 25-60% of the community. The plants in both the understory and ground layer were the same with Hog Peanut, Wild Raspberry, and Reed Canary Grass.

This was a very young and successional area. The topsoil was found to be sandy. This community was only found in Segment 1.

Native Shrub Deciduous Hedgerow Thicket Type (THDM3)

This community was in a small area on the east side of Segment 1 at the intersection with the unopened road allowance and Cataract Road. This community is complexed within meadow community. It appears this community underwent significant alteration before 2014 (GoogleEarth imagery) but has been left fallow.

Trees found at the road intersection were White Ash and American Elm. The thick sub-canopy was dominated by Choke Cherry, Glossy Buckthorn and Red Osier Dogwood. The understory was mostly Rough Agrimony, and Riverbank Grape.

A watercourse has been identified to drain from this community north towards the swamp community.

Other Thickets and Thicket Complexes

Other thickets (THD) and wet meadow thickets (MAM/THD) were identified along the limits of the Study Area in Segments 1, 2, and 3.

4.5.3.2 Plants

A total of 298 plants were identified during fieldwork within the Study Area. NPCA's Natural Areas Inventory 2006-2009 identified 216 of these plants as native; the other 67 as introduced, and the last 15 plants as data deficient or a hybrid plant with no status or could not be identified to species. Approximately 72% of the plants inventoried during fieldwork were native. This percentage is high for plant communities along roads, and near agriculture land uses in southern Ontario.

There were six provincially rare (S1-S3) species identified during surveys. 13 locally rare species from NPCA's Natural Areas Inventory 2006-2009 Status lists (Niagara Peninsula Conservation Authority, 2010), and 12 locally rare species from the Niagara County Status from Oldham Carolinian List (Oldham, 2017). Additionally, three species at risk plants were documented during field surveys. The plant species of conservation concern identified during field investigations are listed in the table below.

Table 4-74: Plant Species of Conservation Concern

Scientific Name	Common Name	S-Rank ¹	ESA ²	NAI ³	Oldham ⁴
<i>Agalinis tenuifolia</i>	Slender-leaved False Foxglove	S4S5		Rare, Native	Native, Rare
<i>Cardamine douglassii</i>	Limestone Bittercress	S4		Rare, Native	Native, Rare
<i>Carex arctata</i>	Drooping Woodland Sedge	S5		Rare, Native	Native, Rare
<i>Carex projecta</i>	Necklace Sedge	S5		Rare, Native	Native, Rare
<i>Coreopsis tripteris</i>	Tall Tickseed	S1S2		Uncommon, Native	Native, Uncommon
<i>Cornus florida</i>	Eastern Flowering Dogwood	S2	END	Uncommon, Native	Native, Uncommon
<i>Erigeron strigosus</i>	Rough Fleabane	S5		Rare, Native	Native, Rare
<i>Eurybia schreberi</i>	Schreber's Aster	S2		Rare, Native	Native, Rare
<i>Smilax rotundifolia</i>	Round-leaved Greenbrier	S2	THR	Uncommon, Native	Native, Uncommon
<i>Galium tinctorium</i>	Dyer's Bedstraw	S5		Rare, Native	Native, Rare
<i>Lobelia siphilitica</i>	Great Blue Lobelia	S5		Rare, Native	Native, status unknown or not specified
<i>Eurybia divaricate</i>	White Wood Aster	S3	END	Rare, Native	Native, Rare
<i>Persicaria hydropiperoides</i>	False Waterpepper	S5		Rare, Native	Native, Rare
<i>Prunus nigra</i>	Canada Plum	S4		Rare, Native	Native, Rare
<i>Schoenoplectus pungens</i>	Common three-square Bulrush	S5		Rare, Native	Native, Rare

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Scientific Name	Common Name	S-Rank ¹	ESA ²	NAI ³	Oldham ⁴
<i>Scirpus hattorianus</i>	Mosquito Bulrush	S4		Rare, Native	Native, Rare
<i>Nyssa sylvatica</i>	Black Gum	S3		Uncommon, Native	Native, Uncommon

Note(s)

1. S-Rank= Provincial (Sub-national) Rank, S1=Critically Imperiled, S2=Imperiled, S3=Vulnerable, S4=Apparently Secure, S5=Secure. S#S#=Range. Breeding Status Qualifiers: B – Breeding, N – Nonbreeding, M – Migrant. ? =Inexact or Uncertain.
2. ESA= Endangered Species Act (Ontario), END= Endangered, THR= Threatened
3. NAI= Niagara Status from Natural Area Inventory (Niagara Peninsula Conservation Authority, 2010)
4. Oldham= Niagara County Status from Oldham Carolinian List (Oldham, 2017)

4.5.3.3 Wetland plants

Plants are identified as wetland plants using a Coefficient of Wetness (must be identified to the species level). The definitions of the Coefficient are show in Table 4-75 as defined by Oldham, Bakowsky, & Sutherland, 1995.

Table 4-75: Coefficient of Wetness Categories

Coefficient of Wetness ¹	Preferred Soil Moisture Regime
5	Almost always occur on uplands
3	Usually occur on uplands
0	Found on uplands and in wetlands
-3	Usually occur in wetlands
-5	Almost always occur in wetlands

1. Oldham, Bakowsky, & Sutherland, 1995.

Many of the plants documented during field surveys are wetland plants. For example, 45 species of plants are almost always occurring in wetlands (Coefficient -5), 63 plants are usually found in wetlands (Coefficient -3). A total of 108 wetland plants were identified during field investigations.

4.5.3.4 Birds

A total of 48 species of birds were documented during breeding bird surveys. The breeding bird survey locations within the Study Area are shown in Figure 4-35. Nine additional birds were observed incidentally during other surveys. The majority of species documented are associated with agricultural, wooded and successional habitats. One species at risk bird (Barn Swallow) was documented during field investigations. Two Carolinian indicator species were documented on site, Carolina Wren and Tufted Titmouse. Three additional Carolinian indicator

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species were documented in secondary sources, Hooded Warbler in the OBBA and Northern Bobwhite and White-eyed Vireo in NHIC. Northern Bobwhite is considered extirpated from the area.

Three species, American Robin, Wild Turkey, and European Starling were confirmed breeding. An additional 19 species were considered probable breeders, 20 were possible breeders, and six were observed with no evidence of breeding noted. The 19 species considered probable breeders are:

- American Crow;
- American Goldfinch;
- Black-capped Chickadee;
- Blue Jay;
- Brown-headed Cowbird;
- Chipping Sparrow;
- Common Grackle;
- Eastern Wood-pewee;
- Great Crested Flycatcher;
- House Sparrow;
- Killdeer;
- Mourning Dove;
- Northern Cardinal;
- Red-eyed Vireo;
- Red-winged Blackbird;
- Savannah Sparrow;
- Song Sparrow;
- Swamp Sparrow; and
- Willow Flycatcher.

The 20 species considered possible breeders are:

- Baltimore Oriole;
- Carolina Wren;
- Cedar Waxwing;
- Common Yellowthroat;
- Downy Woodpecker;
- Gray Catbird;
- Hairy Woodpecker
- House Finch;
- House Wren;
- Indigo Bunting;
- Mallard;
- Northern Flicker;
- Red-bellied Woodpecker;
- Red-tailed Hawk;
- Rose-breasted Grosbeak;
- Turkey Vulture;
- Warbling Vireo;
- White-breasted Nuthatch;
- Wood Thrush; and
- Yellow Warbler;

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A review of secondary sources identified 111 species of birds. The majority of which are found in sources that extend beyond the Study Area. From field data and secondary sources, there are four provincially rare (S1-S3) species; six provincially Endangered or Threatened species; six provincial species of Special Concern. The six provincially endangered or threatened species are: Bank Swallow, Barn Swallow, Bobolink, Chimney Swift, Eastern Meadowlark, and Northern Bobwhite. Provided the range of successional habitat and vegetation communities present, there is a moderate probability for SAR birds to occur in the Study Area.

4.5.3.5 Wetland Birds

Thirteen species designated as wetland birds were documented during field investigations. These bird species are listed in the table below.

Table 4-76: Wetland Birds identified within the Study Area

Species Common Name	Survey Type	Breeding Evidence ¹
Canada Goose	Incidental	Unknown
Common Yellowthroat	Incidental and BBS	Possible, only documented once
Double-crested Cormorant	BBS	Not likely, Fly overs
Great Blue Heron	Incidental	Unknown
Herring Gull	BBS	Not likely, Fly overs
Mallard	Incidental and BBS	Observed
Northern Waterthrush	Incidental	Not likely, observed once
Ring-billed Gull	Incidental and BBS	Not likely, Fly overs
Rusty Blackbird	Incidental	Not likely, observed once
Spotted Sandpiper	Incidental	Not likely, observed once
Swamp Sparrow	Incidental and BBS	Probable, observed both rounds in suitable habitat
Willow Flycatcher	BBS	Probable, observed both rounds in suitable habitat
Wilson's Warbler	Incidental	Not likely, observed once

1. Appendix D of EIS

Niagara Region**Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)****4.5.3.6 Amphibians and Reptiles**

A total of eight species of anurans (frogs and toads) were documented from 25 locations within the Study Area (Figure 4-35). Eight species were documented calling from suitable habitat at appropriate breeding times, and it is assumed all species successfully breed at Stations 1 through 25.

Table 4-77: Species Documented During Anuran Call Surveys

Station Number	Species of Anuran Noted		
	April Survey	May Survey	June Survey
1	Western Chorus Frog, Spring Peeper	Western Chorus Frog, Spring Peeper	Green Frog
2	Western Chorus Frog, Spring Peeper	Spring Peeper	Green Frog
3	None	None	Gray Treefrog
4	Western Chorus Frog, Spring Peeper	Spring Peeper	None
5	Western Chorus Frog, Spring Peeper, Northern Leopard Frog	Western Chorus Frog, Spring Peeper	American Bullfrog, Green Frog
6	Western Chorus Frog, Spring Peeper, Northern Leopard Frog	Western Chorus Frog, Spring Peeper, Green Frog	American Bullfrog, Gray Treefrog, Green Frog
7	Western Chorus Frog, Spring Peeper	American Toad, Spring Peeper	Gray Treefrog, Green Frog
8	Western Chorus Frog, Spring Peeper	None	Green Frog
9	Western Chorus Frog, Spring Peeper	Western Chorus Frog	Green Frog
10	Western Chorus Frog, Spring Peeper	American Toad, Spring Peeper	Gray Treefrog
11	Western Chorus Frog, Spring Peeper	Spring Peeper	None
12	Western Chorus Frog, Spring Peeper	None	None
13	Western Chorus Frog, Spring Peeper	Spring Peeper	Gray Treefrog
14	Western Chorus Frog, Spring Peeper	American Toad, Western Chorus Frog, Gray Treefrog	Gray Treefrog
15	Western Chorus Frog, Spring Peeper	None	American Bullfrog, Green Frog
16	Western Chorus Frog	None	None
17	Western Chorus Frog	None	None
18	Western Chorus Frog	None	None

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Station Number	Species of Anuran Noted		
	April Survey	May Survey	June Survey
19	Western Chorus Frog	None	Gray Treefrog
20	Western Chorus Frog, Spring Peeper	None	Gray Treefrog
21	Western Chorus Frog, Spring Peeper	Western Chorus Frog	Gray Treefrog
22	Western Chorus Frog	Western Chorus Frog, Spring Peeper	Gray Treefrog
23	Western Chorus Frog	Western Chorus Frog	Gray Treefrog
24	Western Chorus Frog	American Toad	Gray Treefrog, Green Frog
25	Western Chorus Frog, Spring Peeper, Pickerel Frog	None	Gray Treefrog, Green Frog

4.5.3.7 Other Wildlife

No additional targeted surveys were completed for wildlife species (e.g., mammals, butterfly or dragonfly surveys). A review of secondary sources found that 40 mammals, and 34 arthropods may be present in the Study Area.

Mammals

Eight mammal species were observed incidentally during field investigations in the Study Area. These species were: American Mink (dead on road), Coyote, Eastern Chipmunk, Eastern Gray Squirrel, Northern Raccoon, Red Squirrel, Virginia Opossum (a Carolinian indicator species), and White-tailed Deer. These are common species in Niagara Region.

The Atlas of the Mammals of Ontario shows about 40 species of mammals that could be found in the Study Area because they occur in the general area. Most of these species are common mammals such as Muskrat, Striped Skunk, and Woodchuck. Endangered bats as listed by the ESA were identified as potentially occurring in the Study Area. These bats are Northern Myotis, Tricolored Bat, Eastern Small-footed Myotis, and Little Brown Myotis (Appendix E of EIS). Little Brown Myotis, Tri-coloured Bat have been reported in the potentially occur in the generally area (Humphrey & Fotherby, 2019). The Study Area has many forests that are assumed to provide habitat for species at risk bats.

The only small mammal observation comes from the Port Robinson West Scoped Subwatershed. The mammal observed was a Meadow Vole. Other mammals observed as part of the field work for the Port Robinson West Scoped Subwatershed included: Beaver, European Hare, Red Fox, Striped Skunk, and Woodchuck (Aquafor Beech Limited, 2014). Small mammals such as shrews (Northern Short-tailed Shrew), rats, mice, and voles (White-footed Mouse, Deer Mouse, Muskrat, House Mouse, Norway Rat, Meadow Jumping Mouse) have the potential to occur and be undocumented or underrepresented. Meso-and large mammals such as Eastern Cottontail, Gray Fox, and weasels (Ermine, Long-tailed Weasel, Mink) likely occur in the Study Area. WSP field staff observed White-tailed Deer in the Study

Area. White Tailed deer wintering areas that are mapped by the province lie are in the Study Area (and acknowledged in the Regional OP (Niagara Region, 2014)).

Arthropods

Two incidental sightings of common arthropods were recorded during fieldwork, both of which have been previously recorded for the area in secondary sources. These two species were Common Wood-nymph, and Northern Cloudywing.

The Ontario Butterfly Atlas identified 34 species of butterflies. One of these species is a species of conservation concern, Monarch (Special Concern). iNaturalist held records of insects such as Black-legged Meadow Katydid, Common Eastern Bumble Bee, and Hickory Tussock Moth. In addition to these insects iNaturalist had records of eight other butterflies. The Port Robinson West Scoped Subwatershed Study identified five butterfly species, one which was the Monarch, a species of Special Concern in Ontario.

4.6 Drainage, Flooding Hazard, and Wetland Hydrology

A Stormwater Management and Hydraulic Assessment Report was completed in support of this Class EA Study. The purpose of this report was to characterize the existing drainage conditions, and to establish preliminary stormwater management alternatives to accommodate the proposed roadway designs. This report documented the following as guidance to be confirmed through subsequent detailed design phase:

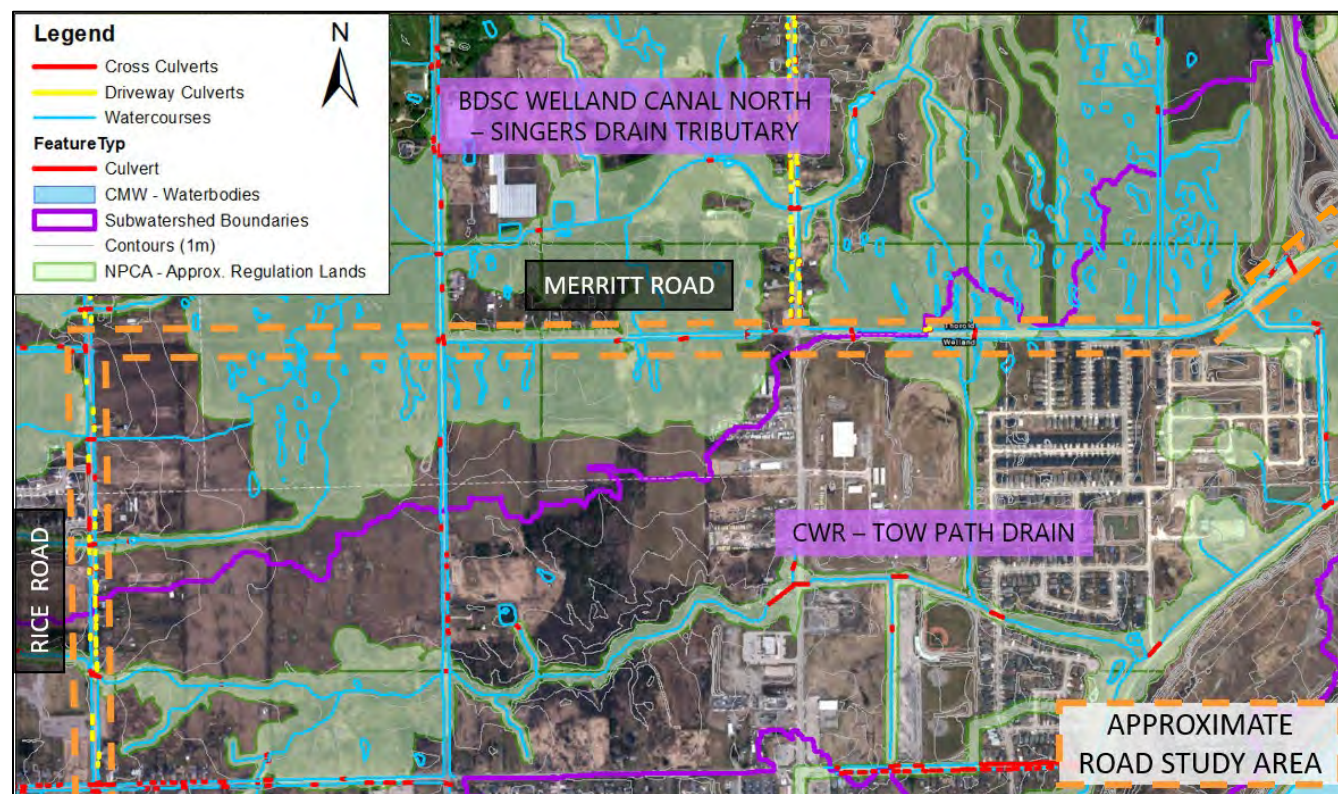
- Existing & Proposed Hydrologic Conditions
- Preliminary Stormwater Management Strategies and Sizing
- Localized Floodplain Impact Assessment for Singer's Drain
- Preliminary Hydraulic Structure Sizing for Regulated Watercourses on Singer's Drain
- Wetland Impact Assessment for the PSW located along Segment 1

The scope of Hydraulic Assessment and Wetland Impact Assessment presented in this report was determined with input from the NPCA. A summary of findings of Stormwater Management and Hydraulic Assessment Report is provided in this report. For detailed information, please refer to the Stormwater Management and Hydraulic Assessment Report provided in Appendix F.

4.6.1 Watershed Characteristics

The Study Area is located within the jurisdiction of the NPCA. The Study Area is located within the Central Welland River watershed, contributing to two individual subwatershed systems, namely Singers Drain subwatershed and Towpath Drain subwatershed. Both of these subwatersheds ultimately contribute to the Central Welland River. The majority of the Study Area contributes to the Singer's Drain subwatershed, which has several tributaries crossing the subject road right-of-way segments, feeding into Niagara Street Cataract Road Woodlot Wetland Complex. These features and drainage conditions are important considerations as part of the infrastructure planning processes, as such NPCA has required an impact assessment to be conducted for the wetlands located adjacent to Segment 1.

Figure 4-36: Singers Drain and Towpath Drain Subwatersheds



4.6.1.1 Singers Drain

The Singers Drain is a watercourse located within the Beaver Dam Shiner's Creek (BDSC) subwatershed system, and ultimately contributes to the Welland Canal North system. The Singers Drain subwatershed has a drainage area of approximately 1570 hectares, and begins west of Pelham Street, south of Port Robinson Road, and continues to drain west to east, through the municipalities of the Town of Pelham, City of Thorold and City of Welland. The lands contributing to the Singers Drain are primarily rural / natural lands, as well as some areas of low density residential.

The Singers Drain subwatershed has been assessed as part of several preceding studies. Through review of the preceding studies, it has been identified that there are several known Flood Damage Centers within the Singers Drain system. Through discussions with the NPCA, it is understood that the area of Cataract Road and Merritt Road, directly north of the intersection of Segment 1 and Segment 2, is also a known Flood Damage Center. This area is understood to be prone to ponded water within the roadside ditches and overtopping the roadway crossing during significant storm events. While the scope of this study was not to investigate these off-site conditions or identify potential solutions, it is important to understand the local conditions as it relates to the preliminary assessment of the roadway designs.

The Study Area of Merritt Road and Rice Road contribute to the Singers Drain system in the headwaters, including Segment 1, Segment 2 and portions of Segment 3 and Segment 4 contributing to the regulated watercourses via roadside ditches. The Study Area also has three existing watercourse roadway crossings along Rice Road (Segment 4), and watercourses crossing through the unopened road allowance of Merritt Road (Segment 1).

4.6.1.2 Towpath Drain

The Towpath Drain is a watercourse located within the Center Welland River Subwatershed system, and contributes to the Welland Canal system. The Towpath Drain Subwatershed has a drainage area of approximately 1700 hectares (+/-), and begins west of Claire Avenue, north of Quaker Road, and continues to drain west to east, through the municipalities of Pelham, Thorold, and Welland. The land use of the Towpath Drain subwatershed is a mix of urban, industrial, natural areas, and agricultural lands.

The Towpath Drain subwatershed has been assessed as part of several preceding studies. Through the review of the preceding studies, it has been identified that the headwaters of the Towpath Drain are identified on the Fonthill Kame-Delta Complex, which is an area of significant groundwater recharge and an area of high groundwater vulnerability. The Central Welland River Watershed Plan identified several special studies to support reduction of contaminant and point source pollution throughout the Towpath Drain subwatershed.

The Study Area of Merritt Road and Rice Road contribute to the Towpath Drain system in the Upper-Mid area of the headwaters (southern portion of Segment 4), as well as further downstream near the eastern portion of Segment 3 approaching the Highway 406 interchange. The Study Area also has one existing watercourse roadway crossing along Rice Road (Segment 4), located north of Quaker Road.

4.6.2 Surface Water / Drainage

As noted previously, the Study Area contributes to two subwatershed systems, ultimately discharging to the Welland Canal. The subject roadways are rurally serviced by roadside ditches under existing conditions and contribute to a variety of watercourses / drainage features throughout the Study Area (Figure 4-37). This includes three tributaries of the Singers Drain which cross Rice Road, namely North, Center and South Tributaries, as well as one crossing of the Towpath Drain on Rice Road. Additional cross-culverts are found along the ROWs to facilitate other tributary drainage or convey ditch drainage to the ultimate outlet. The ditches have been surveyed as part of the current study which supported the characterization of the existing drainage conditions, and development of the subcatchment plan. Figure 4-37 provides an overview of drainage conditions. Detailed figures are provided in Appendix A of the Stormwater Management and Hydraulic Assessment Report (Appendix F).

An integrated hydrologic/hydraulic model of the existing conditions of Merritt Road and Rice Road was developed in the PCSWMM software. Hydrology represents the quantity of water (runoff) generated from a specific area or watershed. Hydraulics deals with the physical properties of water, such as calculating the depth of flow in an open channel. Data from various government sources was used in the development of this model, including Digital Elevation Model (DEM) from the 2015 Southwestern Ontario Orthophotography Project, surficial soil mapping developed by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA), land use mapping provided by the Niagara Region and other data sources.

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The integrated hydrologic/hydraulic model was calibrated using local rainfall data and surface water monitoring data. Local rainfall data for the monitoring period of June to November 2022 was sourced from the Humberstone Landfill Climate Station. This station is less than 7 kilometers away from the study area and would therefore provide a local resource for rainfall / storms occurring during the monitoring period. For surface water data, a Surface Water Monitoring program was designed with input from NPCA to collect surface water data to understand surface water input to the Provincially Significant Wetland along Segment 1 and support model calibration.

Three water level gauges and one barologger for air pressure were installed to collect surface water data from June 15 to October 24, 2022. The first gauge (J23) was installed along the Singers Drain North Tributary at Rice Road, located north of Merritt Road. The second gauge (J11) was installed along the Singers Drain South Tributary, at Rice Road just south of Rosewood Crescent. The last gauge (J159) was installed on the main branch of Singers Drain, at the Merrittville Highway. The combination of the three gauges allowed for monitoring of the representative inflow and outflow of the wetland system. The gauges were located within the road rights-of-way along sections of open channel. The surface water monitoring locations are shown in Figure 4-38.

The results of the integrated hydrologic/hydraulic model simulations are summarized in Table 4-78 for each of the respective drainage system outlets along Rice Road and Merritt Road. Detailed figures showing subcatchment boundaries are provided in Appendix A of the Stormwater and Hydraulic Assessment Report (Appendix F). These results represent the baseline conditions. These results were used to support separate hydraulic analysis for the Singers Drain floodplain system located within Segment 1. The results from this assessment were used to inform the development of the stormwater management strategy discussed in Section 8.11.

Figure 4-37: Study Area Drainage Conditions Overview

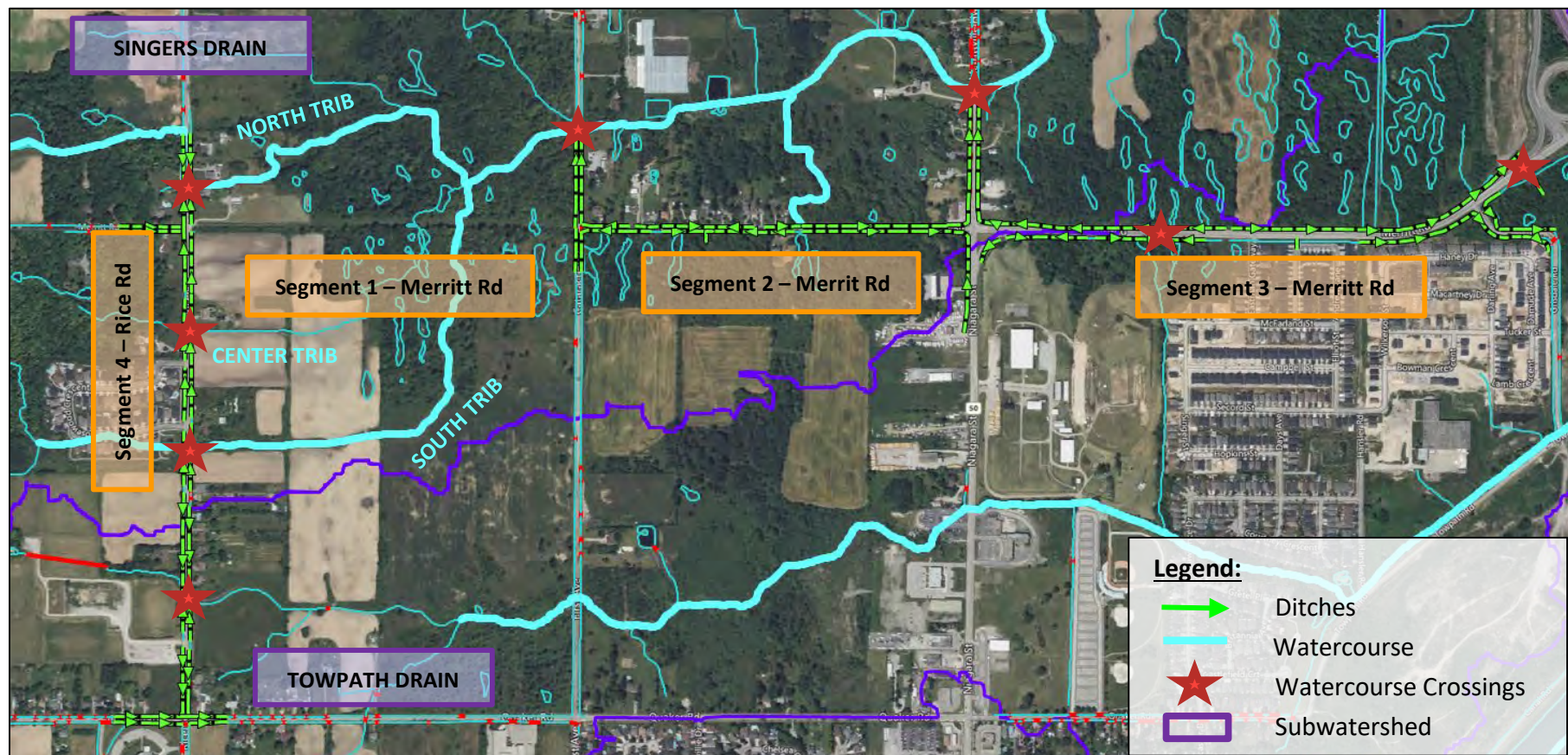


Figure 4-38: Surface Water Monitoring Locations

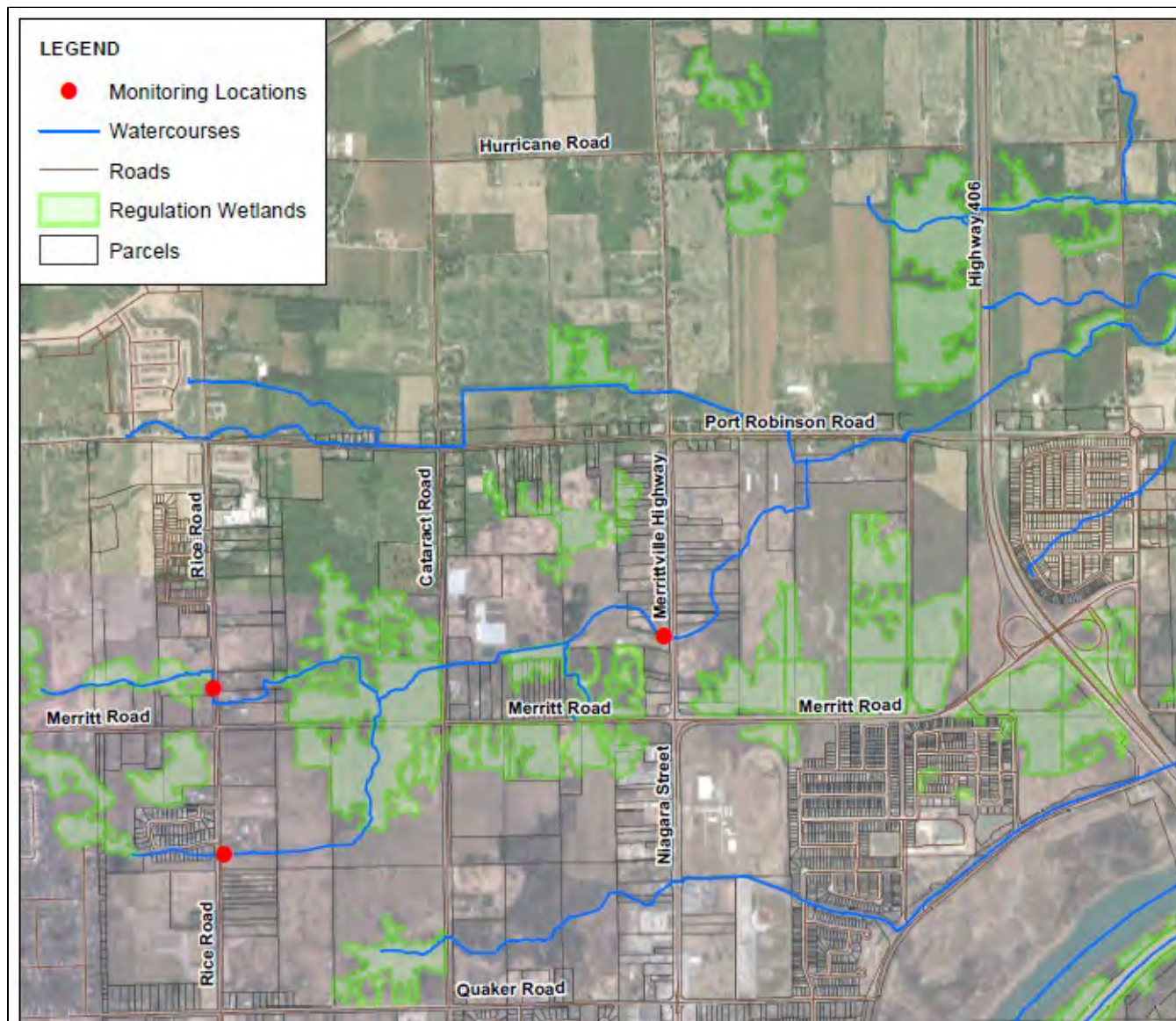


Table 4-78: Existing Condition Design Storm Event Peak Flows (m³/s)

Road Segment	Location	Station ³	PCSWMM Node Name	2-year	5-year	10-year	25-year	50-year	100-year
4	South side of Quaker Rd.	Rice Rd. 10+140	J40	0.42	0.51	0.69	0.69	0.76	0.83
4	North side of Quaker Rd.	Rice Rd. 10+160	J-OF01	0.79	1.00	1.41	1.41	1.62	1.83
4	Private Property @ Rice Rd.	Rice Rd. 10+390	J-OF02	1.67	1.96	2.71	2.71	3.36	3.89
4	South Trib. @ Rice Rd.	Rice Rd. 10+720	J-OF03	3.25	4.10	5.83	5.83	6.80	7.74
4	Center Trib. @ Rice Rd.	Rice Rd. 10+966	J-OF04	0.28	0.36	0.53	0.53	0.61	0.70
4	North Trib. @ Rice Rd.	Rice Rd. 11+270	J-OF05	1.09	1.44	2.24	2.24	2.71	3.18
1	Center Trib. @ Merritt Rd.	Merritt Rd. 20+640	J-OF06	0.34	0.47	0.74	0.74	0.89	1.03
1	South Trib. @ Merritt Rd.	Merritt Rd. 20+715	J-OF07	2.04	2.75	4.05	4.05	4.63	4.75
1	Wetland feature @ Merritt Rd.	Merritt Rd. 20+880	J-OF08	0.15	0.22	0.36	0.36	0.54	0.77
1	West side of Cataract Rd.	Merritt Rd. 20+960	J-OF09	0.07	0.09	0.11	0.11	0.19	0.65
1	Cataract Culvert	Merritt Rd. 20+970	J145	1.93	2.93	4.34	4.34	6.05	7.57
2	East side of Cataract Rd.	Merritt Rd. 20+980	J-OF10	0.15	0.19	0.25	0.25	0.27	0.31
2	Wetland south of Merritt Rd.	Merritt Rd. 21+235	OF_M3	0.23	0.30	0.37	0.45	0.52	0.60
2	West side of Merrittville Hwy.	Merritt Rd. 21+790	J-OF11	0.39	0.49	0.69	0.69	0.79	0.90
2	Merrittville Hwy.	Merritt Rd. 21+800	J158	1.73	2.59	4.60	4.60	6.18	7.46
3	East side of Merrittville Hwy.	Merritt Rd. 21+810	J-OF12	0.24	0.31	0.44	0.44	0.51	0.57

³ Detailed figures showing subcatchment boundaries and stations are provided in Appendix A of the Stormwater and Hydraulic Assessment Report (Appendix F).

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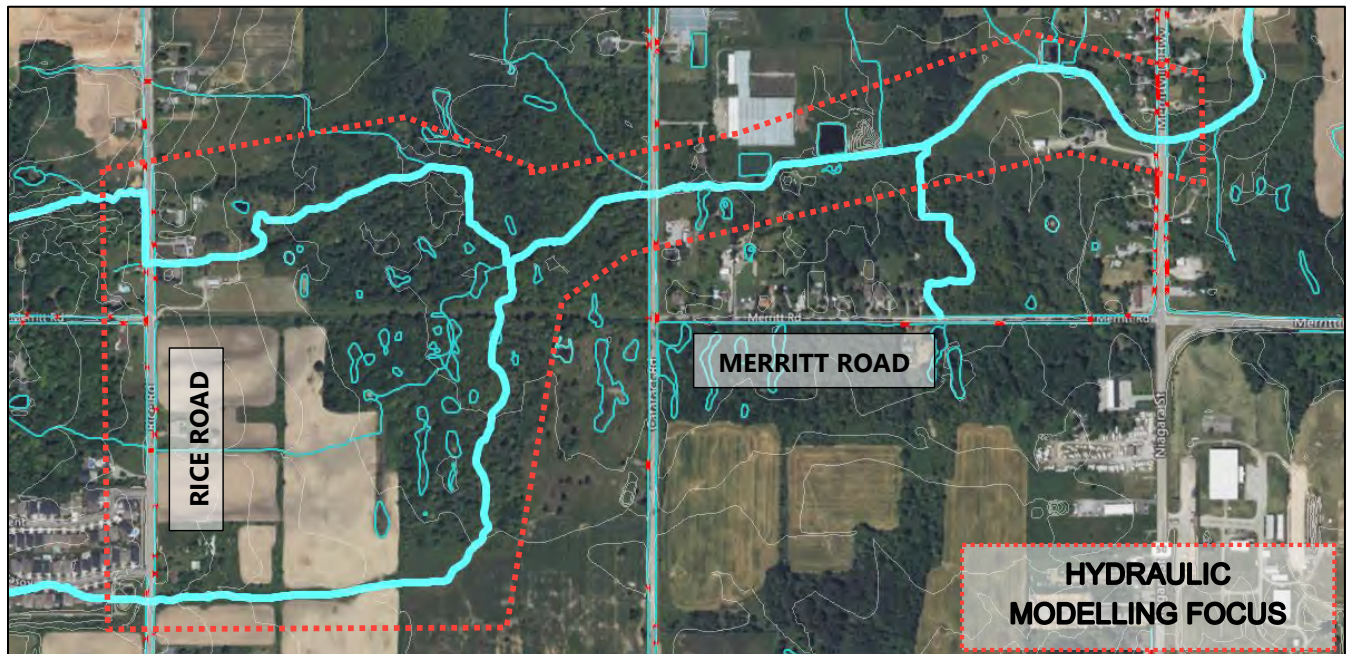
Road Segment	Location	Station ³	PCSWMM Node Name	2-year	5-year	10-year	25-year	50-year	100-year
3	South side of Merrittville Hwy.	Merritt Rd. 21+820	OF_M6	0.21	0.26	0.30	0.37	0.42	0.48
3	Wetland south of Merritt Rd.	Merritt Rd. 22+220	OF_M7	0.16	0.20	0.23	0.27	0.31	0.35
3	Eastman Gateway @ Merritt Rd.	Merritt Rd. 22+480	OF_M8	0.06	0.08	0.09	0.10	0.11	0.13
3	West side of Grisdale Rd.	Merritt Rd. 22+860	OF_M9	0.05	0.06	0.07	0.08	0.10	0.11
3	East side of Grisdale Rd.	Merritt Rd. 22+880	OF_M10	0.05	0.07	0.08	0.09	0.10	0.12
3	Wetland east of Grisdale Rd.	Merritt Rd. 23+010	OF_M11	0.38	0.48	0.56	0.69	0.81	0.93
3	Final Outlet		O160	1.73	2.60	3.08	4.64	6.26	7.58

4.6.3 Flooding Hazard

A hydraulic assessment was completed for Segment 1. This assessment included the base hydraulic model development, the existing conditions characterization and the proposed conditions analysis. It should be noted that the modelling and associated results do not represent or warrant changes to the regulatory mapping limits currently used and approved by the NPCA. The efforts associated with the refined modelling were used to generate a more refined understanding of the flood hazards present within the subject area and were used as a baseline when assessing the potential impacts associated with the proposed roadway design.

There is an existing hydraulic model available for the subject area. This model was generated as part of the Singer's Drain Floodplain Update Report (June 2011) was based upon previous HEC-2 modelling provided by the NPCA and included the full Singer's Drain subwatershed down to the outlet at the Welland Canal. In reviewing the existing modelling within the subject area (Road Segments 1, 2, and 4), the previous modelling was found to be too coarse (3 cross-sections per reach) to accurately represent the watercourses of focus, which pass through the subject Rice Road and Merritt Road rights-of-way. Therefore, a new hydraulic model was proposed to be developed, which would place the focus upon the tributaries of the Singer's Drain which pass through the subject area shown in the figure below.

Figure 4-39: Hydraulic Modelling Focus Area – Merritt Road and Rice Road



A new 1-dimensional (1D) hydraulic modelling for the subject area was proposed and has been completed in the HEC-RAS modelling software. To support model development, various data were used including topographic survey data collected as part of the Class EA Study, LiDAR data from Land Information Ontario and NPCA, and watercourse mapping files from the Niagara Region and NPCA.

Three watercourse tributaries pass through the subject Rice Road corridor (Segment 4) and combine just north of the subject Merritt Road unopened road allowance (Segment 1) to form the main branch within the Study Area (Figure 4-38). All three tributaries (named North, Centre and South) have been included in the hydraulic model, beginning west of Rice Road to include the associated cross-culverts, and join at the confluence point upstream of Cataract Road. The main branch has been included in the modelling from the confluence point and continues east to the termination point of the revised model, located east of Merrittville Highway

A total of five existing structures are located within the Study Area limits and have been included in the modelling based upon WSP field inventory, topographic survey, and confirmed through the Existing HEC-RAS model (AMEC, 2011). The following table provides a summary of each hydraulic structure.

Table 4-79: Existing Culverts

WSP Structure ID	River	Road / Location	Structure Type / Size	Data Source
N1	North Tributary	Rice Road (north of Merritt Road)	0.6 m CSP Culvert	Field Inventory / Survey & Previous HEC-RAS
C1	Centre Tributary	Rice Road (south of Merritt Road)	0.5 m CSP Culvert	Field Inventory / Survey & Previous HEC-RAS
S1	South Tributary	Rice Road (south of Rosewood Crescent)	0.75 m CSP Culvert	Field Inventory / Survey & Previous HEC-RAS
M1	Main Branch	Cataract Road	1.5 m (W) x 1.15 m (H) CSP Arch Culvert	Field Inventory / Survey & Previous HEC-RAS
M2	Main Branch	Merrittville Hwy	3.0 m (W) x 1.38 m (H) Open Bottom Box Concrete Culvert	Field Inventory / Survey & Previous HEC-RAS

The baseline existing conditions hydraulic model was simulated for the 2 year, 5-year, 10-year, 25-year, 50-year and 100-year design storm events. The draft flood hazard mapping has been plotted on the SWOOP LiDAR data to identify the approximate limits of the 100-year simulated floodplain. These results are demonstrated in Figure 4-40.

As demonstrated in Figure 4-40, the draft results differ than the current regulatory floodplain mapping, some of the trends observed include:

- The North Tributary has expansions in the floodplain, likely due to the higher steady flow applied within the reach in comparison to the previous study.
- The Centre Tributary was not mapped as part of the previous study. Therefore, the floodplain delineations provide further detail regarding the flow paths and floodplain spread within this agricultural floodplain.
- The South Tributary results generally demonstrate an expanded floodplain, likely due to the higher steady flow applied within the reach in comparison to the previous study. The current results demonstrate some spill beyond the channel limits, and an expanded right overbank approaching the Segment 1 ROW.
- The area surrounding the confluence point and upstream of Cataract Road is also observed to have a narrower floodplain along the northern limit, likely due to the lower flow rates applied, as well as the application of levees focusing the flow within the primary channels.

- The portion of the Main Branch directly downstream of Cataract Road to approximately the midway point of the reach demonstrates an expansion in the floodplain, both north and south of the primary watercourse, which includes floodplain area expansions in both agricultural and residential lands. From the midway point to the downstream extent of Merrittville Highway, the floodplain demonstrates a constriction in comparison to the previous mapping. These changes can be attributed to the lower flows applied in the current assessment, as well as a more refined terrain to plot the inundation limits.

It is important to note that the RAS Mapper does not plot the water surface elevations beyond the levees applied in a cross-section. Therefore, the full inundated limits including areas of backwater may not be demonstrated in the current mapping, however the resulting water surface elevations can be used as the baseline point of comparison.

In terms of the performance results at the existing structures, the overtopping depths of each structure for the 25-year, 50-year and 100-year storm events are summarized in Table 4-80. The draft results demonstrate that structures N1, C1, S1 and M1 each overtop during the 25-year to 100-year events, whereas structure M2 does not overtop during the reported events. Of those structures which overtop, the maximum overtopping depth ranges from 0.06 meter (+/-) up to 0.47 meter (+/-). In comparison to the previous hydraulic modelling, both the M1 and M2 structures overtopped during the 25-year and 100-year event, with a maximum overtopping depth ranging from 0.29 meter up (+/-) to 0.36 meter (+/-). Structures N1, C1, and S1 along Rice Road were not included in the previous modelling, and therefore cannot be compared.

Figure 4-40: Baseline 100-year Hydraulic Model Results – Comparison to Existing Regulatory Floodplain

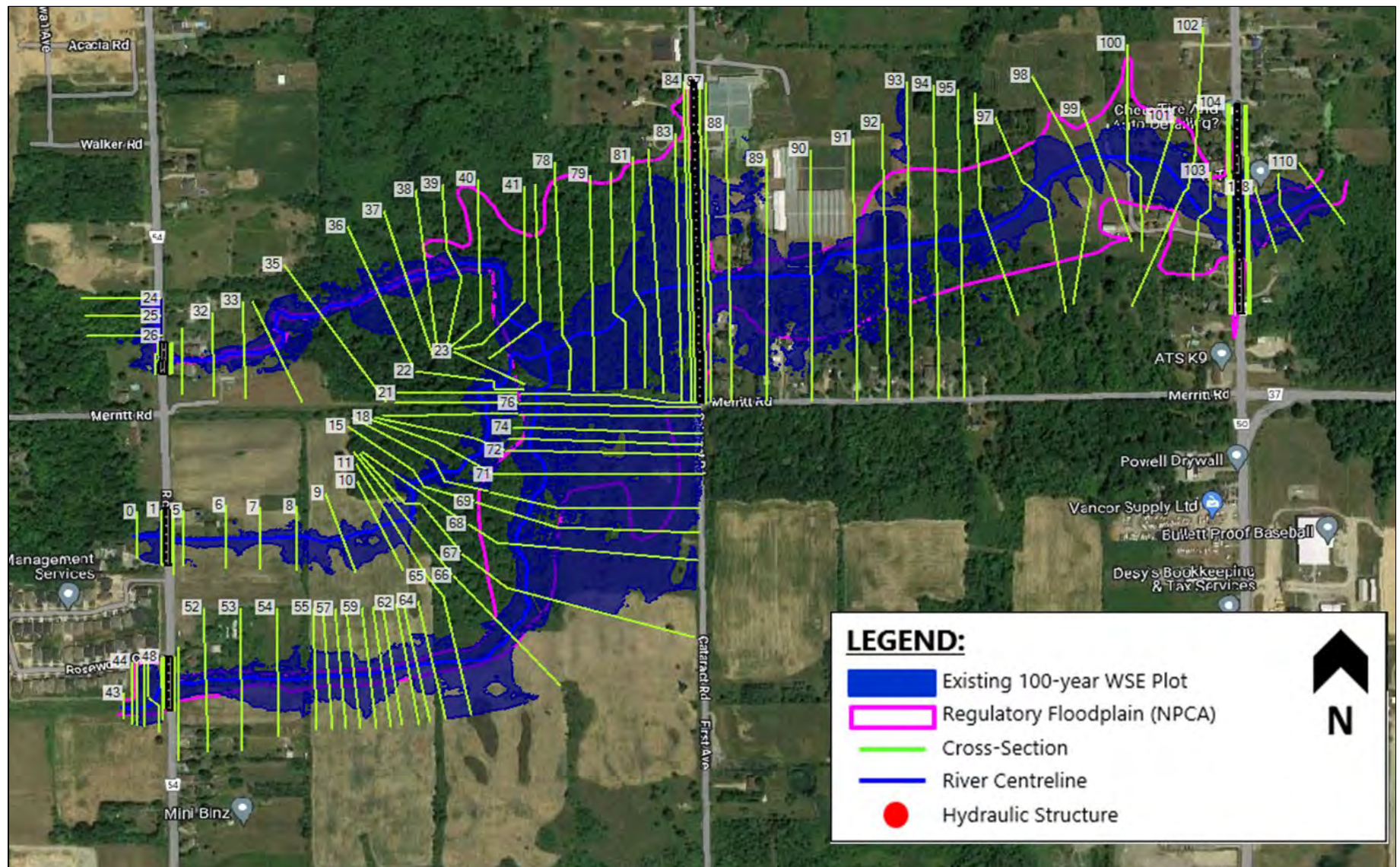


Table 4-80: Overtopping Depths (m) at Hydraulic Structures

Structure ID#	Roadway	Structure Type / Size	Overtopping During:			Maximum Overtopping Depth (m)
			25-year	50-year	100-year	
N1	Rice Rd	0.6 m CSP Culvert	0.09	0.10	0.12	0.12
C1	Rice Rd	0.5 m CSP Culvert	0.05	0.06	0.06	0.06
S1	Rice Rd	0.75 m CSP Culvert	0.24	0.26	0.27	0.27
M1	Cataract Rd	1.5 m (W) x 1.05 m (H) CSP Arch Culvert	0.47	0.43	0.41	0.47
M2	Merrittville Hwy	3.0 m (W) x 1.1m (H) Open Bottom Box Concrete Culvert	-	-	-	-

Cross-sections have been generated in the current hydraulic modelling surrounding the unopened road right-of-way along Merritt Road within Segment 1. This applies to both the Centre Tributary and the South Tributary. The simulated Water Surface Elevations and resulting water depths for each return period have been summarized in Table 4-81 for both the upstream and downstream cross-sections along each reach.

Table 4-81: Existing Conditions Simulated WSE and Water Depth – Segment 1

River	Cross-Section ID	Data Type	Simulation Results					
			2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
Centre Tributary	185	Depth (m)	0.18	0.20	0.21	0.23	0.25	0.28
		WSE (m)	182.02	182.04	182.05	182.07	182.09	182.12
	160	Depth (m)	0.18	0.22	0.24	0.27	0.32	0.36
		WSE (m)	181.92	181.96	181.98	182.01	182.06	182.10
South Tributary	100	Depth (m)	0.20	0.25	0.28	0.30	0.34	0.36
		WSE (m)	181.96	182.01	182.04	182.06	182.10	182.12
	83	Depth (m)	0.19	0.24	0.28	0.30	0.34	0.36
		WSE (m)	181.94	181.99	182.03	182.05	182.09	182.11

Based upon the results within Table 4-81, the simulated flood depths range from 0.18 meter (+/-) up to 0.36 meter (+/-) within this area for the range of simulated events, and the maximum water surface elevation in the South and Centre Tributary is approximately 182.12 m. It should be noted that while in reality, these reaches have the potential to overtop and spill into the adjacent reach generating a combined floodplain, the current 1D modelling treats the two reaches as independent watercourses and does not allow for spill flows to leave or join the adjacent watercourse.

4.6.4 Hydrologic Function of Wetlands

A Wetland Water Balance Risk Assessment was conducted for the wetland located within the vicinity of the proposed Merritt Road Segment 1, as requested by the NPCA through project discussions. This assessment was completed in accordance with Toronto Region Conservation Authority's Wetland Water Balance Risk Evaluation (November 2017). This guideline document identifies that several factors will influence the magnitude of hydrological change. These factors include the following (Toronto and Region Conservation Authority, 2017):

- Wetland feature limits
- Extent and size of pre-development catchments
- Total development area of catchment
- Area of the wetland catchment owned by the proponent
- Percent of impervious cover planned within the proponent's holdings
- Proposed extent and size of the post-development catchment
- Anticipated magnitude and duration of water taking
- Location and extent of any locally significant recharge areas

The Provincial Significant Wetland located within Segment 1 is primarily a surface water fed system and has a total of three watercourses contributing to the system, generally draining from west to east across the Study Area. Two of the watercourses cross Rice Road, south of Merritt Road, and drain north crossing the unopened road allowance of Segment 1. The third watercourse contributes to the wetland north of Merritt Road. All three watercourses combine to form the upstream extent of the main branch of the Singer's Drain, prior to crossing at Cataract Road.

The Provincially Significant Wetland system consists of several localized wetland pockets (Figure 4-41). Some of these wetland pockets are located on-line within the watercourse features (i.e., receive drainage from the contributing road ROW), whereas others are more isolated and would receive local drainage. These wetland pockets have been assessed using the DEM to interpret the representative storage volume and surface area of the individual features, which have then been grouped into localized systems where appropriate. A summary of these wetland groupings summarizing the number of wetland pockets, whether the wetland groupings are on-line features, whether the wetlands groupings are located within the proposed Segment 1 ROW, and the associated storage volume and drainage characteristics is provided in Table 4-82.

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Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)

As noted in Table 4-82, a total of 21 wetland groups have been identified, which represent a total of 41 individual wetland pockets. Of the wetland groups, 10 of them are situated on-line within the watercourses and would therefore receive drainage from either the Rice Road ROW (Segment 4) or the Merritt Road ROW (Segment 1). The other 11 groups are situated off-line and are anticipated to receive more localized drainage as opposed to drainage from upstream contributing drainage systems. Of the wetland groups, four are physically located within the Segment 1 ROW, which is anticipated to be the greatest area of change due to the proposed roadway (not accounting for any anticipated grading changes or temporary construction activities which may occur beyond the proposed ROW limits).

As for the hydrologic representation of the wetland systems, the total surface area of the various wetland groupings is approximately $47,300 \text{ m}^2$ (+/-), which generally provides an estimated total storage volume of approximately $94,000 \text{ m}^3$ (+/-). The drainage areas to each wetland group range from 0.17 ha (i.e., off-line group), up to 89.11 ha (on-line group), and have an average imperviousness ranging from 5% up to 36%. However, on average, at the downstream extent of the total wetland system (i.e., upstream of Cataract Road), the total drainage area is 292.8 ha, with an average existing imperviousness of 23%.

Figure 4-41: Wetland Group Identification Plan

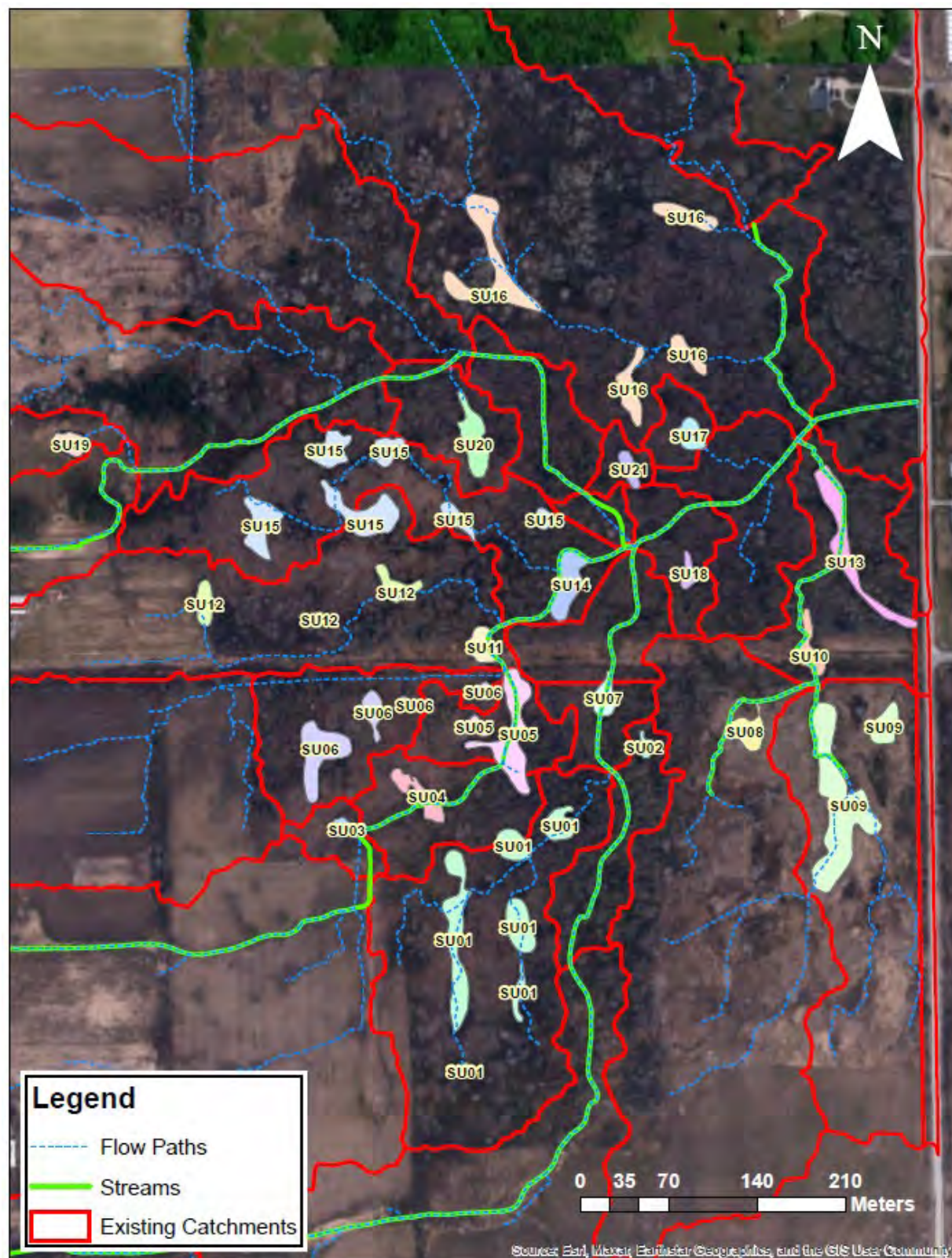


Table 4-82: Associated Storage Volume and Drainage Characteristics of the Wetlands (Existing Conditions)

Wetland Group / Type			Hydrologic Representation of Wetland Group			Existing Hydrologic Drainage Characteristics		
Wetland Group Reference ID#	Number of Wetland Pockets in Group (NPCA Mapping)	Is the Wetland Group On-line? (Watercourse)	Is the Wetland Storage Located within the Segment 1 ROW?	Surface Area (m ²)	Approx. Maximum Volume (m ³)	Cumulative Total Drainage Area (ha)	Total Impervious Drainage Area (ha)	Average Imperviousness (%)
SU01	6	No	No	3552	6098	3.5	0.2	6%
SU02	1	No	No	136	88	0.8	0.0	5%
SU03	1	Yes	No	232	151	18.8	4.1	22%
SU04	1	Yes	No	636	333	19.8	4.2	21%
SU05	2	Yes	Yes+	1712	1180	20.5	4.2	21%
SU06	4	No	No	2376	5160	1.4	0.1	9%
SU07	1	Yes	Yes	408	150	89.1	31.9	36%
SU08	1	Yes	No	636	561	6.3	0.3	5%
SU09	2	Yes	No	3716	1240	3.2	0.2	5%
SU10	1	Yes	Yes	516	489	9.5	0.5	5%
SU11	1	Yes	Yes	520	343	26.8	5.4	20%
SU12	3	No	No	884	2209	4.0	0.4	11%
SU13	1	Yes	No	1420	1216	11.2	0.6	5%
SU14	1	Yes	No	848	417	33.5	6.0	18%
SU15	6	No	No	3412	5291	2.7	0.2	6%
SU16	4	No	No	24248	67622	19.7	2.9	15%
SU17	1	No	No	420	234	0.3	0.0	5%
SU18	1	No	No	192	48	0.6	0.0	5%
SU19	1	No	No	344	182	0.8	0.2	25%
SU20	1	No	No	884	690	0.7	0.0	5%
SU21	1	No	No	204	173	0.2	0.0	5%
TOTAL SYSTEM	41	-	-	47296	93875	292.8	68.5	23%

4.7 Soils and Groundwater

A Preliminary Hydrogeological Investigation was completed for Segment 1 (Unopened Road Allowance) based on the input received from the NPCA. This report is provided in Appendix G. The investigation involved a desktop-based assessment followed by field investigation, which included the drilling of boreholes and the installation of groundwater monitoring wells.

Hydraulic conductivity testing and groundwater level monitoring was undertaken to assist in the hydrogeological characterization of the subsurface soils, to assess seasonal groundwater level variations. The purpose of the preliminary hydrogeological investigation was ultimately to assess the hydrogeological function, in simple terms the role of groundwater in the wetlands located along Segment 1.

Three boreholes (BH/MW1, BH/MW2, and BH/MW3) were drilled along the unopened road allowance of Merritt Road. The location of boreholes is shown in Figure 4-42.

Surficial geology mapping indicates that the Study Area includes fine textured glaciolacustrine deposits containing silt and clay, however, just to the west of Rice Road, is roughly the termination of the geological area known as the Fonthill Kame (Figure 4-43, Figure 4-44, and Figure 4-45). The soils of the kame contain a substantial amount of sandy material and is considered an aquifer that provides groundwater to the area of the kame. Groundwater within the kame generally flows radially towards the edges of the kame. As groundwater reaches the edge of the kame, much of it becomes surface water because the underlaying lower permeability soils cannot receive groundwater at the same rate it flows through the sandy soils. The surface water that results are the headwaters of many of the local creeks, including the creeks that flow through the site (Figure 4-46).

Silty clay / clayey silt soils were encountered within the study area, with the exception of the sandy silt soils encountered at depth at BHMW1. These silty clay / clayey silt soils have relatively low hydraulic conductivities where groundwater cannot readily move through the subsurface. As groundwater cannot readily move through the subsurface within these soils, groundwater is not expected to be a significant source of water to the wetland areas and thus this would generally limit the hydrogeological function of the wetland areas. However, these low permeability soils found near surface would also limit the infiltration of precipitation water into the ground, which can result in ponded water and contribute to wetland conditions especially during the wetter seasons when evaporation is less. Groundwater levels within these silty clay / clayey silt soils at BHMW2 and BHMW3 were found to be near surface and just over a meter below ground surface respectively. The groundwater levels were slightly declining during the monitoring period to date as expected based on the summer period monitored thus far.

Sandy silt soils were encountered at depth at BHMW1. These sandy silt soils have a relatively higher hydraulic conductivity where groundwater can move through the subsurface at a relatively higher rate. Artesian groundwater conditions may suggest that these soils could be hydraulically connected to the permeable soils of the Fonthill Kame. If connected to the soils of the Fonthill Kame, this would provide a steady source of water to the area. However, based on the soils encountered at BHMW2, while limited borehole locations exist to support this, it is thought that these sandy silt soils do not extend to the locations of the mapped wetland areas.

Niagara Region**Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)**

Based on the information available and the assessment conducted as part of this preliminary hydrogeological investigation, groundwater is not expected to be a substantial source of water in terms of quantity to support the wetland areas. However, the hydraulic heads that exist in the subsurface of artesian and near surface conditions limit infiltration which would be expected to be a supporting function of the wetland areas.

P:\2020\Projects_Other\IM20103036_NiagaraMerrittRiceRoad11_GIS\MXD\HydroGeo\BoreholeLocationplan.mxd



LEGEND

Unopened Road Allowance (Merritt Rd)

Approximate Borehole Location

Waterbody

Watercourse

Hamilton

St. Catharines

Niagara Falls

Welland

Buffalo

Site Location
Pelham, ON

NOTES:
- Aerial imagery extracted from ESRI Basemaps, 2020
- Location of features is approximate

Datum: NAD83
Projection: UTM Zone 17N

N

W

S

E

Niagara Region

WSP

MERRITT ROAD AND RICE ROAD MUNICIPAL CLASS EA – PRELIMINARY HYDROGEOLOGICAL INVESTIGATION OF SEGMENT 1

BOREHOLE LOCATION PLAN

PROJECT N°: IM20103036

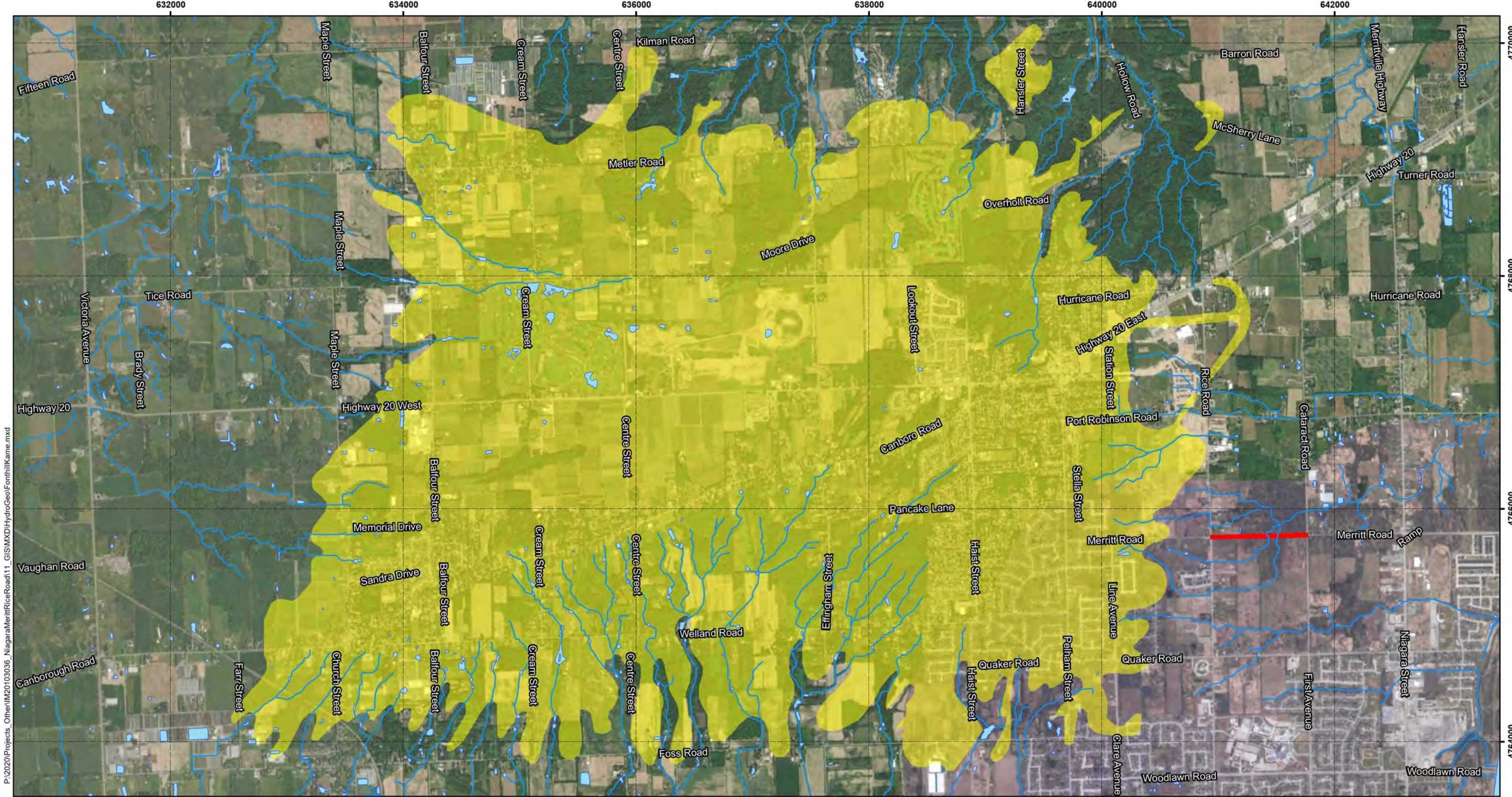
FIGURE 4-42

SCALE: 1:2,500

DATE: September 2022

00.250.5

Kilometres



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LEGEND

-  Unopened Road Allowance (Merritt Rd)
-  Fonthill Kame
-  Ontario Hydro Network (OHN) - Waterbody
-  Ontario Hydro Network (OHN) - Watercourse



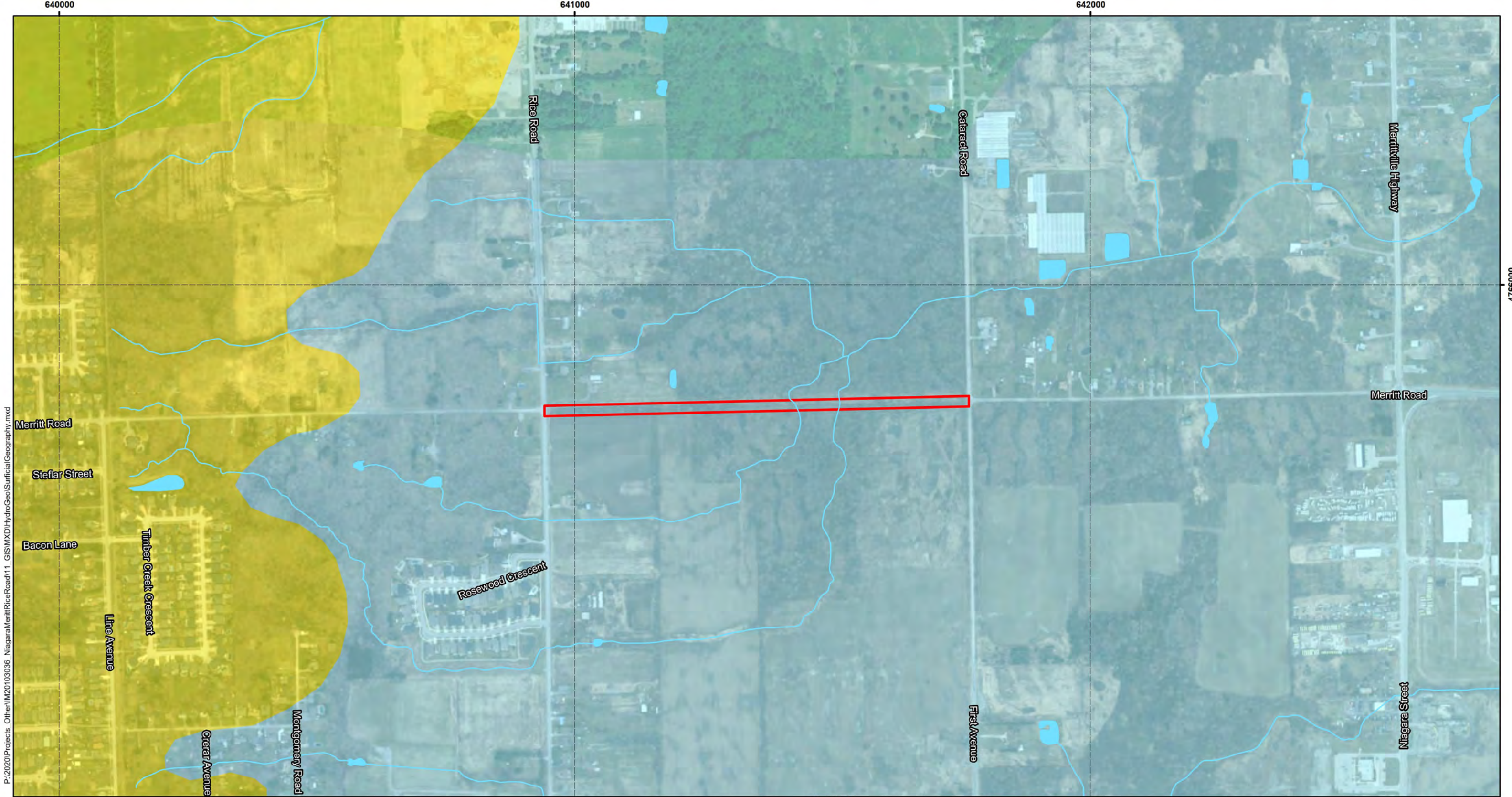
NOTES:
- Aerial imagery extracted from ESRI Basemaps, 2020
- Location of features is approximate

Datum: NAD83
Projection: UTM Zone 17N



 	
MERRITT ROAD AND RICE ROAD MUNICIPAL CLASS EA – PRELIMINARY HYDROGEOLOGICAL INVESTIGATION OF SEGMENT 1	
EXTENT OF FONTHILL KAME	
PROJECT N°: IM20103036	FIGURE 4-43
SCALE: 1:31,000	DATE: September 2022





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LEGEND

- Waterbody
- Watercourse
- Unopened Road Allowance (Merritt Rd)
- 8: Fine-textured glaciolacustrine deposits
- 9: Coarse-textured glaciolacustrine deposits

NOTES:

- Aerial imagery extracted from ESRI Basemaps, 2020
- Surficial Geology of Southern Ontario retrieved from the Ministry of Northern Development, Mines, Natural Resources and Forestry (MNDM)

Datum: NAD83
Projection: UTM Zone 17N

MERRITT ROAD AND RICE ROAD MUNICIPAL CLASS EA – PRELIMINARY HYDROGEOLOGICAL INVESTIGATION OF SEGMENT 1

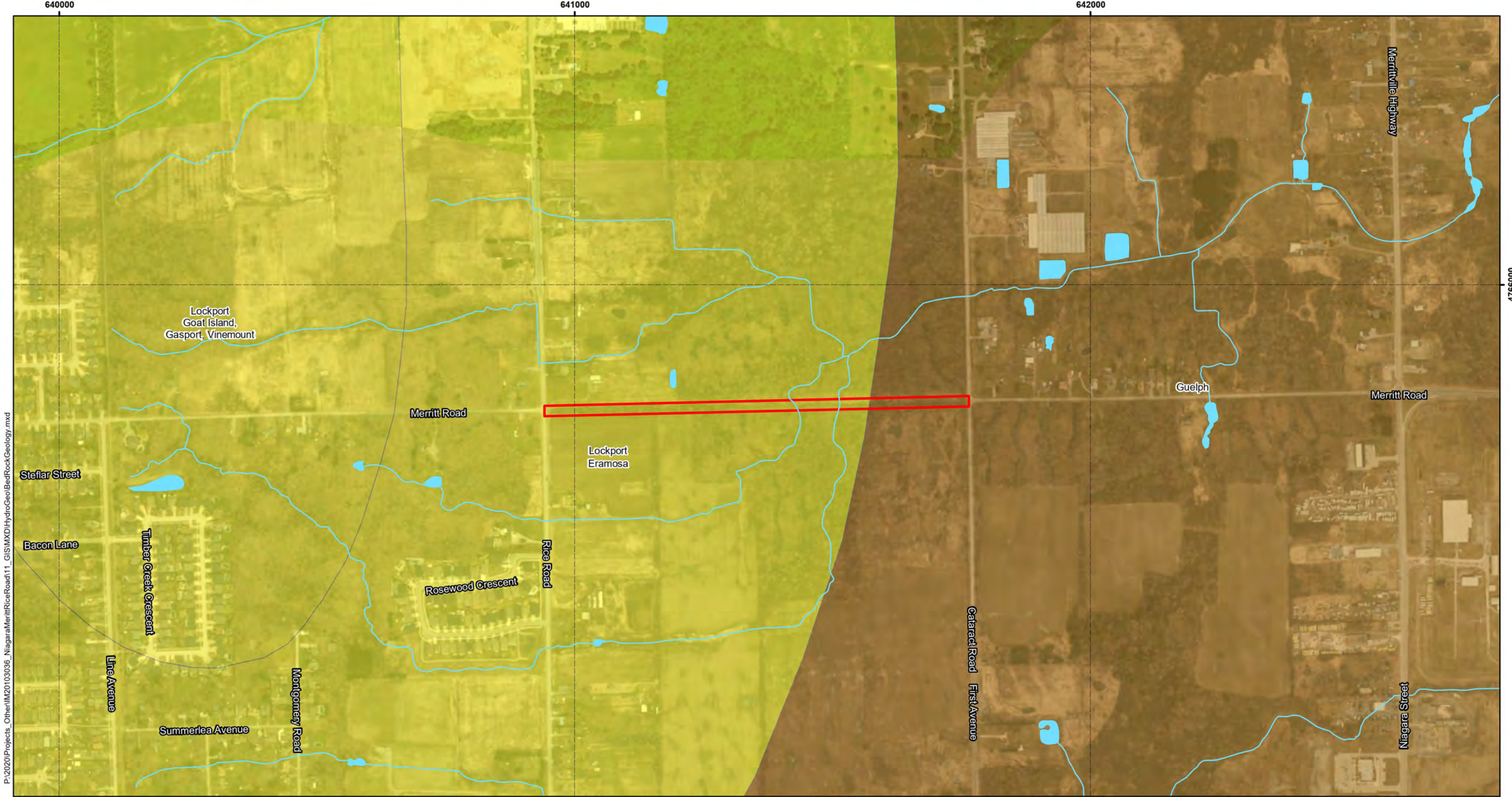
SURFICIAL GEOLOGY

PROJECT N°: IM20103036

FIGURE 4-44

SCALE: 1:7,000

DATE: September 2022



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Unopened Road Allowance (Merritt Rd)

Guelph Formation

Lockport Formation

Waterbody

Watercourse

0

0.5

1

Kilometres

Hamilton

St. Catharines

Niagara Falls

Welland

Buffalo

Site Location

Pelham, ON

Datum: NAD83

Projection: UTM Zone 17N

N

E

S

W

NOTES:

- Aerial imagery extracted from ESRI Basemaps, 2020

- Bedrock Geology of Southern Ontario retrieved from the Ministry of Northern Development, Mines, Natural Resources and Forestry (MNDRM)

Niagara Region

WSP

MERRITT ROAD AND RICE ROAD MUNICIPAL CLASS EA – PRELIMINARY HYDROGEOLOGICAL INVESTIGATION OF SEGMENT 1

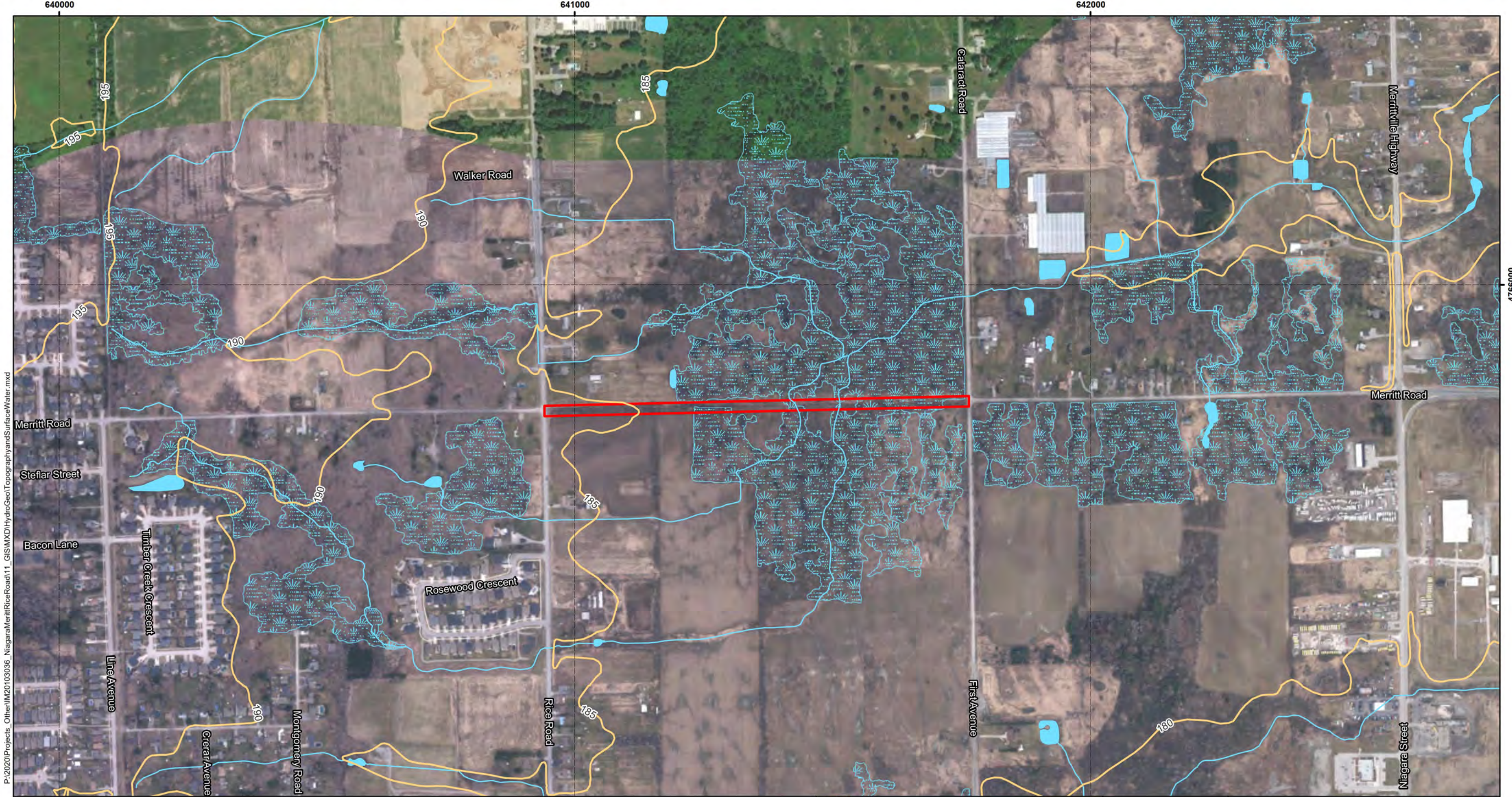
BEDROCK GEOLOGY

PROJECT N°: IM20103036

FIGURE 4-45

SCALE: 1:7,000

DATE: September 2022



P:\2020\Projects_Other\IM20103036_NiagaraMerrittRiceRoad\11_GIS\MXD\HydroGeo\TopographyandSurfaceWater.mxd

- LEGEND**
- Unopened Road Allowance (Merritt Rd)
 - Niagara Street Cataract Road Woodlot Wetland Complex (Provincially Evaluated)
 - Contour (5m Interval)
 - Waterbody
 - Watercourse



NOTES:
- Aerial imagery extracted from ESRI Basemaps, 2020
- Contour data and Waterbody information retrieved from Land Information Ontario (LIO)

Datum: NAD83
Projection: UTM Zone 17N

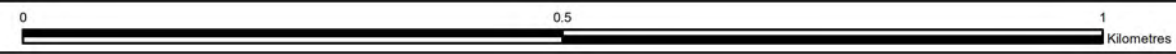


MERRITT ROAD AND RICE ROAD MUNICIPAL CLASS EA – PRELIMINARY HYDROGEOLOGICAL INVESTIGATION OF SEGMENT 1

TOPOGRAPHY AND SURFACE WATER

PROJECT N°: IM20103036 **FIGURE 4-46**

SCALE: 1:7,000 DATE: September 2022



4.8 Source Water

The Clean Water Act, 2006 is intended to protect existing and future sources of drinking water. Under this legislation, various 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 (Government of Ontario, 2006). Source Protection Plans have been developed to contain policies to address the significant drinking water threats.

Subject segments of Merritt Road and Rice Road are located in Niagara Peninsula Source Protection Area. Within this source protection area, municipal drinking water is derived exclusively from surface water sources. The surface water sources include six Water Treatment Plants, which are owned and operated by the Niagara Region. There are six municipal water treatment plants with surface water intakes in the Niagara Peninsula Source Protection Area which supply over 80% of the population. The remaining 20% of the population is supplied by private drinking water systems such as residential wells and cisterns. There are no municipal wells in the Niagara Peninsula Source Protection Area and therefore no Wellhead Protection Areas (Niagara Peninsula Source Protection Committee, 2014).

In the Niagara Peninsula Source Protection Area, activities that are considered significant drinking water threats only occur in the vulnerable areas around municipal water treatment plant intakes. These vulnerable areas are known as Intake Protection Zones (IPZs). Three types of IPZs were delineated: IPZ-1, IPZ-2, and IPZ 3. Niagara Peninsula Source Protection Plan policies apply within these three IPZs. A review of source water protection mapping indicate that the subject road segments are not located in any of the IPZs within the Niagara Peninsula Source Protection Area (Figure 4-47) (Ministry of the Environment, Conservation and Parks, 2021). As such, policies of the Niagara Peninsula Source Water Protection Plan do not apply to this project.

4.9 Technical Environment

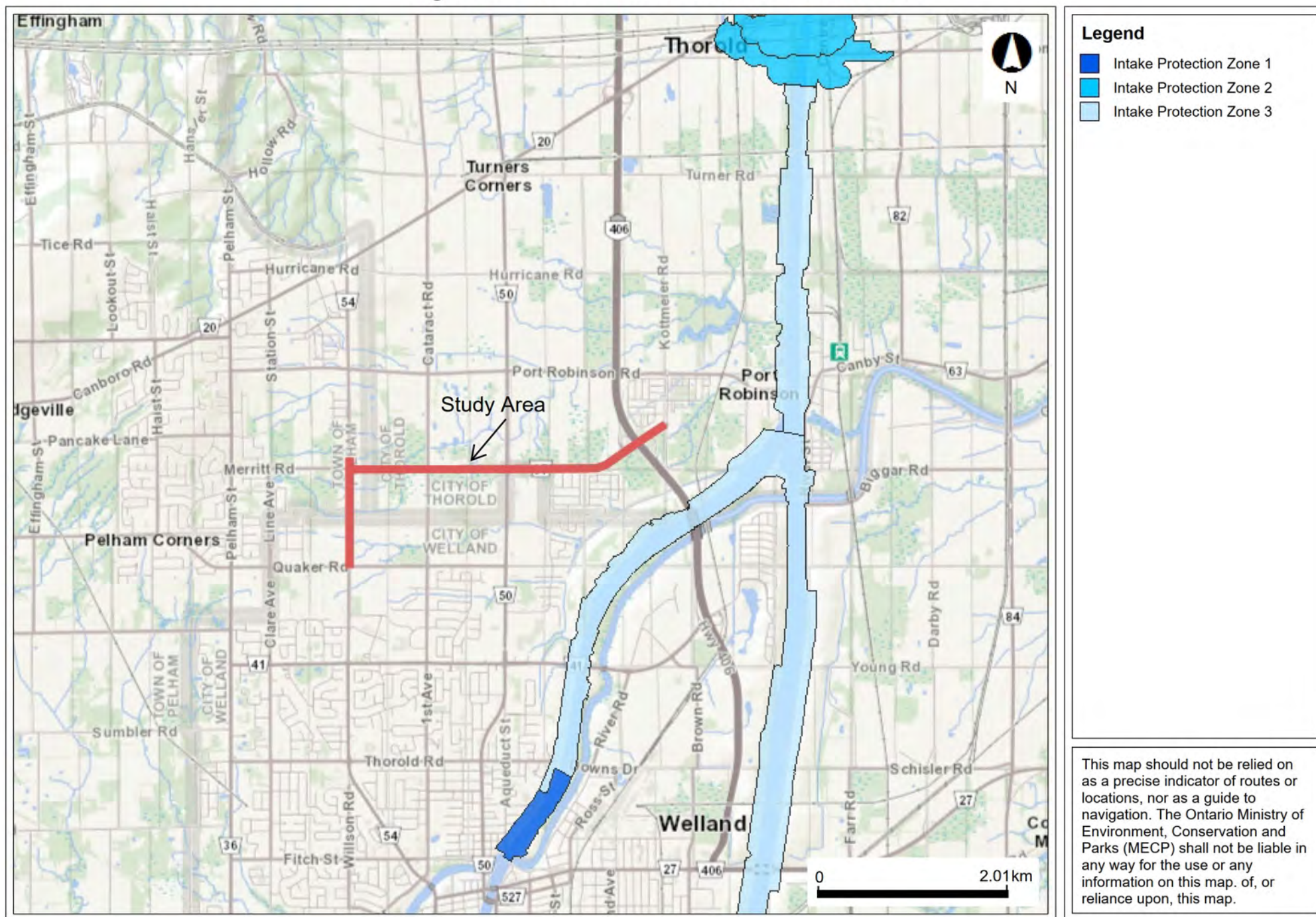
4.9.1 Utilities

Utilities located along subject road segments are identified in Table 4-83. These utilities were identified through Ontario One Call request and consultation with utility providers and staff from Niagara Region and Local Area Municipalities.

Table 4-83: Utilities along Merritt Road and Rice Road in Study Area

Road Segment	Utilities
Segment 1: Merritt Road between Rice Road and Cataract Road	Hydro
Segment 2: Merritt Road between Cataract Road and Merrittville Highway / Niagara Street	Enbridge Gas; Hydro; Bell
Segment 3: Merritt Road between Merrittville Highway / Niagara Street and Highway 406	Enbridge Gas; Hydro
Segment 4: Rice Road between Merritt Road and Quaker Road	Enbridge Gas; Hydro; Bell; Sanitary Sewer; Watermain Niagara Regional Broadband Network (South of Rice Road and Quaker Road)

Figure 4-47: Source Water Protection



5 Consultation / Engagement

5.1 Consultation Approach

Comprehensive consultation was a key component of the Class EA Study. The consultation process carried out during the Class EA study was designed to exceed the formal notice and consultation requirements of the Class EA process. Consultation was carried out with the public, impacted private property owners, Indigenous Communities, government agencies, and key stakeholder groups. The following sub-sections describe the consultation process for this Class EA Study. Consultation documentation (such as, meeting presentations, meeting minutes, project notices, newspaper ads, emails, etc.) are provided in following appendices:

- Appendix H: Study Contact List
- Appendix I: Public Information Centre #1 Summary
- Appendix J: Public Information Centre #2 Summary
- Appendix K: Public Information Centre #3 Summary
- Appendix L: Agency Consultation
- Appendix M: Utility Consultation
- Appendix N: Indigenous Consultation

5.1.1 Project Webpage

At the project commencement stage, a webpage was developed for this project on the Niagara Region's website. Information related to the Class EA study was posted on this webpage throughout the study, including study notices, materials related to Public Information Centres, and study reports. The project webpage can be accessed from this link:

<https://niagararegion.ca/projects/regional-road-37/>.

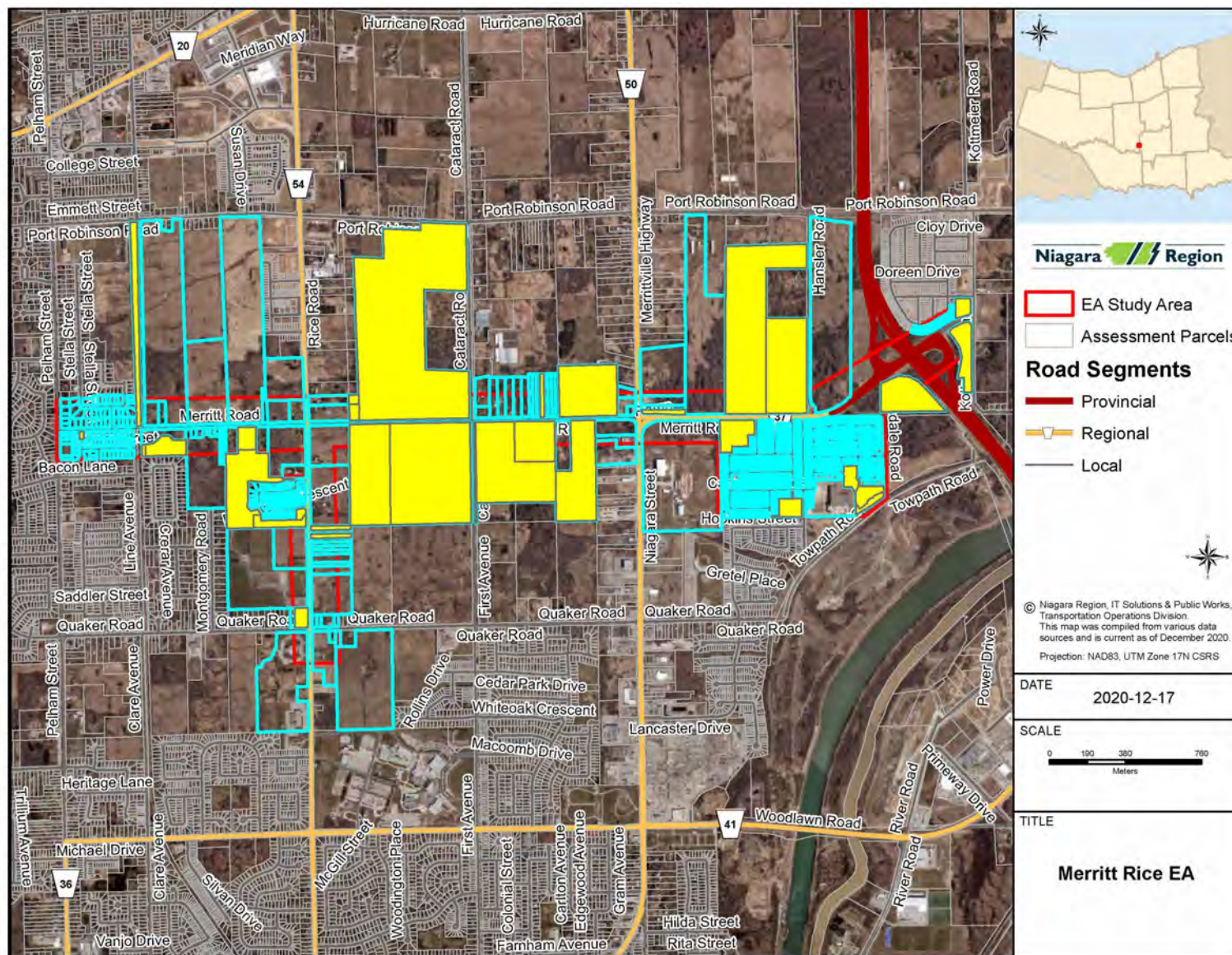
5.1.2 Study Contact List

A Study Contact List was developed at the commencement of this Class EA study. This list included contacts from the local Indigenous Communities, federal and provincial government agencies, NPCA, various departments from the Niagara Region, the Town of Pelham, the City of Thorold, and the City of Welland, utility companies, special interest groups, members of the public who expressed interest in the study, the area residents (over 500 addresses), and impacted property owners. The Study Contact List was updated throughout the study. The final Study Contact List is provided in Appendix H. Table 5-1 identifies the contact groups that are listed on the final Study Contact List. Figure 5-1 shows the consultation study area and highlights the area properties for which addresses were included in the Study Contact List.

Table 5-1: Study Contact List Groups

Contact Group	Name
Indigenous Communities	Six Nations of the Grand River Haudenosaunee Confederacy Chiefs Council c/o Haudenosaunee Development Institute Mississaugas of the Credit First Nation
Provincial Agencies	Ministry of the Environment, Conservation and Parks Ministry of Natural Resources and Forestry Ministry of Transportation Ministry of Citizenship and Multiculturalism Ministry of Municipal Affairs and Housing Ministry of Agriculture, Food and Rural Affairs Infrastructure Ontario
Conservation Authority	Niagara Peninsula Conservation Authority
Niagara Region	Transportation Systems & Planning; Transportation Engineering; Planning and Development Services; Transit; Water/Wastewater; Public Health; Real Estate; Emergency Medical Services; Police Services; Active Transportation Sub Committee; Regional Clerk; Elected Officials.
Town of Pelham	Public Works; Planning & Development; Fire Services; Active Transportation Committee; Elected Officials.
City of Thorold	Engineering Division; Fire and Emergency Services; Active Transportation Advisory Committee; Elected Officials.
City of Welland	Planning; Development and Building Services; Engineering and Public Works; Fire & Emergency Services; Elected Officials.
Utility Companies	Bell Canada Cogeco Cable Rogers Communications Inc. Niagara Region Broadband Networks Niagara Peninsula Energy Inc. Hydro One Networks Inc. Enbridge Gas Distribution TransCanada Pipelines
Special Interest Groups	Niagara College District School Board of Niagara Ontario Trucking Association Ontario Federation of Agriculture Welland Pelham Chamber of Commerce Niagara Regional Agricultural Society Merritt Meadows Rinaldi Homes Niagara Catholic District School Board Greater Niagara Chamber of Commerce Niagara Association of REALTORS

Figure 5-1: Consultation Study Area



5.1.3 Study Notices

5.1.3.1 Notice of Study Commencement

A Notice of Study Commencement was issued to introduce the Class EA Study and invite the public, Indigenous Communities, regulatory agencies and stakeholders to participate in the Study process. The following table lists the methods of distribution of the Notice of Study Commencement.

Table 5-2: Distribution Method for the Notice of Study Commencement

Notice Distribution Method	Date
Posting on project webpage	January 4, 2021
Posting on Niagara Region's Twitter and Facebook pages	January 5, 2021
Email circulation to Government Agencies, Emergency Services, Active Transportation Committees, Utility Companies and Special Interest Groups	January 7, 2021
Email circulation to Regional and municipal clerks for distribution to elected officials	January 8, 2021
Issued for mailout to over 500 addresses within Consultation Study Area (Figure 5-1)	January 11, 2021
Publication in Voice of Pelham	January 13, 2021
Publication in Niagara This Week, Welland Tribune and Thorold News	January 14, 2021
Email circulation to the Indigenous Communities (Mississaugas of the Credit First Nation, Six Nations of the Grand River, and Haudenosaunee Confederacy Chiefs Council c/o Haudenosaunee Development Institute)	January 14, 2021

The Notice of Commencement is provided in Appendix I.

5.1.3.2 Notice of Public Information Centre #1

A Notice of Public Information Centre #1 was issued to invite the public, Indigenous Communities, regulatory agencies and stakeholders to participate in the Public Information Centre #1. The following table lists the methods of distribution of the Notice of Public Information Centre #1.

Table 5-3: Distribution Methods for the Notice of Public Information Centre #1

Notice Distribution Method	Date
Posting on project webpage	March 2, 2021
Posting on Niagara Region's Facebook page	March 2, 2021
Email circulation to the Indigenous Communities (Mississaugas of the Credit First Nation, Six Nations of the Grand River, and Haudenosaunee Confederacy Chiefs Council c/o Haudenosaunee Development Institute)	March 5, 2021

Niagara Region**Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)**

Notice Distribution Method	Date
Issued for mailout to over 500 addresses within Consultation Study Area (Figure 5-1)	March 10, 2021
Email circulation to the members of public who provided email addresses for Study Contact List (13 email addresses)	March 11, 2021
Email circulation to Government Agencies, Emergency Services, Active Transportation Committees, Utility Companies and Special Interest Groups	March 11, 2021
Email circulation to regional and municipal clerks for distribution to elected officials	March 11, 2021
Publication in Voice of Pelham	March 10, 2021 March 17, 2021
Publication in Niagara This Week, Welland Tribune and Thorold News	March 11, 2021 March 18, 2021

The Notice of Public Information Centre #1 is provided in Appendix I.

5.1.3.3 Notice of Public Information Centre #2

A Notice of Public Information Centre #2 was issued to invite the public, Indigenous Communities, regulatory agencies and stakeholders to participate in the Public Information Centre #2. The following table lists the methods of distribution of the Notice of Public Information Centre #2.

Table 5-4: Distribution Methods for the Notice of Public Information Centre #2

Notice Distribution Method	Date
Posting on project webpage	May 25, 2021
Email circulation to the Indigenous Communities (Mississaugas of the Credit First Nation, Six Nations of the Grand River, and Haudenosaunee Confederacy Chiefs Council c/o Haudenosaunee Development Institute)	May 26, 2021
Issued for mailout to over 500 addresses within Consultation Study Area (Figure 5-1)	May 26, 2021
Email circulation to the members of public who provided email addresses for Study Contact List (53 email addresses)	May 27, 2021
Email circulation to Government Agencies, Emergency Services, Active Transportation Committees, Utility Companies and Special Interest Groups	May 27, 2021
Email circulation to regional and municipal clerks for distribution to elected officials	May 27, 2021
Publication in Voice of Pelham	May 26, 2021 June 2, 2021
Publication in Niagara This Week, Welland Tribune and Thorold News	May 27, 2021 June 3, 2021

The Notice of Public Information Centre #2 is provided in Appendix J.

5.1.3.4 Letters to Impacted Property Owners

As a result of proposed improvements to Merritt Road and Rice Road, some of the private properties, that are located directly adjacent to these roadways within the Study Area, will be impacted (e.g., property requirements, impact to access, etc.). In advance of the Public Information Centre #3, a letter was sent to a total of 28 impacted private property addresses listed in Table 9-1. The purpose of this letter was to invite the private property owners to attend meetings to discuss project's anticipated impacts on their properties. The letter was issued for mailout on November 3, 2021. The template of letter for impacted property owners is provided in Appendix K.

5.1.3.5 Notice of Public Information Centre #3

A Notice of Public Information Centre #3 was issued to invite the public, impacted private property owners, Indigenous Communities, government agencies, and key stakeholder groups to participate in the Public Information Centre #3. The following table lists the methods of distribution of the Notice of Public Information Centre #3.

The Notice of Public Information Centre #3 is provided in Appendix K.

Table 5-5: Distribution Methods for the Notice of Public Information Centre #3

Notice Distribution Method	Date
Email circulation to the Indigenous Communities (Mississaugas of the Credit First Nation, Six Nations of the Grand River, and Haudenosaunee Confederacy Chiefs Council c/o Haudenosaunee Development Institute)	November 16, 2021
Issued for mailout to over 500 addresses within Consultation Study Area (Figure 5-1)	November 9, 2021
Email circulation to the members of public who provided email addresses for Study Contact List (59 email addresses)	November 22, 2021
Email circulation to Government Agencies, Emergency Services, Active Transportation Committees, Utility Companies and Special Interest Groups	November 22, 2021
Email circulation to regional and municipal clerks for distribution to elected officials	November 16, 2021 / November 22, 2021
Publication in Voice of Pelham	November 17, 2021 November 24, 2021
Publication in Niagara This Week	November 18, 2021 November 25, 2021
Publication in Thorold News	November 18, 2021 November 26, 2021
Publication in Welland Tribune	November 20, 2021 November 27, 2021

5.1.3.6 Notice of Study Completion

A Notice of Study Completion was issued to inform the public, impacted private property owners, Indigenous Communities, government agencies, and key stakeholder groups about the completion of the Class EA Study, and where, when, and how the Environmental Study Report was made available for the formal review period. The Notice of Study Completion also included information on how to submit a request for Section 16 Order Process. The following table lists the methods of distribution of the Notice of Study Completion.

The Notice of Study Completion is provided in Appendix U.

Table 5-6: Distribution Methods for the Notice of Study Completion

Notice Distribution Method	Date
Publication in Niagara This Week, The Voice of Pelham, The Welland Tribune, and Thorold News	Weeks of March 4 and March 11, 2024
Issued for mailout to over 500 addresses within Consultation Study Area (Figure 5-1)	Week of March 4, 2024
Email circulation to the members of public and impacted property owners who provided email addresses for Study Contact List (78 email addresses)	Week of March 11, 2024
Email circulation to the Indigenous Communities (Mississaugas of the Credit First Nation, Six Nations of the Grand River, and Haudenosaunee Confederacy Chiefs Council c/o Haudenosaunee Development Institute)	Week of March 11, 2024
Email circulation to Government Agencies, Emergency Services, Active Transportation Committees, Utility Companies and Special Interest Groups	Week of March 11, 2024
Email circulation to regional and municipal clerks for distribution to elected officials	Week of March 11, 2024

5.2 Public Consultation

5.2.1 Public Information Centre #1

As part of the virtual Public Information Centre (PIC), an online meeting was held on March 24, 2021, which started at 6:00 p.m. PIC #1 was held virtually in a meeting room through Microsoft Teams. The information materials and Virtual Consultation Platform for PIC#1 were posted online on the project webpage. Comments were invited at the online meeting and during a two-week period following the event (March 24 - April 7). The purpose of the PIC #1 was to:

- Provide a summary of study background and the Municipal Class EA process;
- Provide an overview of technical studies completed and planned;
- Present the Problem and Opportunity(s);
- Identify the constraints and opportunities;
- Present the possible cross-sections;

- Allow the public to provide input;
- Enable the use of public feedback in the next stage of developing and evaluating potential alternative designs; and
- Identifying the next stage of the process.

Online meeting attendees were encouraged to voice their comments during the meeting, or to email them to Study Team Members following the event. A total of 47 attendees joined the online meeting. Following the online meeting, a recording of the event was also made available on project webpage. There was also an online comment form available on the project webpage which residents could fill out until April 7, 2021. The PIC #1 slides are provided in Appendix I.

As noted above, the PIC #1 participants were encouraged to provide feedback on the Study by submitting comments on via email, or through the online comment form. The deadline for comments was April 7, 2021. Seven members of the public voiced comments during the online meeting. Seven PIC participants submitted comments via the online comment form. The Study Team continued to receive comments via email after April 7, 2021. A total of six members of public had submitted comments via email up to April 13, 2021.

5.2.2 Public Information Centre #2

As part of the PIC #2, an online meeting was held on June 9, 2021, at 6:00 p.m. The online meeting was held through Microsoft Teams. The information materials for PIC#2 were posted online on the project webpage in advance of the online meeting. The purpose of the PIC #2 was to share the following information:

- Study Overview, Municipal Class EA process and Timeline
- Feedback from the Public Information Centre #1
- Future Traffic Conditions
- Problem Statement
- Evaluation of Alternative Solutions
- Preferred Solution
- Technical Studies
- Possible Cross-sections
- Next Steps and Questions

The PIC #2 slides are provided in Appendix J. Comments were invited during a three-week period from June 9, 2021 – June 30, 2021. PIC participants were encouraged to submit their comments during the online meeting, by sending them via email to the Study Team Members, or by completing an online comment form available on the project webpage.

5.2.3 Public Information Centre #3

As part of the PIC #3, an online meeting was held on December 1, 2021, at 6:00 p.m. The online meeting was held through Microsoft Teams. The information materials for PIC#3 were posted online on the project webpage in advance of the online meeting. The purpose of the PIC #3 was to share the following information:

- Study Overview, Municipal Class EA process and Timeline
- Progress on Technical Investigations and Consultation
- Class EA Phase 1: Problem or Opportunity
- Class EA Phase 2: Preferred Solution
- Feedback from the Online Public Information Centres #1 and #2
- Alternative Design Concepts
- Evaluation Criteria
- Preliminary Preferred Design
- Drainage and Stormwater Management
- Preliminary Impacts and Mitigation Measures
- Next Steps

The PIC #3 slides are provided in Appendix K. Comments were invited during a three-week period from December 1, 2021 – December 23, 2021. PIC participants were encouraged to submit their comments during the online meeting, by sending them via email to the Study Team Members, or by completing an online comment form available on the project webpage.

5.2.4 Public Comments

A summary of key comments and questions received during the three PICs and Study Team's responses is provided in Table 5-7. The comments received were grouped by subject/topic and the content of comments was summarized. Please note that the comments provided in Table 5-7 do not reflect the exact wording, but instead provide a summary of those comments. For PIC materials and detailed comments, please refer to Appendix I, Appendix J, and Appendix K.

Table 5-7: Summary of Key Public Comments and Study Team's Responses

Subject	Summary of Key Comments and Questions	Study Team Response
Impacts to Natural Environment	Concerned about impacts of extension of Merritt Road on Provincially Significant Wetlands, watercourses, and associated floodplains, significant Woodlands, wildlife, and species at risk.	The lands adjacent to Merritt Road and Rice Road will continue to experience population and employment growth in the near future. The need for the proposed improvements was identified in the Council approved 2017 Niagara Region TMP. A transportation assessment was completed as part of this Class EA Study to assess traffic operations and safety in the context of anticipated development that will be occurring within/adjacent to the study area in accordance with three separate Secondary Plans (East Fonthill Secondary Plan in the Town of Pelham, Port Robinson Secondary Plan in the City of Thorold and Northwest Welland Secondary Plan in the City of Welland). As a result of the proposed development, the transportation assessment identified significant congestion on the road network, particularly on Merritt Road between the Merrittville Highway/Niagara Street and the Highway 406 interchange by 2041. With the existing Merritt Road segment between Rice Road and Cataract Road remaining closed, Niagara Street between Merritt Road and Quaker Road and Quaker Road between Rice Road and Niagara Street will also experience a significant increase in traffic volumes given the need for motorists to take an indirect route between the Town of Pelham and the Highway 406 intersection. The Study team has completed an Environmental Impact Study (Appendix E) to document existing natural environment conditions within the Study Area, project's potential impacts on natural environment, and recommended avoidance and mitigation measures. This study was completed in accordance with Niagara Region's Environmental Impact Study Guidelines, and it was shared for review and comment by staff from Niagara Region and NPCA. A summary of existing natural environment conditions within the Study Area is presented in Section 4.5, and a detailed account of proposed mitigation measures is presented in Section 9.4 of this report. Commitments for future additional studies, and permits and approvals are identified in Section 10.
Active Transportation Facilities	Will the Study Team consider sidewalks and bike lanes on one side of the road?	The following active transportation facilities are proposed considering minimizing impacts to property properties and natural environment, and drainage conveyance: – Segment 1: Multi-use path on the north side – Segment 2: Multi-use path on the north side – Segment 3: Bike path and sidewalk on the south side, up to Grisdale Road. Multi-use path across Highway 406 overpass up to Kottmeier Road – Segment 4: Sidewalk on the east side and multi-use path on the west side Please refer to Section 8 for more details about the preferred design.
Project Implementation	How will the construction of road segments be phased? Will all roads be constructed at once or will they be constructed in a phased approach?	The implementation of the road improvements will be based on the recommendations of the Transportation Assessment Report (Appendix A) as summarized in Section 8.13 (Construction Phasing / Implementation Strategy).
Municipal Services	Are municipal services (water or sewer) proposed?	No water or wastewater sewer services are proposed as part of this EA. Upon completion of the Class EA Study, the Niagara Region staff in coordination with the staff from Local Area Municipalities, will address the required services during the Detailed Design stage.
Stormwater Management	Will proposed roadway improvements include stormwater management infrastructure?	The proposed stormwater management strategy is summarized in Section 8.11 and detailed in the Stormwater Management Report (Appendix F).
Property Impacts (including Access)	How much of private property will be required?	Preliminary extents of private property requirements are shown on the design plans provided in Appendix Q. These property requirements will be subject to review and refinement during detailed design.
Cost Estimate	Updated information on proposed project costs has not been provided.	The preliminary construction cost estimate is provided in Section 8.12.

Subject	Summary of Key Comments and Questions	Study Team Response
Environmental Assessment Process	An Individual Environmental Assessment should have been completed for this project, not a Municipal Class EA.	Individual environmental assessments are prepared for large-scale projects with the potential for significant environmental effects. They require approval from the MECP. On the other hand, the Municipal Class Environmental Assessments are completed for the municipal infrastructure projects that have predictable and manageable environmental effects. The Municipal Class Environmental Assessment process is an approved process under the Ontario's Environmental Assessment Act. The Minister of the Environment, Conservation and Parks has the authority and discretion to make an Order under Section 16 of the Environmental Assessment Act. Information about this process is provided in Section 11.1.
Consultation Process	The consultation process is inadequate. In a transparent process, adequate information would be shared, questions would be answered, and where necessary followed up on with further information. In addition, Public Information Centres cannot be considered adequate meaningful consultation when most questions are not answered, and pertinent details and data are not made available.	This project is being planned in accordance with the requirements for a Schedule 'C' project under the Municipal Class Environmental Assessment process. Three public information centres have been hosted for the project. Each public information centre involved an online presentation with opportunities for anyone to ask questions. The public information centres included a minimum of two-week period for anyone to provide comments and/or ask questions. Information materials related to each event were made available on the project webpage during the comments / questions period. Given the amount of information presented at the public information centre #3, the Study Team had invited comments from December 1, 2021, to December 23, 2021 (~three weeks). The Study Team provided responses to the comments received as part of the public information centres. Summary reports for all three public information centres are also available on the project webpage. This report is also available for public review during the duration (minimum of 30 days) outlined in the Notice of Study Completion.

5.2.5 Meetings with Impacted Property Owners

As noted in Section 5.1.3.4, a letter was issued to a total of 28 impacted private property owners. The purpose of the letter was to invite the property owners to attend meetings to discuss project's impacts on their properties. The letter was issued prior to the Public Information Centre #3.

Of 28 property owners, a total of six private property owners contacted the Study Team in response to the letter of meeting invitation. In addition, Upper Canada Planning & Engineering Ltd., a planning consultant representing four private property owners along Merritt Road and Rice Road, contacted the Study Team for meetings. Based on the responses received, virtual meetings were held on November 22, November 26, and December 8, 2021. The purpose of these meetings was to:

- Share the preliminary preferred design of the proposed road improvements on Merritt Road and Rice Road, and
- Discuss impacts of the proposed road improvements on the private properties.

Items of discussion at the meetings are listed in the table below. Minutes of the meetings are provided in Appendix K. For privacy purposes, the names of property owners were redacted from the meeting minutes.

Table 5-8: Summary of Meetings with Private Property Owners

Meeting Information	Items of Discussion
November 22, 2021 Meeting with Property Owner for 520 Rice Road and 528 Rice Road	The following key points were discussed at this meeting: – Preliminary preferred design; – Traffic concerns along Rice Road; – Construction Schedule; – Appreciation for proposed active transportation facilities; – Impacts on private properties.
November 22, 2021 1131 Rice Road and 1155 Rice Road	The following key points were discussed at this meeting: – Preliminary preferred design; – Amount of private property taking required and compensation for private property taking; – Construction timeline.
November 26, 2021 1165 Rice Road and 1180 Rice Road	The following key points were discussed at this meeting: – Preliminary preferred design; – Concern about the proposed road cross-section along Segment 1 due the impacts of proposed ditches on private property; – Impact to property access; – Concern about the amount of private property taking due to proposed road improvements.

Meeting Information	Items of Discussion
December 8, 2021 Upper Canada Planning & Engineering Ltd., representing Hert Inc., Primont Homes and Mountainview Homes	The following key points were discussed at this meeting: – Preliminary preferred design; – Future development and anticipated traffic; – Stormwater management; – Access for future development on Regional Roads; – Concern about the widening of Rice Road and associated private property takings; – Compensation for private property taking.

5.3 Agency Consultation

An Agency/Stakeholder Committee was developed at the commencement of the Class EA Study. This committee was comprised of staff from various departments from the Niagara Region, Town of Pelham, City of Thorold, City of Welland, NPCA, MTO and utility companies. The Agency/Stakeholder Committee was consulted throughout the Class EA Study, prior to key decision-making milestones to solicit technical feedback. Meetings were held with the Agency/Stakeholder Committee as a group, as well as individually, as required. In addition, agencies and stakeholders were consulted via correspondence.

A summary of Agency/Stakeholder Committee Meetings is provided below. Minutes of the meetings are provided in Appendix L.

5.3.1 Agency/Stakeholder Committee Meeting #1

The Agency/Stakeholder Committee Meeting #1 was held on January 13, 2021. Attendees at this meeting included staff from Niagara Region (Transportation Planning, Transportation Engineering, Water/Wastewater, Planning and Development Services, Transit, Public Health), Town of Pelham (Engineering, Community Planning), City of Thorold (Engineering), City of Welland (Planning, Engineering), Niagara Region Conservation Authority and MTO.

The purpose of this meeting was to introduce the Class EA Study to the Agency/Stakeholder Committee Members and receive preliminary feedback for consideration into the Study. Staff from Niagara Region noted that they determined that a Health Impact Assessment was required as part of this Study. This assessment would utilize information collected as part of the Class EA Study, and will complement the Class EA process, and will focus on mitigating the potential negative health impacts and maximizing potential positive health impacts.

Key topics of discussion during this meeting included ownership of road segments, planned servicing, other projects in the area, Highway 406 ramp, natural environment, and consultation program for the Class EA Study.

5.3.2 Agency/Stakeholder Committee Meeting #2

The Agency/Stakeholder Committee Meeting #1 was held on April 28, 2021. Attendees at this meeting included staff from Niagara Region (Transportation Planning, Corporate Services (Real Estate)), Town of Pelham (Engineering), City of Thorold (Engineering), City of Welland (Planning), Niagara Regional Broadband Network and Hydro One.

The purpose of the meeting was to discuss existing and future planned utilities within the study area. The following utilities were identified along Merritt Road and Rice Road: Bell Canada (within Segments 2 and 4), Hydro One (within Segments 1-4), Enbridge Gas (within Segments 2-4), Niagara Regional Broadband Network (South of Rice Road and Quaker Road), and Sanitary Sewer and Watermain. All agencies/stakeholders were encouraged to share any further information relating to utilities within the study area.

5.3.3 Agency/Stakeholder Committee Meeting #3

The Agency/Stakeholder Committee Meeting #1 was held on May 20, 2021. Attendees at this meeting included staff from Niagara Region (Transportation Planning, Transportation Engineering, Water/Wastewater, Planning and Development Services, Transit, Public Health), Town of Pelham (Engineering, Community Planning, Pelham Active Transportation Committee), City of Welland (Planning), NPCA and Ministry of Transportation.

The purpose of the meeting was to provide an update on the Class EA Study, present the findings of the evaluation of alternative solutions, and, and request feedback on the evaluation of alternative solutions and the preferred solution in advance of the PIC #2. Study Team presented an overview of the Class EA Study, feedback received from the PIC #1, results of traffic analysis, evaluation of alternative solutions, and planned and completed investigations. An overview of the preferred solution was provided, which would include the following:

- Extension of Merritt Road between Rice Road and Cataract Road;
- Improvements to Merritt Road between Cataract Road and Highway 406;
- Improvements to Rice Road between 200 meter north of Merritt Road and Quaker Road; and
- Providing active transportation facilities on both Merritt Road and Rice Road.

Staff from the Niagara Region Public Health provided an update on the Health Impact Assessment that was being completed for this project. It was noted that recommendations from the Health Impact Assessment were being finalized, and these recommendations can be incorporated into the Class EA study.

Key topics of discussion during this meeting included impacts of intersection improvements on traffic patterns, bike lanes (on-road vs off-road), and mitigation measures to avoid/minimize impacts on the natural environment.

5.3.4 Agency/Stakeholder Committee Meeting #4

The Agency/Stakeholder Committee Meeting #4 was held on July 21, 2021. Attendees at this meeting included staff from Niagara Region (Transportation Planning, Transportation Engineering, Planning and Development Services, Corporate Services (Real Estate), Public

Health), Town of Pelham (Engineering, Community Planning, Pelham Active Transportation Committee), City of Thorold (Engineering), City of Welland (Planning), and Ministry of Transportation.

The purpose of the meeting was to discuss active transportation options for this project, specifically Off-Road / In-Boulevard Cycle Tracks. There was a general consensus regarding the use of off-road bicycle tracks in the project.

5.3.5 Agency/Stakeholder Committee Meeting #5

The Agency/Stakeholder Committee Meeting #5 was held on August 19, 2021. Attendees at this meeting included staff from Niagara Region (Transportation Planning, Transportation Engineering), Town of Pelham (Engineering, Community Planning), and City of Thorold (Engineering).

The purpose of the meeting was to review preliminary road cross-section alternatives and to obtain input from the local area municipalities (Town of Pelham, City of Thorold, and City of Welland) on active transportation infrastructure. Study Team received the following feedback during this meeting for consideration into the road cross-section alternatives: consider providing cycling infrastructure across Highway 406 interchange (east of Grisdale Road), consider providing ditch between cycle track and travelling lanes to accommodate snow removal from snow plowing, and consider providing streetlights on the west side of Rice Road. Study Team thanked everyone for their participation and noted that the updated cross-sections would be circulated to the attendees.

5.3.6 Agency/Stakeholder Committee Meeting #6

The Agency/Stakeholder Committee Meeting #6 was held on November 19, 2021. Attendees at this meeting included staff from Niagara Region (Transportation Planning, Transportation Engineering, Water/Wastewater, Corporate Services (Real Estate), Urban Design, Environmental Planning, Public Health) Town of Pelham (Engineering), City of Thorold (Engineering), City of Welland (Engineering, Planning), MTO, Hydro One, and Cogeco.

The purpose of the meeting was to share the preliminary preferred design and obtain input from staff from Niagara Region and local area municipalities (Town of Pelham, City of Thorold and City of Welland), the MTO and utility companies. Meeting attendees asked various questions related to design elements. Study Team provided responses during the meeting.

Study Team noted that a separate meeting will be hosted with the MTO regarding the design over the Highway 406. MTO staff noted that the proposed design/works within the MTO ROW would have to be provided to MTO for review and endorsement by the senior staff.

5.3.7 Agency Correspondence

Correspondence with agencies (emails and individual meetings) is summarized in the table below. A record of consultation (correspondence and meeting minutes) is provided in Appendix L.

Table 5-9: Summary of Agency Correspondence (Emails and Individual Meetings)

Agency	Date	Communication Method	Summary of Communication
Transport Canada	February 3, 2021	Email	Transport Canada provided the generic response to the NOC. Transport Canada requested the proponent to self-assess if the project will impact any federal property or waterways.
Ministry of the Environment, Conservation and Parks	January 4, 2021	Email	In response to the Notice of Study Commencement, the Ministry identified the following Indigenous Communities for consultation for this project. – Six Nations of the Grand River – Haudenosaunee Confederacy Chiefs Council – Mississaugas of the Credit First Nation The Ministry staff advised that a formal acknowledgment letter will follow.
	January 5, 2021	Letter via Email	The Ministry provided formal acknowledgement letter for this Class EA Study, identifying Ministry’s areas of interest (such as Species at Risk) and delegating procedural aspects of rights-based consultation to the Niagara Region through this letter.
	October 29, 2021	Email	WSP contacted the Ministry to request a meeting.
	November 16, 2021	Meeting	This meeting was attended by the Ministry’s Environmental Assessment Coordinator and Species at Risk staff. The purpose of the meeting was to share the preliminary findings of the natural environment fieldwork with the Ministry and receive input on the next steps related to impacts on the species at risk and their habitat. The Study Team provided an overview of the preliminary preferred design and findings of the natural environment fieldwork, including the following Species at Risk: Barn Swallow (Threatened); Round-leaved Greenbrier (Threatened); White wood Aster (Threatened); and Eastern Flowering Dogwood (Endangered). The Ministry staff did not provide any specific comments, as more information (i.e., detailed design) is required to specify impacts. An Information Gathering Form (IGF) will be required by the Ministry to provide further direction. It was noted that the IGFs are typically submitted at detailed design phase (to better understand impacts). The Ministry staff recommended that the Indigenous Communities are appropriately engaged as part of the Class EA process. WSP shared that as part of this Class EA, project notices and project summary were shared with the Indigenous Communities. In addition, draft Stage 1 Archaeological Assessment and draft Cultural Heritage Assessment Report were shared with the Indigenous Communities for their review and comment. Where requested, the Indigenous Communities were invited to participate in the natural environment field investigations.
	November 9, 2022	Documents via Email	Study Team submitted the Information Gathering Form to the Ministry to obtain advice on the next steps related to species at risk permitting process for consideration into detailed design.
	November 14, 2022	Email	The Ministry advised to submit the Information Gathering Form to Ministry’s general SAR email address. Study Team sent the form to Ministry’s general SAR email address.
	October 24, 2023	Letter via Email	The Ministry provided comments on draft Environmental Study Report. Responses to Ministry’s comments are provided in Table 5-13 and Appendix L.
Ministry of Citizenship and Multiculturalism	February 5, 2021	Letter via Email	Ministry of Citizenship and Multiculturalism (Previously Ministry of Heritage, Sport, Tourism and Culture Industries) provided formal acknowledgement letter for this Class EA Study, noting that under the EA process, the proponent is required to determine a project’s potential impact on cultural heritage resources. The letter further noted that the archaeological resources, built heritage resources and cultural heritage landscapes should be identified through technical cultural heritage studies and their recommendations are to be addressed and incorporated into EA projects. The Ministry advised that the cultural heritage studies should be provided the Ministry before issuing a Notice of Completion or commencing any work on the site.
	February 10, 2021	Email	Study Team contacted the Ministry to request information on protected and potential cultural heritage resources within, and adjacent to, the Study Area.

Agency	Date	Communication Method	Summary of Communication
	February 12, 2021	Email	Ministry provided response to Study Team' information request.
	July 15, 2021	Via Ministry's Portal	The Study Team submitted Stage 1 Archaeological Assessment Report to the Ministry.
	October 22, 2021	Letter via Email	The Study Team submitted a request to the Ministry to conduct an expedited review of the Stage 1 Archaeological Assessment Report.
	December 16, 2021	Letter via Email	The Ministry provided comments to make some edits to the report based on assessments reports that are within the Study Area, that were not available at the time of submission of the Stage 1 Archaeological Assessment Report or were revised reports now accepted into the Ministry registry.
	February 4, 2022	Via Ministry's Portal	The Study Team submitted the updated Stage 1 Archaeological Assessment Report to the Ministry.
	February 23, 2022	Letter via Email	The Ministry shared a letter noting that the Ministry reviewed the Stage 1 Archaeological Assessment Report and the Ministry was satisfied that the fieldwork and reporting for the archaeological assessment was consistent with the ministry's 2011 Standards and Guidelines for Consultant Archaeologists and the terms and conditions for archaeological licences. The Ministry also noted that the report was entered into the Ontario Public Register of Archaeological Reports.
	June 8, 2022	Document via Email	Study Team shared the Cultural Heritage Assessment Report with Ministry for review.
	July 8, 2022	Email	Ministry staff responded that they did not have substantial comments on the Cultural Heritage Assessment Report.
	October 26, 2023	Email	The Ministry provided comments on draft Environmental Study Report. Responses to Ministry's comments are provided in Table 5-13 and Appendix L.
Ministry of Transportation	January 6, 2022	Email	Niagara Region staff contacted MTO for availability for a meeting to discuss different design options for carrying two eastbound lanes over Highway 406 to Toronto bound on-ramp. A meeting was scheduled for January 17, 2022.
	January 17, 2022	Meeting	Study Team held a meeting on January 17, 2022 with MTO staff to discuss future needs and potential improvements at Grisdale Road and Highway 406 interchange. Study Team presented existing conditions, need for improvements and design Options 1, 2 and 3 (described below). Option-1: Under this option, the Grisdale Road/Merritt Road intersection would be modified as Right-In/Right-Out only, by providing a pork-chop island to restrict westbound left (WBL) and northbound left (NBL) movements. It was noted that this type of treatment is not preferred as drivers may not to comply with turn restrictions and potentially create greater safety concern. Additionally, the existing exclusive eastbound left (EBL) turn lane carrying in-bound traffic to Highway 406 E/W-S On-Ramp would be converted to a shared eastbound through-left (EBTL) to utilize existing capacity and avoid widening on the south side of Merritt Road. Option-2: Similar to Option-1, the Grisdale Road/Merritt Road intersection would be modified to Right-In/Right-Out only, by providing a raised concrete median along Merritt Road extending up to Highway 406 westerly Off-Ramp. This configuration would ensure that westbound left (WBL) and northbound left (NBL) movements are not permitted to/from Grisdale Road. Under existing conditions, the Highway 406 N-E/W Off-Ramp has an exclusive channelized southbound right (SBR) turn lane which serves as a free-flow deceleration lane and a single shared southbound right/left lane at the terminal. In addition to limiting Grisdale Road/Merritt Road intersection as Right-In/Right-Out only, a minor modification to the Highway 406 N-E/W Off-Ramp was also included in this option, which is the signalization of the ramp terminal and removal of channelized southbound right (SBR) turn lane while extending the lane to the intersection adjacent to southbound left (SBL) turn lane. It was anticipated that this modification would reduce speed of vehicles exiting the highway onto Merritt Road and potentially increase overall safety of the roadway. Similar to Option-1, the existing exclusive eastbound left (EBL) turn lane carrying in-bound traffic to Highway 406 E/W-S On-Ramp would be converted to a shared eastbound through-left (EBTL). Option-3: In this option, a westbound left (WBL) turn would be permitted at Grisdale Road/Merritt Road intersection along with eastbound right (EBR) and northbound right (NBR) turning movements, in other words a RIRO plus westbound left (WBL). Since northbound left (NBL) would not be permitted under this option, the median island and right-turn channel would be designed to ensure that northbound left (NBL) is completely restricted. However, this option facilitates safer turn onto Grisdale

Agency	Date	Communication Method	Summary of Communication
			Road from Merritt Road with a provision of a dedicated WBL turn lane. Similar modification to Highway 406 N-E/W Off-Ramp as in Option-2 is proposed. However, two dedicated southbound right (SBR) turn lane and an exclusive southbound left (SBL) turn lane is proposed along with signalization of ramp terminal. During the meeting, MTO staff suggested that the Study Team develop an option providing an additional eastbound through eastbound traffic lane while maintaining existing eastbound left turn lane at Highway 406 N-E/W Off-Ramp and E/W-S On-Ramp intersection at Merritt Road. Study Team developed this new option referred to as Option-4. The MTO staff also inquired about provision of active transportation connectivity across the bridge to the east side of Highway 406.
	January 26, 2022	Emails	MTO staff advised Study Team to evaluate an option of roundabout for the Highway 406 southbound off-ramp. MTO staff noted that as some of the design options presented by Study Team propose new traffic signal at the off-ramp terminal, it is the Ministry requirement to also review a roundabout option before proposing any new traffic signal. Niagara Region provided a response to MTO that the Study Team will evaluate the roundabout option as well. Niagara Region staff added that it is likely that a two-lane roundabout would be required due to the relatively high traffic volumes approaching on the southbound off-ramp during the PM peak period and high eastbound traffic volumes on Merritt Rd during the AM peak period under future conditions. Having a two-lane roundabout will occupy a large footprint and impact trees and will bring the off-ramp terminal closure to Grisdale Rd intersection. Study Team developed an option for a 2-lane roundabout, referred as Option-5.
	February 28, 2022	Email	Study Team shared a memo with MTO which discussed design options 1 through 5 for Grisdale Road and Highway 406 interchange (summarized above).
	March 3, 2022	Email	MTO staff provided a response that they would review the memo and provide comments. MTO staff suggested arranging a meeting to discuss the design option. A meeting was scheduled for March 22, 2022.
	March 22, 2022	Meeting	Study Team held a meeting MTO staff on March 22, 2022 to discuss and receive feedback for design options 1 - 5 presented in the memo. During meeting, MTO staff requested Study Team to determine feasibility of providing active transportation on the north side of the Highway 406 interchange, having pedestrian crossing at the proposed signalized Highway 406 N-E/W Off-Ramp and E/W-S On-Ramp intersection at Merritt Road while removing channelized WBR turn and provide a short WBR turn lane at the intersection. Study Team subsequently developed this option, referred as Option-6.
	April 13, 2022 – April 27, 2022	Email	Study Team shared updated design options memo with MTO staff for review. This updated memo included new options 5 and 6 as summarized above. Several email exchanges occurred between the Study Team and MTO staff during this period related to the review of this memo. MTO staff suggested hosting a meeting to review all the MTO comments on the design options. A meeting was scheduled for May 10, 2022.
	May 10, 2022	Meeting	The purpose of this meeting was to obtain comments from the MTO staff regarding the design options for Merritt Rd over Highway 406 Interchange. MTO staff suggested reviewing MTO's cycling manual to understand the height requirements for the parapet wall and barrier separation. MTO staff also suggested that the Study Team to revisit Signal Warrant from the OTM Book 12 to check conflicting volumes and provide the signal warrant.
	June 15, 2022	Email	Study Team shared the following information with MTO staff: – Signal Warrant (Merritt Road / Highway 406 westerly ramps intersection) – Future Total Volume Year 2041 – Design Option 6 (Preferred) – Cross section of exiting conditions and proposed improvements under Design Option 6 Several email exchanges occurred during this period between the Study Team and MTO staff related to review of these materials. MTO staff shared comments on the updated design memo on August 17, 2022. Study Team provided responses to MTO's comments on 7 September 2022, and shared updated memo with MTO staff on November 16, 2022, requesting feedback by November 30 as ESR was being finalized.

Agency	Date	Communication Method	Summary of Communication
			MTO staff provided a response that following MTO team review of the updated memo, there will be a need to arrange MTO executive review meeting to present the proposed recommendations to MTO Senior Management for their review and final approval. The MTO senior management approval will be required before the proposed changes at the interchange and the MTO right of way are included in the EA document.
	June 15, 2022 – March 14, 2023	Emails	Between June 15, 2023, and February 10, 2023, several rounds of comments were provided by MTO staff on the design options memo, including on the preferred design (Option 6) for Merritt Road, east of Grisdale Road and over Highway 406 Overpass. The design option was eventually accepted by MTO staff and a MTO Executive Review Meeting was scheduled for March 21, 2023. Study Team shared meeting presentation with MTO staff on March 14, 2023.
	March 21, 2023 – May 26, 2023	MTO Executive Review Meeting	An Executive Review Meeting was held with MTO's senior management on March 21, 2023, to present the preferred Option 6 and receive MTO's approval. Option 6 was accepted in principle by MTO senior management during the meeting with provision of minor comments. The Project Team subsequently updated the Option 6 to address MTO Senior Management's comments. On May 23, 2023, the MTO staff confirmed that they have no more comments on Option 6, and the Project Team could proceed with including the preferred Option 6 in the environmental assessment reporting. On May 26, 2023, Study Team shared final memo with MTO staff for their records.
	July 10, 2023 – August 16, 2023	Document via Email and Subsequent Emails	Study Team shared draft Stormwater Management and Hydraulic Assessment Report with MTO staff for their review. MTO staff reviewed the report and provided comments. The Project Team subsequently addressed MTO's comments and shared the updated report.
	October 27, 2023	Email	The Ministry provided comments on draft Environmental Study Report.
	November 2, 2023	Email	Study Team provided responses to Ministry's comments. Responses to Ministry's comments are provided in Table 5-13 and Appendix L.
Niagara Peninsula Conservation Authority	February 11, 2021	Meeting	The purpose of this meeting was to discuss the natural environment/ecological assessment scope of work for the Environmental Impact Study, and associated Terms of Reference.
	February 16, 2021	Document via Email	Study Team shared the Terms of Reference, which outlined the details of the natural environment/ecological assessment scope of work for the Environmental Impact Study. This document included details of secondary information sources and policy documents that were to be reviewed and proposed ecological field investigations.
	March 2 and March 8, 2021	Emails	Study Team followed up to inquire if there were any comments on the Terms of Reference for the Environmental Impact Study.
	March 11, 2021	Email	NPCA staff shared comments on the Terms of Reference for the Environmental Impact Study.
	March 26, 2021	Email	Study Team provided responses to NPCA's comments on the Terms of Reference for the Environmental Impact Study.
	April 8 and April 26, 2021	Emails	Study Team followed up to inquire if there were any further comments and shared the updated Terms of Reference for the Environmental Impact Study.
	May 13, 2021	Email	NPCA staff provided further comments on the Terms of Reference for the Environmental Impact Study.
	July 14, 2021	Email	Study Team requested data in support of aquatic assessment
	August 4, 2021	Email	NPCA shared some of the requested data. NPCA staff also shared Port Robinson West Subwatershed Study (2014) on August 23, 2021.
	November 19, 2021	Meeting	The purpose of the meeting was to share the preliminary findings of the natural environment fieldwork with the NPCA and receive input on the next steps related to impacts on wetlands and watercourses.
	November 30, 2021	Email	NPCA staff noted that there were no comments on the minutes of the meeting of November 19, 2021 and inquired about the status of the EIS to determine whether the preferred alternative would be supported by NPCA Regulation and Policies. They noted concerns with potential impacts to the wetland, watercourse and floodplain, and suggested a meeting to discuss to ensure that NPCA policies will be addressed. A meeting was scheduled for December 8, 2021.
	December 8, 2021	Meeting	The purpose of this meeting was to share the preliminary preferred design with NPCA and discuss NPCA's feedback.

Agency	Date	Communication Method	Summary of Communication
	December 23, 2022	Letter via Email	NPCA shared comments regarding additional monitoring and assessment related to the watercourses, wetlands and floodplain. NPCA's letter identified the need for completing the following additional technical studies as part of the Class EA process: - Hydrological monitoring plan to characterize the surface overland flow within Segment 1; - Monitoring report with recommendations for maintaining the hydrological and ecohydrological functions of the watercourses and wetlands during and post-construction of the proposed development; - Ecohydrological impact assessment that incorporates the findings of the hydrological monitoring with the ecological characterization of the watercourses and PSW (e.g., field surveys).
	January 13, 2022	Email	Study Team provided a response requesting a meeting to discuss NPCA's comments, and the potential for completing the additional assessments during detailed design phase of the project. Study Team also shared questions related to the requirements of the technical investigations. A meeting was set up for January 28, 2022.
	January 28, 2022	Meeting	The purpose of this meeting was to discuss NPCA's comments related to wetland and flooding impacts. The Study Team acknowledged receipt of comments letter (dated December 23, 2021) from NPCA. It was discussed that the required technical studies would be completed as part of the Class EA Study. Requirements of the technical studies were also discussed.
	February 18, 2022	Email	Study Team shared details of additional technical studies to address NPCA's comments related to wetland impacts and flooding impacts. Technical studies included: Hydraulic Floodplain Analyses; Wetland Hydrologic Characterization; and Preliminary Hydrogeological Investigation. Study Team also noted that following NPCA's confirmation, various tasks will be executed and reports will be shared with the NPCA as they become available.
	March 2, 2022	Email	NPCA provided a response noting that they were satisfied with the proposed technical studies.
	May 25, 2022	Email	Study Team provided update on the Class EA Study; shared proposed locations for surface water monitoring for review and feedback and requested DEM/DTM data.
	June 1, 2022	Email	Study Team followed up regarding proposed surface water monitoring locations and DEM/DTM data.
	June 3, 2022	Email	NPCA sought clarification whether the proposed monitoring locations were for informing the flood plain modelling or wetland hydrology characterization. With respect to the DEM data, NPCA shared their staff's contact information responsible for sharing the DEM data. This data was shared with the Study Team on June 8, 2022.
	June 3, 2022	Email	Study Team provided a response that the surface water monitoring program was being proposed to develop hydrologic modelling and to inform the wetland hydrologic characterization.
	June 8, 2022	Email	Study Team followed up regarding NPCA's review of the proposed surface water monitoring locations. Study Team also provided update that the monitoring wells were being planned to be installed in the unopened road allowance on June 27 as part of the groundwater monitoring program.
	June 13, 2022	Email	NPCA staff provided a response, suggesting that a fourth monitor be installed in the culvert at Cataract Road to capture flows in this area in addition to the two proposed at Rice Road and one proposed at Merrittville Highway. NPCA staff also noted that there was no objection to the proposal to produce a scoped hydraulic model for the watercourses in Segment 1 and 2.
	June 13, 2022	Email	Study Team provided a response that the channel downstream and upstream of the road crossing at Cataract Road is heavily vegetated and is not conducive to flow gauges. The flow gauges have to be in open watercourses. Study Team added that there is also the issue of the backwater in the channel from downstream which impacts depth readings and can make it difficult to determine flows. Due to these reasons, the stream crossing location at Cataract Road was not selected for surface water monitoring.
	July 28, 2022	Email	Study Team shared Hydraulic Analysis – Draft Existing Conditions memo (dated July 28, 2022) for the NPCA review.
	August 19, 2022	Email	NPCA staff provided comments on the Hydraulic Analysis – Draft Existing Conditions memo (dated July 28, 2022). They noted that there was no objection with the assessment and its methodology, and once the topographic survey for the Cataract Road and Merrittville Highway culverts and road profiles is completed, it should be incorporated into the hydraulic analysis and the 'Final Existing Conditions' brief be circulated to the NPCA for review. NPCA staff also noted that they would prefer to remove

Agency	Date	Communication Method	Summary of Communication
			any storage attenuation of the adjacent wetlands, and as a conservative approach, assume that the wetlands are saturated prior to the 100-year event and do not have the ability to provide significant flood storage.
	September 22, 2022	Email	Study Team shared the Preliminary Hydrogeological Assessment for Merritt Road – Segment 1 (Unopened Road Allowance) for NPCA staff's review. Study Team also noted that attempts were made to complete Bathymetric surveys in summer 2022 along the unopened road allowance, however, the vegetation cover limited the opportunities to collect elevation data at that time. Study Team proposed to move forward with the hydrologic modelling using the estimations from the DEM, and identified the options to move forward with, and sought NPCA staff's feedback. Identified options included collecting bathymetric survey data now, or deferring it to detailed design phase.
	September 30, October 6 and October 17, 2022	Email	Study Team followed up on the inquiry related to the bathymetric survey.
	October 24, 2022	Email	NPCA staff noted that they reviewed the Preliminary Hydrogeological Investigation and had no objection with the methodology and the preliminary conclusion of the report. With respect to the questions, NPCA staff noted that they would prefer to remove any storage attenuation of the adjacent wetlands and as a conservative approach, assume that the wetlands are saturated prior to the 100-year event and do not have the ability to provide significant flood storage. NPCA staff also noted that they would object to including the wetland's storage capacity in the analysis.
	November 2, 2022	Email	Study Team confirmed that NPCA's comments will be applied for removal of wetland storages as part of the hydraulic analysis (floodplain). Study Team proposed to move forward with the hydrologic modelling using the estimations from the DEM. Study Team also proposed to defer detailed Bathymetric survey and associated refinements to modelling / mitigation as a requirement for the detailed design phase.
	April 28, 2023	Document via Email	Study Team shared draft EIS with NPCA for their review and comments.
	May 23, 2023	Email	NPCA provided comments on the draft EIS.
	June 6, 2023	Email	Study Team provided responses to NPCA comments, noting that additional work that was requested in NPCA's comments, will be completed during detailed design phase.
	June 15, 2023	Email	NPCA confirmed concurrence with Study Team's responses.
	June 19, 2023	Document via Email	Study Team shared final EIS with NPCA for their records.
	July 10, 2023 – August 15, 2023	Document via Email and Email Exchanges	Study Team shared draft Stormwater Management and Hydraulic Assessment Report with NPCA for their review. NPCA staff reviewed the report and provided comments that they support the recommended mitigation measures and requirements presented in the report, and look forward to reviewing further information during detailed design phase.
	January 17, 2024	Document via Email	NPCA provided comments on the draft Environmental Study Report, Environmental Impact Study, and Stormwater Management Report.
	February 14, 2024	Document via Email	Study Team provided responses to NPCA's comments on draft Environmental Study Report, Environmental Impact Study, and Stormwater Management Report. Responses to NPCA comments are provided in Table 5-13 and Appendix L.

5.4 Utility Consultation

Study Team completed a locates request through Ontario One Call to identify any existing or planned utilities along the subject road segments. In addition, a dedicated meeting held with utility companies. A summary of correspondence with utility companies is provided below. Proof of correspondence with the utilities companies is provided in Appendix M.

Table 5-10: Responses received from Utility Companies

Date	Communication Method	Summary of Communication
Bell Canada		
January 29, 2021	Email	In response to Ontario OneCall request, Bell Canada provided drawings showing location of their infrastructure within the Study Area.
Cogeco		
May 3, 2022	Email	Cogeco contact Study Team to inform that they have cable along Merritt Road, from Niagara Street to Highway 406.
May 4, 2022	Email	Study Team requested more information about Cogeco infrastructure.
May 6, 2022	Email	Cogeco provided a response that they have fibre on the north side poles that starts from Niagara Street heading east to Highway 406. Cogeco also provided the drawing showing the location of their infrastructure.
Enbridge		
April 27, 2021	Email	Enbridge shared drawings showing their gas pipeline in the Study Area.
October 2, 2023	Email	As part of the review of the draft Environmental Study Report, Enbridge Gas shared drawings showing general locations of Gas Main along Segments 2, 3 and 4, and noted that at this point, Enbridge will not be able to identify any conflicts until the project design has advanced to detailed design. Enbridge advised that the Project Team share 60% design when it becomes available. Enbridge clarified that their the drawings indicate general vicinity of Gas Main and do not specify depths. The best way to accurately locate the Gas Main in the field, to ensure it is clear of the proposed works, is to site-verify through daylighting test digs via hydro-vac. Enbridge encourage all parties to perform these exploratory test digs during design phase so any major conflicts with Gas Main can be identified and dealt with early on. Discovering Gas conflicts during the later stages of design process or construction phase, could negatively impact project timelines.

Niagara Region
Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37)
and Rice Road (Regional Road 54)

Date	Communication Method	Summary of Communication
		The Study Team has documented these comments for the Project Team to contact Enbridge during detailed design phase.
Hydro One		
January 5, 2021	Email	In response to Ontario OneCall request, G-tel Engineering Inc. shared the drawings for Hydro One infrastructure within the Study Area.
April 28, 2021	Email	Hydro One provided a form to the Study Team to complete and submit to Hydro One with detailed design drawings in order to receive Hydro One's technical review/comments. Hydro One staff also noted that their preliminary review showed a Hydro One transmission corridor possibly being affected in the vicinity of Merritt Road and Cataract Road.
October 16, 2023	Email	As part of the review of the draft Environmental Study Report, Hydro One commented that the Secondary Land Use group is aware of this project and requested to continue communication with Hydro One Real Estate Coordinator. Niagara Region will continue to consult with Hydro One during detailed design.
Niagara Regional Broadband Network		
April 29, 2021	Email	Niagara Regional Broadband Network shared drawings for their infrastructure on the intersection of Rice Road and Quaker Road.
Pelham Water		
January 7, 2021	Email	In response to Ontario OneCall request, PVS Locators shared drawings for Pelham Water infrastructure along Merritt Road and Rice Road.
TC Energy		
October 31, 2021	Email	TC Energy advised to obtain underground utility locations through Ontario One-Call to identify if works are proposed within 30 metres of TC Energy's pipeline facility. In that case, a meeting would be required with them to discuss the project. Otherwise, TC Energy can be removed from the contact list.
City of Welland		
October 30, 2023	Email	As part of review of the draft Environmental Study Report, the City of Welland noted that City has local water main located along Rice Road.

5.5 Indigenous Consultation

Engagement with Indigenous Communities is a key component of the Class EA process. The MECP delegated the procedural aspects of the duty to consult to Niagara Region in its response to the Notice of Commencement on October 15, 2020. In consultation with the MECP, Niagara Region sought direction on the identification of Indigenous Communities that may have an interest in the Study. MECP confirmed that engagement should proceed with the Mississaugas of the Credit First Nation (MCFN), Six Nations of the Grand River (SNGR) and Haudenosaunee Confederacy Chiefs Council, as represented by the Haudenosaunee Development Institute (HDI).

Following understood consultation protocols with these Indigenous Communities, Study Team contacted the Indigenous Communities about this Class EA Study. A summary of outreach to the Indigenous Communities is provided in Table 5-11. Proof of correspondence with the Indigenous Communities is provided in Appendix N.

Table 5-11: Summary of Correspondence with the Indigenous Communities

Date	Communication Method	Communication Summary
Mississaugas of the Credit First Nation (MCFN)		
January 14, 2021	Email	Niagara Region shared the project summary and Notice of Study Commencement.
February 1, 2021	Email	The Study Team shared details of the upcoming Stage 1 Archaeological Assessment.
February 2, 2021	Email	MCFN identified interest in participating in the Stage 1 Archaeological Assessment and asked if Niagara Region can review and execute the attached agreement.
February 3, 2021	Email	Niagara Region responded noting that once the Stage 1 Archaeological Assessment has been completed, the agreement would be reviewed and signed.
February 3, 2021	Email	MCFN sent response letter to the Notice of Commencement.
February 5, 2021	Email	MCFN provided Niagara Region with an agreement for review of technical reports.
February 11, 2021	Email	Niagara Region provided a formal letter, explaining details of the Project, including timelines and technical studies that will be completed. This letter was in response to MCFN response letter.
March 5, 2021	Email	Niagara Region shared the Notice of Public Information Centre #1.
April 15, 2021	Email	The Study Team reached out to MCFN to identify that a draft Environmental Study Report will be shared in late 2021 or early 2022. The Study Team also noted that a draft Stage 1 Archaeological Assessment will also be shared when it is ready.
April 22, 2021	Email	The Study Team provided a link to the draft Stage 1 Archaeological Assessment and draft Cultural Heritage Existing Conditions Report.
May 13, 2021	Email	The Study Team followed up with MCFN to see if they had any comments for the draft Stage 1 Archaeological Assessment and draft Cultural Heritage Existing Conditions Report.
May 26, 2021	Email	Niagara Region shared the Notice of Public Information Centre #2.
May 31, 2021	Email	Niagara Region provided MCFN a draft participation agreement for upcoming Natural Environment fieldwork.
May 31, 2021	Email	MCFN responded to Niagara Region to proceed with execution of the participation agreement.
June 23, 2021 – July 29, 2021	Email	Several email exchanges occurred to coordinate field participation for the Terrestrial Habitat Assessment Fieldwork.
July 13, 2021 – July 20, 2021	Email	Several email exchanges occurred to coordinate field participation for the Aquatic Habitat Assessment.
September 13, 2021 – September 14, 2021	Email	Several email exchanges occurred to coordinate the Natural Environment Field Investigations.
November 16, 2021	Email	Niagara Region shared the Notice of Public Information Centre #3.
April 27, 2022 – May 19, 2022	Email	Several email exchanges occurred coordinating field participation for the targeted Species at Risk Surveys.
May 26, 2022 – June 23, 2022	Email	Several email exchanges occurred to coordinate the Stage 2 Archaeological Assessment.
May 13, 2022	Email	The Field Liaison Representative Participation Agreement and the Archaeological Review Agreement was signed on May 13, 2022.
September 22, 2022 – October 4, 2022	Email	Several email exchanges occurred to coordinate the field participation for the Stage 2 Archaeological Assessment.
December 8, 2022	Email	Study Team shared Draft Stage 2 Archaeological Assessment Report for Segment 1 for review and comment.
December 15, 2022	Email	Study Team sent a reminder email regarding the review of the Draft Stage 2 Archaeological Assessment Report for Segment 1.

Niagara Region
Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)

Date	Communication Method	Communication Summary
December 16, 2022	Email	MCFN responded that they review the Draft Stage 2 Archaeological Assessment Report for Segment 1 and there are no questions or comments about the archaeological work conducted or the content of the report.
October 3, 2023	Email	Study Team shared draft Environmental Study Report for review and requested comments by October 31, 2023.
November 3, 2023	Email	The Study Team sent a follow-up email regarding the review request for the draft Environmental Study Report. The Study Team also provided an extension until November 7, 2023 to submit comments. No comments were received from MCFN on the draft Environmental Study Report.
Six Nations of the Grand River (SNGR)		
January 14, 2021	Email	Niagara Region shared the project summary and Notice of Study Commencement.
January 15, 2021	Email	SNGR informed the Niagara Region of their receipt of the Notice of Study Commencement and noted interest in any Archeological Assessment that may occur.
January 15, 2021	Email	Niagara Region acknowledged that they will be reaching out in regard to the Archeological Assessment.
January 26, 2021	Email	The Study Team advised of the Stage 1 Archeological Assessment undertaking and asked if SNGR was interested in reviewing it.
January 26, 2021	Email	SNGR responded to the Study Team that they are interested in reviewing the Stage 1 Archeological Assessment and will forward any comments.
January 26, 2021	Email	The Study Team followed up with SNGR that they will share the Stage 1 report once completed, which is estimated to be completed by Spring 2021.
February 1, 2021	Email	The Study Team shared details of the upcoming Stage 1 Archaeological Assessment.
March 5, 2021	Email	Niagara Region shared the Notice of Public Information Centre #1.
April 5, 2021	Email	The Study Team reached out to SNGR to identify that a draft Environmental Study Report will be shared in late 2021 or early 2022. The Study Team also noted that a draft Stage 1 Archaeological Assessment will also be shared when it is ready.
April 22, 2021	Email	The Study Team provided a link to the draft Stage 1 Archaeological Assessment and draft Cultural Heritage Existing Conditions Report.
May 13, 2021	Email	The Study Team followed up with SNGR if they had any questions or comments about the draft Stage 1 Archaeological Assessment and draft Cultural Heritage Existing Conditions Report.
May 26, 2021	Email	Niagara Region shared the Notice of Public Information Centre #2.
August 24, 2021	Email	The Study Team provided a summary of consultation completed to date and indicated next steps in the Study.
November 16, 2021	Email	Niagara Region shared the Notice of Public Information Centre #3.
April 27, 2022 – May 19, 2022	Email	Several email exchanges occurred coordinating field participation for the targeted Species at Risk Surveys.
May 26, 2022 – June 16, 2022	Email	Several email exchanges occurred to review and finalize participation agreements for archaeological fieldwork. The agreement was signed on June 16, 2022.
June 17, 2022 – June 23, 2022	Email	Several email exchanges occurred to coordinate the field participation for the Stage 2 Archaeological Assessment.
September 22, 2022 –October 2, 2022	Email	Several email exchanges occurred to coordinate the field participation for the Stage 2 Archaeological Assessment.
December 8, 2022	Email	Study Team shared Draft Stage 2 Archaeological Assessment Report for Segment 1 for review and comment.
December 15, 2022	Email	Study Team sent a reminder email regarding the review of the Draft Stage 2 Archaeological Assessment Report for Segment 1. SNGR responded to the reminder email and thanked the Study Team for sharing the draft report. No comments were provided on the report.
October 3, 2023	Email	Study Team shared draft Environmental Study Report for review and requested comments by October 31, 2023.

Niagara Region
Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)

Date	Communication Method	Communication Summary
October 16, 2023	Email	SNGR noted that considering the environmental impacts to the woods and the waterbody, the Six Nations Wildlife and Stewardship office feels it is pertinent to make comments. SNGR inquired if there is there flexibility in the comment deadline.
October 17, 2023	Email	The Study Team provided an extension until November 7, 2023 to submit comments.
November 3, 2023	Email	SNGR shared comments on the draft Environmental Study Report. SNGR's comments are provided in Appendix N.
January 31, 2024	Letter via Email	Study Team provided response to SNGR's comments on the draft Environmental Study Report. Study Team's response is provided in Table 5-12 and Appendix N.
Haudenosaunee Development Institute (HDI)		
January 14, 2021	Email	Niagara Region shared the project summary and Notice of Study Commencement.
February 1, 2021	Email	The Study Team shared details of the upcoming Stage 1 Archaeological Assessment.
March 5, 2021	Email	Niagara Region shared the Notice of Public Information Centre #1.
April 22, 2021	Email	The Study Team provided a link to the draft Stage 1 Archaeological Assessment and draft Cultural Heritage Existing Conditions Report.
May 13, 2021	Email	The Study Team followed up with HDI if they had any questions or comments about the draft Stage 1 Archaeological Assessment and draft Cultural Heritage Existing Conditions Report.
May 26, 2021	Email	Niagara Region shared the Notice of Public Information Centre #2.
August 24, 2021	Email	The Study Team provided a summary of consultation completed to date and indicated next steps in the Study.
August 26, 2021	Email	HDI indicated interest in involvement in the vegetation survey and requested links to draft reports completed to date.
August 30, 2021	Email	The Study Team asked HDI to provide a draft agreement and provided a link for the Stage 1 Archaeology Assessment and draft Cultural Heritage Existing Conditions Report.
September 1, 2021 –October 4, 2021	Email	Several email exchanges occurred to review and finalize participation agreements for environmental fieldwork. The final agreement was signed on October 4, 2021.
September 9, 2021 –September 14, 2021	Email	Several email exchanges occurred to coordinate the Natural Environment Field Investigations.
November 16, 2021	Email	Niagara Region shared the Notice of Public Information Centre #3.
November 22, 2021	Email/Phone	The Study Team followed-up via email, after a phone call to confirm if HDI received the Notice of Public Information Centre #3. The Study Team also provided an update on the status of field work and technical studies. The Study Team also requested clarification on what HDI would like to be involved in construction and detailed design.
November 22, 2021	Email	HDI confirmed which technical reports they are interested in reviewing and requested to be involved in the Construction and Remediation Phases of the Project.
April 27, 2022 - May 19, 2022	Email	Several email exchanges occurred coordinating field participation for the targeted Species at Risk Surveys.
May 26, 2022 – June 23, 2022	Email	Several email exchanges occurred to coordinate the Stage 2 Archaeological Assessment.
September 22, 2022 –September 29, 2022	Email	Several email exchanges occurred to coordinate the field participation for the Stage 2 Archaeological Assessment.
December 8, 2022	Email	Study Team shared Draft Stage 2 Archaeological Assessment Report for Segment 1 for review and comment.

Date	Communication Method	Communication Summary
December 15, 2022	Email	Study Team sent a reminder email regarding the review of the Draft Stage 2 Archaeological Assessment Report for Segment 1.
October 3, 2023	Email	Study Team shared draft Environmental Study Report for review and requested comments by October 31, 2023.
October 12, 2023	Email	The Study Team sent a follow-up email regarding the review request for the draft Environmental Study Report.
October 12, 2023 October 19, 2023	Email	HDI advised that the agreement that was in place had expired and provided a new agreement to accommodate their review of the draft Environmental Study Report. HDI further advised that they would begin their initial review and provide any comments on the ESR once the agreement is signed.
October 19, 2023	Email	Niagara Region responded to HDI noting that we are near completion and filing the ESR. At this stage of the EA process, we are only looking for a review of the Draft ESR document. As per the Region's current practice, we only compensate for the review of Stages 2-4 Archeological studies. As such, we are proceeding under our current agreements and are more than willing to review an overarching amendment as part of our ongoing communication with all Indigenous Communities. This will take place as part of the annual agreement review process. Niagara Region also noted that the Study Team still hope HDI can review and provide any comments on the ESR documents by the due date. We are willing to extend the review date of the draft documents to November 7, 2023 to provide more time for the review.

5.6 Review of Draft Environmental Study Report

The draft Environmental Study Report was circulated to the following groups for review on October 2, 2023, and follow up reminders were subsequently issued:

- Indigenous Communities
- Government Agencies
- Utility Companies

This opportunity for review of the draft report was provided before issuing the Notice of Study Completion. Comments were requested by October 31, 2023. Comments received on the draft Environmental Study Report and Study Team's responses are provided in sections below, and correspondences are provided in Appendix L, Appendix M, and Appendix N.

5.6.1 Review of Draft Environmental Study Report by Indigenous Communities

Table 5-12: Comments from Indigenous Communities

Comment	Study Team's Response
Haudenosaunee Confederacy Chiefs Council, as represented by the Haudenosaunee Development Institute (HDI)	
On October 12, 2023 and October 19, 2023, HDI advised that the agreement that was in place had expired and provided a new agreement to accommodate their review of the draft Environmental Study Report. HDI further advised that they would begin their initial review and provide any comments on the ESR once the agreement is signed.	On October 19, 2023, the Niagara Region responded to HDI noting that we are near completion and filing the ESR. At this stage of the EA process, we are only looking for a review of the Draft ESR document. As per the Region's current practice, we only compensate for the review of Stages 2-4 Archeological studies. As such, we are proceeding under our current agreements and are more than willing to review an overarching amendment as part of our ongoing communication with all Indigenous Communities. This will take place as part of the annual agreement review process. Niagara Region also noted that the Study Team still hope HDI can review and provide any comments on the ESR documents by the due date. We are willing to extend the review date of the draft documents to November 7, 2023 to provide more time for the review.
Six Nations of the Grand River (SNGR)	
On November 3, 2023, SNGR provided comments on various sections of the draft Environmental Study Report. A marked-up version of draft report with SNGR comments is provided in Appendix N.	On January 31, 2024, Niagara Region provided the following response: Niagara Region acknowledges Six Nations Wildlife and Stewardship Office's (SNWSO) comments and concerns related to project's potential impacts to the environment, including but not limited to wildlife, vegetation, trees, species at risk, floodplain, wetlands, surface water and groundwater. As part of the Class EA process, the Niagara Region completed an Environmental Impact Study (EIS), which included multi-season ecological surveys (vegetation, wildlife, and species at risk). Additional technical studies such as Hydraulic Floodplain Analyses, Wetland Hydrologic Characterization study, and Preliminary Hydrogeological Investigation were also completed to address comments from the NPCA related to wetland impacts and flooding impacts. The EIS made recommendations for mitigation and compensation measures, which will need to be further defined in consultation with government agencies. Niagara Region is committed to work with the government agencies during detailed design and construction phases of the project to implement the recommendations of the EIS, including the following: – Installation of structures over watercourses with adequate sizing and gravel base to maintain the flow of surface water and shallow groundwater in order to mitigate anticipated impacts to the form and function of wetlands within the Study Area. – Compensation for the removal of wetland, with the objective of net gain within the watershed. The NPCA recommended a compensation ratio of not less than 2:1 to be achieved to compensate for the loss of swamps within the Study Area and 1:1 for marsh habitats removed from the Study Area. – Installation of amphibian exclusion fencing and ecopassages to direct amphibians underneath roadways to mitigate anticipated negative impacts to local populations due to road mortality and habitat fragmentation. – Recommendation that runoff from the road should not be allowed to run directly into wetlands, and that stormwater detention areas should be installed to intercept water prior to discharging to

Comment	Study Team's Response
	wetlands. Additionally, splash guards are recommended to further minimize introduction of contaminants (such as salt) into the adjacent wetlands. – A Tree Protection Plan to identify impacted trees and to propose reasonable and implementable mitigation measures to mitigate anticipated impacts to retained trees and propose compensation for trees to be negatively impacted and/or removed. Tree compensation would be in accordance with Region's guidelines. – Acquiring permit from the NPCA under Conservation Authorities Act, and authorization from the Ministry of the Environment, Conservation and Parks for species at risk under Endangered Species Act. – Comprehensive compliance monitoring and effectiveness monitoring. Collectively these monitoring programs intend to demonstrate that proposed mitigation measures have been implemented as designed and function as intended. Niagara Region values Six Nations Wildlife and Stewardship Office's feedback on this project and looks forward to continued consultation during detailed design phase. The Region will proceed to issue the Notice of Study Completion and the Environmental Study Report for public review.
Mississaugas of the Credit First Nation (MCFN)	
No comments were received from the MCFN.	No response required.

5.6.2 Review of Draft Environmental Study Report by Government Agencies

Table 5-13: Comments from Government Agencies

Comment	Study Team's Response
Ministry of the Environment, Conservation and Parks (MECP)	
MECP provided the following comments on October 24, 2023:	Study Team's responses are provided below:
<i>General</i>	
1) Section 1.2 on Page 13 of the ESR refers to Schedule A/A+ projects, which does not reflect the changes made to project schedules outlined in the 2023-amended version of the Municipal Class EA (MCEA). Previously, projects were classified as Schedule A/A+ but are now classified as exempt. It is recommended that references to Schedules A/A+ projects from the 2015-amended MCEA be replaced as in the 2023-amended MCEA.	Reference to the former Schedule A/A+ projects have been updated to reflect "Exempt Projects" in accordance with the 2023-amended MCEA.
2) The proponent may wish to add a Conclusion section to the ESR that includes a short summary listing key activities and the principal decisions/conclusions.	A Closure section has been added to the report.
<i>Evaluation of Alternatives</i>	
3) It is recommended that the preferred Alternative Solution be highlighted in the ESR to provide more clarity (i.e., Highlight the preferred Alternative Solution in Table 6-1 on Page 168).	Evaluation table in Section 6 has been updated to highlight preferred solution.
4) It is recommended that the preferred Road Alignment Alternatives for each segment also be highlighted in the ESR to provide more clarity (i.e., Highlight the preferred Alternative for Cross-Sections in Table 7-1 on Page 176 and Table 7-7 on Page 185, and highlight the preferred Alternative for Intersections in Table 7-13 on Page 188)	Evaluation tables in Section 7 have been updated to highlight preferred design options.
<i>Notice of Completion</i>	
5) Please ensure that the date for the Notice of Completion and any follow- up correspondence will be included in the final Environmental Study Report.	Comment noted.
<i>Indigenous Consultation</i>	
6) Please continue reaching out to communities if there are any substantial changes to the project/process, such as findings of interest during the Stage 2 Archaeological Assessment, or if the proponent is applying for subsequent permits from the ministry that may be of interest or concern to communities. We recommend that the proponent include the record of consultation with any subsequent applications to the ministry to help in our review of those applications.	The Niagara Region will continue to engage with the Indigenous Nations during detailed design phase of the project.
<i>Noise and Vibration</i>	
7) The mitigation measures in relation to operational and construction noise in Section 9.2.3.2 of the ESR should be addressed with further detail. It is recommended to please refer to page 201 in Appendix 2 of the 2023 amended MCEA for more mitigation measures related to operational and construction noise.	Noise related mitigation measures have been reviewed from Appendix 2 of the 2023 amended MCEA and relevant measures have been incorporated in Section 9.2.3.2.
8) Section 9.4.3.3 on page 234 of the ESR stated that "Traffic noise from major roads may interfere with amphibian breeding choruses", however, Section 9.4.3.4 does not mention mitigation measures specific to this issue.	These impacts will be further reviewed during detailed design.
<i>Source Water Protection</i>	
9) Please 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 either by using the vulnerability scores assigned to the particular IPZ's, or whether there were any source protection plan policies that applied. Further information on the vulnerability score and source water protection features can be found on the Source Water Protection Atlas (Ministry of the Environment, Conservation and Parks (gov.on.ca))	As noted in Section 4.8, activities that are considered significant drinking water threats in the Niagara Peninsula Source Protection Area, only occur in the vulnerable areas around municipal water treatment plant intakes. A review of source water protection mapping indicate that the subject road segments are not located in any of the IPZs within the Niagara Peninsula Source Protection Area. As such, policies of the Niagara Peninsula Source Water Protection Plan do not apply to this project. A figure has been added to show the location of Study Area in relation to the IPZs (Figure 4-47).

Comment	Study Team's Response
<i>Species at Risk</i>	
10) American Chestnut and Butternut were both referred to as having a high probability of occurrence within the study area although they were not observed in the initial vegetation surveys. – WSP recommended that a thorough tree inventory occur in the footprint and 5-10 m outside for American Chestnut, Butternut and Eastern Flowering Dogwood. – SARB recommends that this inventory occur up to 25 m from the project footprint in order to ensure both regulated habitat and root harm prevention zones are considered.	MECP's recommendation has been added as a commitment in Table 10-1.
11) SARB notes that there are records of Red-headed Woodpecker in the vicinity of the project. – SARB recommends that this species be considered. – SARB recommends that if suitable habitat is present, the species is surveyed for using the Wisconsin Survey Protocol.	MECP's recommendation has been added as a commitment in Table 10-1.
12) SARB notes that Eastern Small-Footed Myotis was not considered in s. 9.4.3.1 Potential Effects on Species at Risk of the Draft Environmental Study Report even though it was listed as having a high potential to occur in the study area. – SAR recommends consideration of impacts to this species and its habitat.	MECP's recommendation has been added as a commitment in Table 10-1.
13) WSP submitted an IGF Nov. 2022, here they identified potential impacts to Eastern Flowering Dogwood, White Wood Aster, Little Brown Myotis, Northern Myotis and Tri-coloured Bat. – SARB requested further consideration of Blanding's Turtle which has not yet been provided.	MECP's recommendation has been added as a commitment in Table 10-1.
14) Based on the information provided, it appears likely that an ESA authorization will be required	A commitment is included in Table 10-2 to acquire an <i>ESA</i> authorization for the project during detailed design.
Ministry of Citizenship and Multiculturalism (MCM)	
MTO provided the following comments on October 26, 2023:	Study Team's response:
MCM noted that the discussion of stage 2 archaeological assessment can be updated to reflect that the stage 2 report (PIF# P327-0026-2022) for segment 1 is now complete, and the report has been accepted onto the Ontario Public Register of Archaeological Reports. The Ministry inquired if stage 2 archaeological assessment work planned for segments 2-4 of the project and recommended specifying that any necessary archaeological assessment work for segments 2-4 will be completed during detailed design.	Section 4.4.2 of this report has been updated to note that the Stage 2 AA for Segment 1 was accepted by the Ministry. This section was also updated to note that the Stage 2 AA for segments 2, 3 and 4 will be completed during detailed design phase of the project. In addition, the general statements related to Stage 2 AA in Section 9.3.2.2 (Archaeological Resources > Mitigation Measures) and Table 10-1 (Commitments for Additional Work) of the report were also updated to specify Segments 2, 3 and 4.
Ministry of Transportation	
MCM provided the following comments on October 27, 2023:	Study Team provided the following responses on November 2, 2023:
<i>Environmental office</i>	
There's no mention of the 2009 Transportation Environmental Study Report (TESR) for Hwy 406 from 0.2 km north of Port Robinson Road to East Main Street. The 2009 TESR Preferred Plan at Merritt Road includes entrance ramps with a future study to be carried out when required. Has Niagara Region review the 2009 TESR to confirm that their design does not preclude entrance ramps to Hwy 406. See the attached pdf. Please advise if you require a copy of the 2009 TESR.	The Project Team was not aware of the 2009 TESR and the future study for the entrance ramps. Since the entrance ramps will be subject to a future study, the Niagara Region is committed to work with the MTO during detailed design phase to review the 2009 TESR and adjust the road design to align with the design for future ramps, if required. A commitment has been added in Section 10 (Table 10-1) of this report in this regard.
Section 9.2.3 Noise: It is noted that construction noise was assessed. Please clarify if a Noise Assessment was completed to determine if the approved development, i.e., Noise Sensitive Areas, shown in the Figure E6 will warrant noise mitigation, i.e., noise wall or noise berm. Or if the development/developer will be constructing a noise wall.	The development area shown in Figure E6 has already been developed with residential development. A Noise Impact Assessment was not completed as part of the Class EA Study. A noise wall or berm is not proposed as part of the proposed road improvement works.
Section 9.4 Natural Environment:	Comment noted.

Comment	Study Team's Response
Please be advised that no compensation for fish, SAR wildlife or SAR vegetation is permitted within the MTO ROW or the MTO lands or 14 m setback. If the regulatory agency requires compensation, consultation is required with MTO, Niagara Region and the regulatory agency.	
Section 9.9 Soil: Excess soil is to be managed as per the O.Reg. 406/19 and the Soil Rules 2023. The 2014 MECP Excess Soil document is now out of date. Please revise.	This reference has been updated in the report.
MTO will not permit any excavated soil generated as a result of the projects within the MTO ROW or MTO lands. Any excavated soil generated as a result of this project must be managed off site as per the regulation.	Comment noted. This input has been incorporated in the following sections of this report: Section 9.9 (Soil) and Table 10-1 (Future Commitments).
Please be advised that MTO is using MTO lands (see the area in yellow) to stockpile soil from MTO construction projects. If during Detail Design, it is identified that Niagara Region must impact this area to facilitate their construction, approval will be required from MTO Environmental and Maintenance.	Comment noted. This input has been incorporated in the following sections of this report: Section 9.9 (Soil) and Table 10-1 (Future Commitments).
	
Traffic office 1. Per MTO's General Guidelines for the Preparation of Traffic Impact Studies, please highlight any v/c for ramp terminal approaches greater than 0.75 as critical.	Comment noted. This report has been updated to reflect this. This update has been made in the following sections of this report: Section 4.2.1.3; Section 4.2.2.1; Table 4-20; Section 4.2.2.2; Table 4-37; Section 4.2.3.1; Table 4-48; and Section 4.2.3.2. In addition, the corresponding sections of the Transportation Assessment Report (Appendix A) have also been updated: Section 4.4; Section 5.3; Section 7.1.2; Table 28; Section 7.2.2; Table 44; Section 8.1.2; Table 55; and Section 8.2.2.
2. Please add the missing SB LT volume for the Highway 406 SB & Merritt Rd intersection in Figure 4-19.	The SB LT volume for the Highway 406 SB & Merritt Rd intersection are shown in Figure 4-19 of the ESR (Figure 24 of the Transportation Report – Appendix A). Forecast volumes for this movement are (7 during the AM peak hour and 15 during the PM peak hour).

Comment	Study Team's Response
3. The Intersection Operations tables for the 2041 Scenario 2 (w/ Improvements) in Section 4.2.3.2 seem to be missing a table for the Hwy 406 SB Ramp & Merritt Rd intersection. Please include.	The intersection Operations tables for the 2041 Scenario 2 (w/ Improvements) for the Hwy 406 SB Ramp & Merritt Rd intersection is included in the Highway 406 Interchange Redesign Memo (Appendix M) of the Transportation Report (which is provided as Appendix A of the ESR). For the ease of reference and review, this table has been added to Section 4.2.3.2 of the ESR (as Table 4-60) and in Section 10.1 of the Transportation Assessment Report (Appendix A) as Table 81.
4. The signal warrant for the Hwy 406 SB Ramp & Merritt Rd intersection seems to use the forecasted AM & PM Peak Volumes as representative volumes for all 8 hours. This does not follow OTM Book 12 guidelines, either Average Hourly Volumes should be calculated according to Justification 7 (with adjusted thresholds) or existing 8-hour volumes be forecast as was done for all other signal warrants in Section 4.6 of Appendix A. Please correct it in the report.	A table applying Justification 7 to the 2031 volumes has been added to Section 4.2.2.2 of this report (as Table 4-31), and Section 10.2 of the Transportation Assessment Report (Appendix A) as Table 82.
5. Following the above, are traffic signals warranted in any scenario prior to 2041. Please specify in the report	The warrant will be met for 2031 based on the volumes.
6. Please share the final synchro files for our records	Study Team provided the Synchro files for the Highway 406 / Merritt Road options evaluation.
Niagara Peninsula Conservation Authority	
NPCA provided the following comments on January 17, 2024:	Study Team provided the following responses on February 13, 2024:
<i>Environmental Study Report, Draft, dated September 29, 2023</i>	
3.2.6 NPCA Policy Document This section refers to NPCA's Policy Document from September 2018, which was superseded in November 2022. As this EA started before the 2022 policies were in effect, referencing our previous policies is fine. However, please include a note that NPCA updated its policies in November 2022.	A note has been added to the ESR.
<i>Appendix E, Environmental Impact Study, dated June 16, 2023</i>	
8.2.6 Wetland Form and Function NPCA is supportive of enhancement opportunities to increase ecological resilience and function of natural heritage features. However, NPCA does not consider enhancement as a substitute for wetland re-creation when considering compensation for the impacts of this degree of wetland removal. Please clarify how the proposed compensation clearly demonstrates conformance with NPCA's Policy, specifically 2.5.2 k. Please note that NPCA may consider areas under agricultural production AND areas that do not contain a permanent form of development as possible areas for wetland compensation.	As noted in comment 1, the NPCA allows a policy document from 2018 to be used in this EA. Comment 2 references a policy document from 2022. However, as NPCA is a public commenting body for EAs and has a Protocol for Planning Services with the Region dated January 2018, their input to the project is valued and considered. Policy 2.5.2 k) recommends that the decision to pursue compensation be subject to: i) all efforts to protect the feature being exhausted first; ii) the feature is not protected by any other applicable federal, provincial or municipal requirement(s); and iii) is taking place in consultation with the municipality or the proponent. In response: - i), the Region led EA considered the options of the road alignment in this location. A background TMP was completed (by others) and is the factor in selecting this location. ii) Provincial and municipal requirements protect the feature iii) The project is led by the Region, and their staff from various departments (including environmental planning) was engaged. The Region will consult with the NPCA during detailed design phase to confirm wetland compensation requirements and location. The Region will also discuss with MNRF as the wetland is a PSW.
8.2.6 Wetland Form and Function	The scope of this study was limited to an EA. The detailed design will be completed under a subsequent separate phase. The EA presented a preliminary option for road design. The roadway design may be subject to further refinement during detailed design, along with the delineation of the

Comment	Study Team's Response
Please provide the total area of wetland proposed for removal due to the proposed undertaking and the total area of wetland proposed for compensation. NPCA staff acknowledge that this area will be refined as detailed design progresses. a. As previously commented, compensation of swamps is not typically allowed by NPCA due to the lag effect between feature removal and feature recreation and the inherent challenges associated with effectively recreating swamp communities. As such NPCA recommends a compensation ratio of not less than 2:1 to be achieved to compensate for the loss of swamps within the study area and 1:1 for marsh habitats removed from the study area.	grading limits, which may impact the area of wetland removal. As such, it was WSP's opinion that, to avoid confusion or misrepresentation, no estimates of impact area were provided. In our experience, providing numbers pre-emptively makes updates difficult. Therefore, WSP felt it was pre-emptive to provide areas of loss. The Region will undertake consultation with the NPCA during detailed design to confirm wetland compensation requirements and location. A detailed compensation plan is recommended based on the detailed design (NPCA also notes this in comment #4).
8.2.6 Wetland Form and Function NPCA staff request that a Wetland Compensation Monitoring Plan be developed to demonstrate that wetland compensation has been achieved. a. This Plan must be implemented for the re-configured/re-created wetland feature(s), to accurately monitor any changes in the wetland community over time and to measure the success of the re-configuration/restoration and management actions. b. Monitoring must be conducted annually at a similar time of year (i.e., late July). c. All plants identified as part of the Wetland Compensation Monitoring Program must be categorized by the wetness index based on the Floristic Quality Assessment System for Southern Ontario. d. The results of the Wetland Compensation Monitoring Program must be submitted to NPCA annually prior to December 31, until planting of the wetland compensation area is complete. It is recommended that a monitoring plan be implemented for a minimum of 5-years upon completion of the wetland compensation plantings. e. Details regarding this Plan can be submitted at the detailed design stage for review and comment.	WSP agrees that a detailed Wetland Compensation Plan must be developed. As noted in Comment response #3, the compensation plan should be conducted after EA completion and during detailed design. NPCA seems to agree with this timeline based on comment #4e. NPCA will need to provide necessary input for the plan. It is also recommended that compensation requirements be tailored to the compensation location.
<i>Appendix F, Stormwater Management and Hydraulic Assessment Report (Draft), dated August 2023</i>	
2.2.1 Singers Drain Singers Drain is erroneously classed as a municipal drain, please revise.	Text has been updated.
Towpath Drain is erroneously classed as a municipal drain, please revise.	Text has been updated.
As noted within Key Comment #3, the area of segment 1 (wetlands south of the unopened road allowance) does not have clear channels and required the use of levees, and staff note that cross sections 313 and 284 could benefit from levees on the right-hand side of the cross sections. NPCA is in support of the assessment that further 2D modeling would be beneficial.	The HEC-RAS model has been updated to incorporate levees along the right-hand side of cross sections 313 and 284. The hydraulics modelling results have remained the same.
Model The utilized terrain file appears to use a 2 m grid, please provide clarification regarding why this was selected.	Two sets of LiDAR data have been received/sourced and reviewed accordingly. These include the 2 m resolution SWOOP DEM, which was based upon Orthophotography collected by MNRF in 2015 (ref. Land Information Ontario, 2015), and a 5 m resolution DEM provided by the NPCA in 2022. In comparing the two data sets, it was found that the SWOOP DEM had a better resolution (2 m) and had the potential to provide further detail in the areas of focus. Accordingly, SWOOP DEM was used for model development. Nonetheless, the NPCA DEM was also used to compare the findings from the SWOOP DEM and confirm the understanding of the features of interest.
Several cross sections have an artificially deepened channel, please clarify if surveying was completed to establish creek bed depths.	Channel elevations were determined at locations where survey data was available in proximity to cross-road culverts.

Comment	Study Team's Response
Cross section 1171 LOB length and cross section 65 ROB length were unexpectedly long, please provide clarification.	The cross-section 65 could not be found in the model. The HEC-Ras model has been updated accordingly. The modelling results were not impacted by the change in the model.
Town of Pelham	
Town of Pelham provided the following comments on January 17, 2024:	Study Team's responses:
Page iii of the Executive Summary indicates that segment 4 of Rice Road in the Town of Pelham is a 50 km/hr road. This segment of road is 60 km/hr.	Page iii of Executive Summary and page 40 of the Section 4.1.1 have been updated to note that the speed limits of Rice Road is 60 km/h within the limits of Town of Pelham, and 50 km/h within the limits of Town of Pelham.
Please integrate the multi-use path on the west side of Rice Road, north of Merritt Road into the road design. 235 Merritt Road should be identified for road widening to obtain the final segment of the multi-use path.	The following note has been added to the drawings: Multi-use Path will extend north of Merritt Road on the west side of Rice Road. This will be completed during detailed design.
The Town intends to extend the multi-use path on the north side of Merritt Road west of Rice Road. The intersection design at Merritt and Rice Road should consider this multi-use path on the north side of Merritt Road west of Rice Road.	
City of Welland	
City of Welland provided the following comments on October 30, 2023:	Study Team provided the following responses on November 9, 2023:
Section 4.2: The Regional Official Plan projects growth to 2051 but the transportation modeling for the EA only reflected 2031 to 2041 horizon years.	The established scope for the study was to evaluate expected 2031 and 2041 conditions; Regional traffic forecast modelling for these years was provided by the Region and used in the analysis.
Section 4.2.1: This section refers count data for the 2020 base year. 2020 is likely not an accurate depiction of traffic volumes.	Traffic data from prior to 2020 was available for each intersection (see table 3 of Transportation Assessment Report provided in Appendix A) and a rigorous review of data was conducted to approximate expected traffic volumes for 2020 had the pandemic not occurred. This section of the ESR has been updated.
Section 5.4: Welland is not included in the table for utility coordination. City has local water on Rice Road.	The table in Section 5.4 has been updated to list City of Welland and its local water main.
Section 7.3.1.4: For segment 4 (Rice) the preferred alignment is a hybrid - widening to the west in Welland and then to the east in Thorold to avoid property acquisition. Is the intent for the road to shift at the boundary or Rosewood Crescent?	The preferred alignment (as shown in Appendix Q) starts to shift easterly just south of the Rosewood Crescent.
Section 7.3.2.4: Rice Road is in the Welland Urban Boundary. The Northwest Secondary Area Plan will be incorporating storm sewers in lieu of ditches on Quaker Road as the area develops. The storm sewer will extend north on Rice to the water crossing. A culvert replacement will also be required across Rice Road at the current crossing location north of Quaker, as well as new sanitary servicing and an upsized watermain on Rice Road. Future coordination is required.	Comment noted. The Niagara Region will coordinate with the three local area municipalities for their projects, as required, during next phases of this project. A commitment has been added in Table 10-1.
Section 8.3.3: Illustrates the preferred cross-section on Segment 3 with a two-way cycle track and sidewalk on the south boulevard (Welland ownership across Regional fairground). There is no mention of Welland's request to have the Region/Region's Consultant facilitate a maintenance (snow removal) agreement with Thorold.	The Niagara Region will execute maintenance agreements with the three local area municipalities during detailed design phase. A commitment has been added in Table 10-1 of this report.
Sections 8.3.3 and 8.7: On Segment 3, what material will the 0.6 m textured, coloured tactile strip be comprised of and how will this impact maintenance?	Material of the tactile strip will be determined during detailed design phase.
Section 8.3.3: The proposed road is platform is illustrated as raised above existing for Segment 3. Is there a preliminary grade or increase in cover that can be shared?	The general profile of Segment 3 generally follows that of the existing. A copy of the plan and profile can be found in Appendix Q, which illustrates both the proposed roadway and the existing ground profiles.
Section 8.3.4: Illustrates the preferred cross-section on Segment 4. As noted previously there will be a need to coordinate for the installation of new sanitary servicing, an upsized watermain, storm sewers and a culvert crossing.	Comment noted. The Niagara Region will coordinate with the three local area municipalities for their projects, as required, during next phases of this project. A commitment has been added in Table 10-1.

Comment	Study Team's Response
Section 8.3.4: The proposed road is platform is illustrated as raised above existing for Segment 4, Rice Road. Is there a preliminary grade or increase in cover that can be shared?	The general profile of Segment 4 generally follows that of the existing with some adjustments to provide a smooth roadway profile. A copy of the plan and profile can be found in Appendix Q, which illustrates both the proposed roadway and the existing ground profiles.
Section 8.9: As noted previously, new developments are anticipated along Rice Road as part of the Northwest Secondary Area Plan. Coordination will be required to ensure a 2.5 m raised median is not placed at future entrance locations.	Comment noted. The Niagara Region will coordinate with the three local area municipalities during detailed design phase.
Section 8.10.1: The proposed servicing plans referenced (Figures 8-7) for the Northwest Secondary Area in Welland is undergoing a review and revision by area developers and their Consultant. Future coordination will be required to ensure that the revised plan is captured.	Comment noted. The Niagara Region will coordinate with the three local area municipalities during detailed design phase.
Section 8.11.4.1: As noted previously, a culvert replacement will be required north of Quaker and development in the Northwest Secondary Area will need to be considered. Coordination will be required.	Comment noted. The Niagara Region will coordinate with the three local area municipalities during detailed design phase.
Section 8.13.1: Improvements along Rice Road in Welland, including the Quaker Road intersection, are identified for "by 2041" timeline. It is anticipated that development in the Northwest Secondary Area will significantly precede this milestone. Coordination will be required.	Comment noted. The Niagara Region will coordinate with the three local area municipalities during detailed design phase.
Section 8.13.1: Improvements include a recommendation for the City of Welland/City of Thorold to signalize the intersection of First Avenue/Cataract Road and Quaker Road by 2041, as well as a recommendation for the City of Welland to add a southbound lane on Quaker Road through the intersection of Niagara Street and Quaker Road beyond 2041. The recommendations and associated timelines seem out of scope with the EA purpose. As noted previously, it is anticipated that development in the Northwest Secondary Area will significantly precede these milestones and need and timing will be confirmed as development moves forward.	Roads under the jurisdiction of Welland and Thorold were considered in the study to understand travel patterns on the broader network. Recommendations regarding these roads are for consideration. Future geodemographic related assumptions for 2031 and 2041 were guided by the Niagara Region model. The municipalities will have more detailed information about development timelines, and can make suitable decisions in their own jurisdictions.
Section 8.13.2: The proposed staging does not include a discussion or mention of coordination of servicing installation for Segment 4.	A commitment has been added in Table 10-1 for the Niagara Region to coordinate with the three local area municipalities for their projects, as required, during next phases of this project.
Appendix Q: The depth of the ditch is quite deep in some locations. What is the separation with the proposed sidewalk and multi-use path on Rice Road?	The ditch profile has been set to allow for overland drainage from both the roadway and the grade of the adjacent land. In some areas, the roadway is higher than the adjacent land, thus increasing the height between the top of roadway to bottom of ditch. The low points of the ditches are set based on the drainage outlets (i.e., culverts or drainage courses). The ditch profile will be refined and finalized during detailed design. For Rice Road, as shown on the typical section in Section 8.3.4, there will be a MUP on the west side and a SW on the east side. It is on Merritt Road (Segment 3), where there are cycle tracks separated by a 0.6 m wide buffer beside the SW, as illustrated in Section 8.3.3.
Appendix Q: The depth of the ditch is quite deep in some locations, particularly on Rice Road as it approaches Merritt Road where a significant depth of almost 5 m is shown. Furthermore, this ditch is partially aligned on private property.	The ditch profile has been set to allow for overland drainage from both the roadway and the grade of the adjacent land. In some areas, the roadway is higher than the adjacent land, thus increasing the height between the top of roadway to bottom of ditch. The low points of the ditches are set based on the drainage outlets (i.e., culverts or drainage courses). The ditch profile will be refined and finalized during detailed design. In some areas, the ditch does extend outside of the current roadway ROW. As noted in Section 9.2.1 of the report, some additional property may be required to accommodate the current roadway grading design.

5.6.3 Review of Draft Environmental Study Report by Utility Companies

Table 5-14: Comments from Utility Companies

Comment	Study Team's Response
Enbridge Gas	
Enbridge Gas provided the following comments on October 2, 2023:	Study Team's response:
Enbridge Gas shared drawings showing general locations of Gas Main along Segments 2, 3 and 4, and noted that at this point, Enbridge will not be able to identify any conflicts until the project design has advanced to detailed design. Enbridge advised that the Project Team share 60% design when it becomes available. Enbridge clarified that their the drawings indicate general vicinity of Gas Main and do not specify depths. The best way to accurately locate the Gas Main in the field, to ensure it is clear of the proposed works, is to site-verify though daylighting test digs via hydro-vac. Enbridge encourage all parties to perform these exploratory test digs during design phase so any major conflicts with Gas Main can be identified and dealt with early on. Discovering Gas conflicts during the later stages of design process or construction phase, could negatively impact project timelines.	The Study Team has documented these comments for the Project Team to contact Enbridge during detailed design phase.
Hydro One	
Hydro One provided the following comments on October 16, 2023:	Study Team's response:
The Secondary Land Use group is aware of this project. Please continue constructive conversations with Alan Liu, Hydro One Real Estate Coordinator. Please inform us if the scope of the project changes so that we may assess the impact to our assets. We reiterate that this message does not constitute any form of approval for your project. Please note that your project may require you to submit a Property Management Proposal (PMP) for Hydro One to fully assess the impact to our assets. To learn more about this process please visit Secondary Land Uses (hydroone.com).	Comment noted. The Niagara Region will continue to engage with Hydro One during detailed design phase of the project, as needed.

6 Class EA Phase 2: Alternative Solutions

Phase 2 of the Class EA process requires that various reasonable solutions shall be identified to address the problem and opportunity. The potential solutions are then evaluated against criteria related to natural, socio-economic, and cultural environments and technical and cost considerations. Based on the evaluation, the preferred solution is presented to the government review agencies, the public, Indigenous Communities, and key stakeholders for review and input. A summary of the identification and evaluation of alternative solutions for this project is provided below, and a detailed evaluation is provided in Appendix O.

6.1 Identification of Alternative Solutions

The following alternative solutions were identified as part of this study:

Table 6-1: Alternative Solutions

Alternative Solution	Description
Alternative Solution 1: Do Nothing	As the name implies, this alternative would not propose any improvements to the Merritt Road and Rice Road segments within the study area.
Alternative Solution 2: Manage Transportation Demand	Transportation Demand Management (TDM) alternative would manage the demands placed on transportation infrastructure by implementing a set of policies, programs, services, and/or initiatives that aim to increase efficiency in the transportation network by changing how, how much, when, where, and why people travel.
Alternative Solution 3: Limit Growth and Development	This alternative would involve restricting development of adjacent lands.
Alternative Solution 4: Improve Other North-South and East-West Roads	This alternative considers road infrastructure improvements to the other north-south and east-west roads.
Alternative Solution 5: Improve Merritt Road and Rice Road	This alternative would involve the following: – Extension of Merritt Road between Rice Road and Cataract Road; – Improvements to Merritt Road between Cataract Road and Highway 406; – Improvements to Rice Road between 200 m north of Merritt Road and Quaker Road; – Localized intersection improvements, such as addition of dedicated turn lanes, traffic signals/roundabouts and/or improvements to the timing of the existing traffic signal at Merritt Road and Merrittville Highway/Niagara Street intersection to improve traffic operations; and – Providing active transportation facilities on both Merritt Road and Rice Road.

6.2 Evaluation Criteria

To identify the impacts and advantages of each alternative solution, evaluation criteria were developed within each of the categories related to transportation, socio-economic, natural, and cultural environments and technical and cost considerations. These criteria were chosen based on their ability to identify potential positive and negative effects of each alternative and distinguish the advantages and disadvantages between them.

Table 6-2: Evaluation Criteria for Alternative Solutions

Factor	Evaluation Criteria
Transportation	Municipal Planning Policies: Addresses recommendations of the Niagara Region's TMP (2017), for improvements to Merritt Road and Rice Road in alignment with Complete Streets guidelines Provincial Planning Policies: Complies with the Provincial Policy Statement (2020) and conforms with Growth plan for the Greater Golden Horseshoe (2020) Capacity and Level of Service: Potential to improve existing and future traffic congestion and level of service (LOS) on Merritt Road and Rice Road Safety: Potential to improve road safety by removing roadside hazards along Merritt Road and Rice Road Active Transportation: Potential to incorporate active transportation facilities for walking and cycling Network Connectivity: Potential to provide a direct route between Highway 406 interchange and areas west of the study area (Town of Pelham). Goods Movement: Potential to improve goods movement
Socio-economic Environment	Private Property: Potential for property requirements Economic Development: Supports future growth and economic sustainability along Merritt Road and Rice Road Public Realm: Ability to provide opportunities to enhance streetscaping, landscaping, and public realm along Merritt Road and Rice Road Accessibility: Provides opportunities to improve accessibility and reduce barriers in the built environment Construction Impacts: Potential impacts to residents, businesses and institutions during construction Health: Provide active transportation infrastructure which will promote walking and cycling Noise: Potential for noise impacts
Natural Environment	Terrestrial Environment: Potential impacts to terrestrial resources (vegetation, wetlands, trees, species at risk, and wildlife) Aquatic Environment: Potential impacts to fish and fish habitats Air Quality: Impacts to air quality

Factor	Evaluation Criteria
Cultural Environment	Archaeological Resources: Potential impacts to lands identified to retain potential archaeological resources Built Heritage and Cultural Resources: Potential impacts on built heritage and cultural heritage landscapes
Engineering / Constructability	Utilities: Impacts on utilities Stormwater Management: Provides opportunities to reduce stormwater quantity and/or improve stormwater quality Climate Change: Provides opportunities to improve resilience of the subject roads to changing climatic conditions Implementation: Potential for impacts associated with project implementation/construction
Cost	Implementation Cost: Cost to construct Operation and Maintenance Cost: Cost to operate and maintain

6.3 Evaluation of Alternative Solutions

The alternative solutions were evaluated using the evaluation criteria presented in the table above. The alternatives were assigned a score based on the scoring system presented below:

				
Highest negative impacts or lowest benefits	Higher negative impacts or lower benefits	Moderate negative impacts and benefits	Lower negative impacts or greater benefits	Lowest negative impacts or greatest benefits

Alternatives represented by a full dark circle symbol were given the highest score where the evaluation criteria resulted in the lowest anticipated impacts, or highest benefits from the alternative. In cases where the alternative had the highest anticipated impact or lowest benefit according to the evaluation criteria, a lowest score represented by white circle with black outline was assigned. Accordingly, circles shaded one-quarter, half, or three-quarters, represented a range between higher negative impacts or lower benefits, moderate negative impacts and benefits and lower negative impacts or greater benefits.

The detailed evaluation is found in Appendix O. A summary table is provided below:

Table 6-3: Evaluation of Alternative Solutions

Evaluation Criteria	Alternative Solution 1 – Do Nothing	Alternative Solution 2 – Manage Transportation Demand	Alternative Solution 3 – Limit Growth and Development	Alternative Solution 4 – Improve Other North-South and East-West Roads	Alternative Solution 5 – Improve Merritt Road and Rice Road
Transportation					
Municipal Planning Policies					
Provincial Planning Policies					
Capacity and Level of Service					
Safety					
Active Transportation					
Network Connectivity					
Goods Movement					
Socio-economic Environment					
Private Property					
Economic Development					
Public Realm					
Accessibility					
Construction Impacts					
Health					
Noise					

Evaluation Criteria	Alternative Solution 1 – Do Nothing	Alternative Solution 2 – Manage Transportation Demand	Alternative Solution 3 – Limit Growth and Development	Alternative Solution 4 – Improve Other North-South and East-West Roads	Alternative Solution 5 – Improve Merritt Road and Rice Road
Natural Environment					
Terrestrial Environment	●	●	●	◐	◑
Aquatic Environment	●	●	●	◐	◑
Natural Heritage	●	●	●	◐	◑
Air Quality: Impacts to air quality	●	◐	●	◐	◑
Cultural Environment					
Archaeological Resources	●	●	●	◐	◑
Built Heritage and Cultural Heritage Landscapes	●	●	●	◐	◑
Engineering/Constructability					
Utilities	●	◐	●	◐	◑
Stormwater Management	○	○	○	○	●
Climate Change	○	○	○	◐	●
Implementation	●	◐	●	◐	◑
Cost					
Implementation Cost	●	●	●	◑	◑
Operation and Maintenance Cost	●	●	●	◐	◐
Overall Recommendation	Not Recommended	Not Recommended	Not Recommended	Not Recommended	Recommended

6.4 Preferred Solution

Alternative 5 – Improve Merritt Road and Rice Road was identified as the preferred solution. This alternative would involve the following:

- Extension of Merritt Road between Rice Road and Cataract Road;
- Improvements to Merritt Road between Cataract Road and Highway 406;
- Improvements to Rice Road between 200 meter north of Merritt Road and Quaker Road;
- Localized intersection improvements, such as addition of dedicated turn lanes, and traffic signals/roundabouts and/or improvement of the timing of the existing traffic signal at Merritt Road and Niagara Street intersection to improve traffic operations; and
- Providing active transportation facilities on both Merritt Road and Rice Road.

It is recognized that the Niagara Region and specifically the adjacent lands to Merritt Road and Rice Road will continue to experience population and employment growth in the near future. The proposed improvements to these two roads will help address transportation capacity and active transportation connectivity issues. These improvements will also implement complete street approach which will improve safety for drivers; bicyclists; and pedestrians of all ages and abilities, while provide opportunities for walking and cycling. Stormwater management measures will also be recommended as part of the proposed improvements to manage stormwater.

It is anticipated that the proposed improvements will impact the following Regional Core Natural Heritage System features (Niagara Region, 2014):

- Environmental Conservation Area
- Potential Natural Heritage Corridor
- Provincially Significant Wetland (Niagara Street Cataract Road Woodlot Wetland Complex)
- Significant Woodland
- Life Science Area of Natural and Scientific Interest
- Fish Habitat

Each municipal Official Plan delineates the same areas as natural heritage. The Niagara Region Official Plan Policy 7.B.1.14 allows “essential public uses of a linear nature, including transportation routes, may be permitted within the Core Natural Heritage System or adjacent lands where an Environmental Assessment for the proposed use has been approved under Provincial or Federal legislation” (Niagara Region, 2014). Likewise, the Provincial Policy Statement (2020) supports the development of transportation and infrastructure corridors and does not consider activities that create or maintain infrastructure authorized under an EA process as development (Ministry of Municipal Affairs and Housing, 2020).

Accordingly, this Class EA will aim to protect natural heritage features, by evaluating all potential natural environmental impacts, identifying appropriate mitigation measures and complying with all other environmental protection requirements, including but not limited to

identifying potential permits required by the NPCA and other agencies (e.g., MECP and Fisheries and Oceans Canada).

Given the proximity of the intersection to the Core Natural Heritage features listed above, the alternative design concepts will recognize the sensitivity of these natural areas. Any future works will avoid and mitigate negative impacts to the Core Natural Heritage System wherever possible and consider enhancement of the features and associated buffers.

After habitat has been evaluated and delineated the guiding principle in limiting impacts will be to protect habitat to maintain habitat function. Standard mitigation measures to minimize impacts during construction phases (e.g., erosion and sediment control plans, spill plans, etc.) will be included. To prevent long-term impacts such as road mortality and hydrology changes various road designs that include road ecology principles will be explored and incorporated (e.g., elevated road or tunnels and fencing). Habitat enhancement, restoration, and compensation will also be required. Long-term monitoring and adaptive mitigation/monitoring will also be included in the recommendations to ensure impacts to the surrounding habitat features are reduced and mitigated.

6.5 Consultation on Preferred Solution

As required by the Municipal Class EA process, the public, Indigenous Communities, government agencies, and key stakeholders were contacted to share the results of the evaluation of alternative solutions and obtain input on the preferred solution. A discussion of consultation process is provided in Section 5. Following the Public Information Centre #2, the project proceeded to Phase 3 of the Municipal Class EA process, where alternative design concepts for the Merritt Road and Rice Road improvements were identified and evaluated to identify a recommended design.

7 Class EA Phase 3: Identification and Evaluation of Alternative Designs

7.1 Approach to Identification and Evaluation of Alternative Design Concepts

Phase 3 of the Municipal Class EA process involves development and evaluation of alternative design concepts for the Preferred Solution. For this project, Alternative 5 – Improvements to Merritt Road and Rice Road was identified as the preferred solution. Accordingly, in accordance with the Phase 3 of the Municipal Class EA process, alternative design concepts were identified and evaluated to identify a preliminary preferred design. This process was generally comprised of the following four steps:

- Identification of constraints
- Identification of alternative design concepts
- Identification of evaluation criteria
- Evaluation of alternative design concepts to identify a preferred design

The alternative design concepts were developed using direction from the Niagara Region's Complete Street Design Manual (2023). Based on this evaluation process, a preliminary preferred design was identified and presented to the public at the Public Information Centre #3. **It is important to note that following PIC #3, the preliminary design was reviewed and refined. The following provides a summary of the preliminary design alternatives and the preliminary preferred design presented at PIC #3, followed by the final preferred design selected following the PIC #3.** Detailed evaluation is provided in Appendix P.

Preliminary Design Alternatives and Preliminary Preferred Design Presented at PIC #3:

7.2 Identification of Constraints

The first step in the identification of alternative design concepts was to identify any constraints for consideration into the development of design alternatives. Constraints were identified for each road segment, and included constraints related to utilities, natural environment, private properties, stormwater management, Highway 406, and existing and future road cross-section considerations as well as considerations for future pedestrian and cycling facilities in accordance with the Complete Street Design Manual.

7.3 Identification and Evaluation of Alternative Design Concepts

Alternative design concepts were identified for the following:

- Road Alignment Alternatives
- Road Cross-Section Alternatives
- Road Intersection Alternatives

To identify the impacts and advantages of each alternative design concept, evaluation criteria were developed related to transportation, socio-economic, natural, and cultural environments and technical and cost considerations. These criteria were chosen based on their ability to identify potential positive and negative effects of each alternative and distinguish the advantages and disadvantages between them. The evaluation criteria that were used for the evaluation of alternative design concepts is presented in sub-sections below.

7.3.1 Road Alignment Alternatives

7.3.1.1 Identification of Road Alignment Alternatives for Segments 1, 2, 3, and 4

The table below lists the road alignment alternatives that were identified as part of Phase 3 of the Class EA process for this project. These alternatives and their evaluation process are discussed in further detail in subsections below.

Table 7-1: Road Alignment Alternatives

Road Segment	Alternatives for Cross-Sections
Segment 1: Merritt Road (Rice Road to Cataract Road)	Alternative A: Centre Alignment Alternative B: Hybrid Alignment
Segment 2: Merritt Road (Cataract Road to Merrittville Highway / Niagara Street)	Alternative A: Centre Alignment Alternative B: South Alignment Alternative C: Hybrid Alignment
Segment 3: Merritt Road (Merrittville Highway / Niagara Street to Highway 406)	Alternative A: Centre Alignment Alternative B: North Alignment Alternative C: North Alignment with Adjusted Curve
Segment 4: Rice Road (200 m north of Merritt Road to Quaker Road)	Alternative A: Centre Alignment Alternative B: Hybrid Alignment

7.3.1.2 Evaluation Criteria for Road Alignment Alternatives

The following evaluation criteria was identified to evaluate the road alignment alternatives:

Table 7-2: Evaluation Criteria for Alternative Alignments

Factor	Evaluation Criteria
Transportation	Safety/Road Geometry: Ability to improve sightlines and horizontal alignment and ability to provide safe access to driveways and properties along the corridor
Socio-economic Environment	Private Property Impacts: Private property taking Lifestyle Disruption: Potential for lifestyle disruption effects to residents such as noise or visual impacts Agricultural Land: Potential for loss of agricultural land
Natural Environment	Terrestrial Environment: Impacts on terrestrial resources (vegetation, wetlands, trees and wildlife) Aquatic Environment: Impacts to fish and fish habitats

Factor	Evaluation Criteria
Cultural / Archaeological Environment	Archaeological Resources: Impacts on lands identified to retain potential archaeological resources Built Heritage and Cultural Resources: Impacts on built heritage and cultural heritage landscapes
Engineering/Constructability	Utilities: Impacts on utilities Drainage: Impacts on existing culverts and ditches and ability to facilitate drainage systems

7.3.1.3 Evaluation of Road Alignment Alternatives for Segments 1, 2, 3, and 4

The alternatives were assigned a score based on the scoring system presented below:

				
Highest negative impacts or lowest benefits	Higher negative impacts or lower benefits	Moderate negative impacts and benefits	Lower negative impacts or greater benefits	Lowest negative impacts or greatest benefits

Alternatives represented by a full dark circle symbol were given the highest score where the evaluation criteria resulted in the lowest anticipated impacts, or highest benefits from the alternative. In cases where the alternative had the highest anticipated impact or lowest benefit according to the evaluation criteria, a lowest score represented by white circle with black outline was assigned. Accordingly, circles shaded one-quarter, half, or three-quarters, represented a range between higher negative impacts or lower benefits, moderate negative impacts and benefits and lower negative impacts or greater benefits.

Preferred road alignment was selected for each road segment based on a detailed evaluation of road alignment alternatives using a set of criteria noted in Table 7-2. Summary scoring tables are provided below. **For more details, please refer to the detailed evaluation of alternative design concepts provided in Appendix P.**

Table 7-3: Evaluation of Road Alignment Alternatives for Segment 1

Evaluation Criteria	Alternative A: Centre Alignment	Alternative B: Hybrid Alignment
Transportation		
Safety/Road Alignment	●	●
Socio-economic Environment		
Private Property Impacts	◐	◐
Lifestyle Disruption	●	●
Agricultural Land	◐	◐
Natural Environment		
Terrestrial Environment	○	○
Aquatic Environment	◐	◐
Cultural Environment		
Archaeological Resources	◐	◐
Built Heritage and Cultural Resources	◐	◐
Engineering		
Utilities	◐	◐
Drainage	◐	◐
Overall Recommendation	Recommended	Not Recommended

Table 7-4: Evaluation of Road Alignment Alternatives for Segment 2

Evaluation Criteria	Alternative A: Central Alignment	Alternative B: South Alignment	Alternative C: Hybrid Alignment
Transportation			
Safety/Road Alignment			
Socio-economic Environment			
Private Property Impacts			
Lifestyle Disruption			
Agricultural Land			
Natural Environment			
Terrestrial Environment			
Aquatic Environment			
Cultural Environment			
Archaeological Resources			
Built Heritage and Cultural Resources			
Engineering			
Utilities			
Drainage			
Overall Recommendation	Not Recommended	Recommended	Not Recommended

Table 7-5: Evaluation of Road Alignment Alternatives for Segment 3

Evaluation Criteria	Alternative A: Central Alignment	Alternative B: North Alignment	Alternative C: North Alignment with Adjusted Road Curve
Transportation			
Safety/Road Alignment			
Socio-economic Environment			
Private Property Impacts			
Lifestyle Disruption			
Agricultural Land			
Natural Environment			
Terrestrial Environment			
Aquatic Environment			
Cultural Environment			
Archaeological Resources			
Built Heritage and Cultural Resources			
Engineering			
Utilities			
Drainage			
Overall Recommendation	Not Recommended	Recommended	Not Recommended

Table 7-6: Evaluation of Road Alignment Alternatives for Segment 4

Evaluation Criteria	Alternative A: Centre Alignment	Alternative B: Hybrid Alignment
Transportation		
Safety/Road Alignment		
Socio-economic Environment		
Private Property Impacts		
Lifestyle Disruption		
Agricultural Land		
Natural Environment		
Terrestrial Environment		
Aquatic Environment		
Cultural Environment		
Archaeological Resources		
Built Heritage and Cultural Resources		
Engineering		
Utilities		
Drainage		
Overall Recommendation	Recommended	Not Recommended

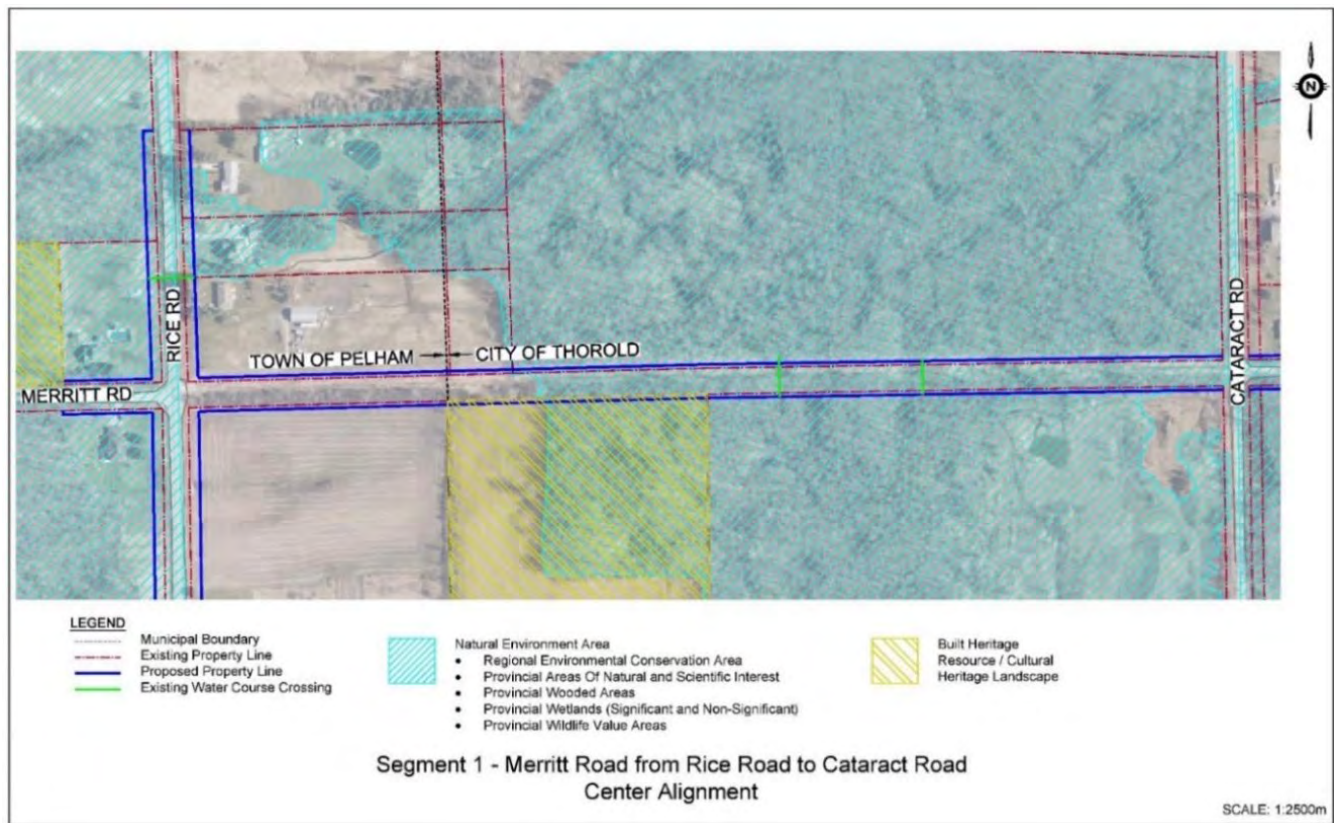
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7.3.1.4 Preliminary Preferred Road Alignment Alternatives for Segments 1, 2, 3, and 4

Alternative A - Centre Alignment was identified as the preferred design for Segment 1. This alternative would involve a 26 meter wide road right of way alignment along the centreline of the 20 meter wide unopened road allowance. The preferred road alignment for Segment 1 is shown in Figure 7-1.

Figure 7-1: Segment 1 - Alternative A: Centre Alignment

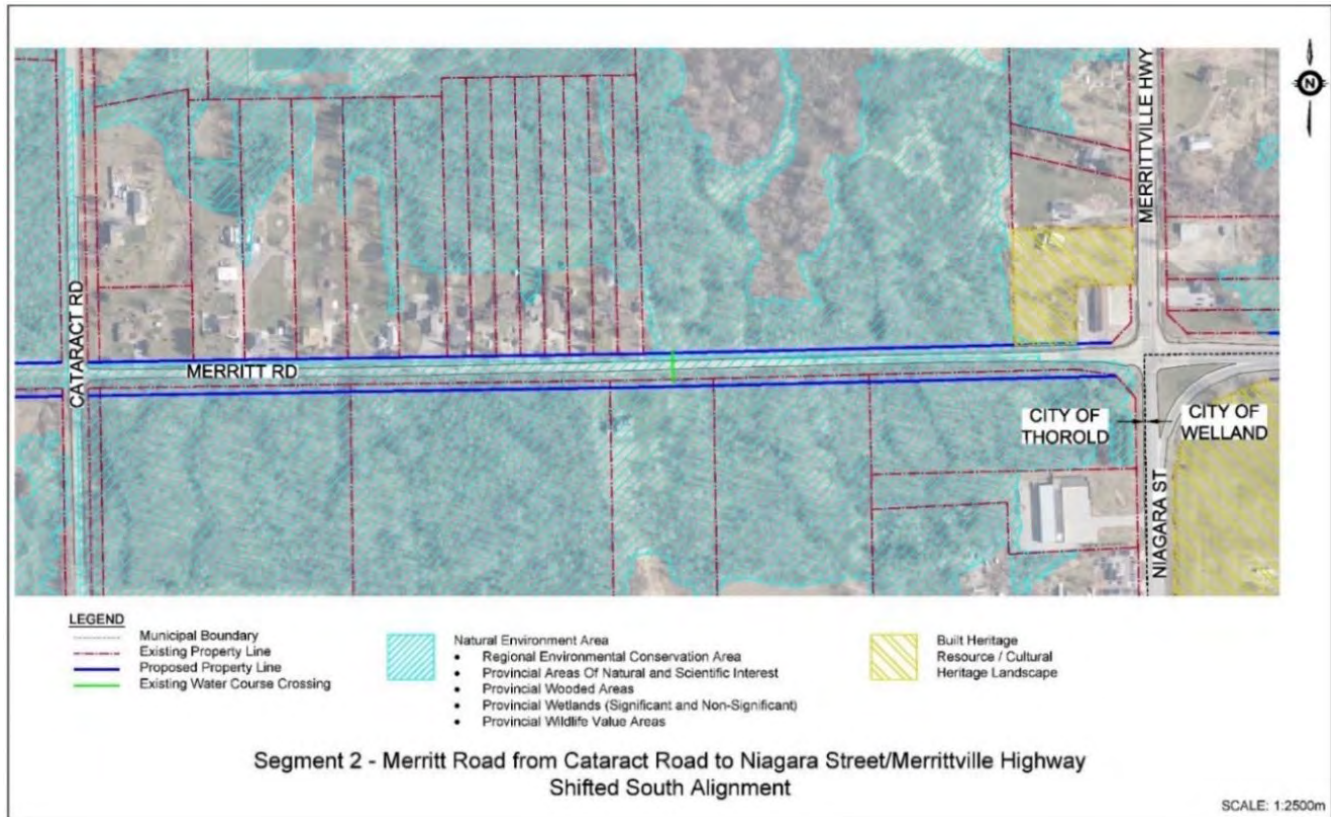


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Alternative B - South Alignment was identified as the preferred alignment for **Segment 2**. This alternative would involve widening the existing Merritt Road to a 26 meter road right of way and shifting the centreline to the south. This alternative is shown in Figure 7-2.

Figure 7-2: Segment 2 - Alternative B: South Alignment (Widen to the south)

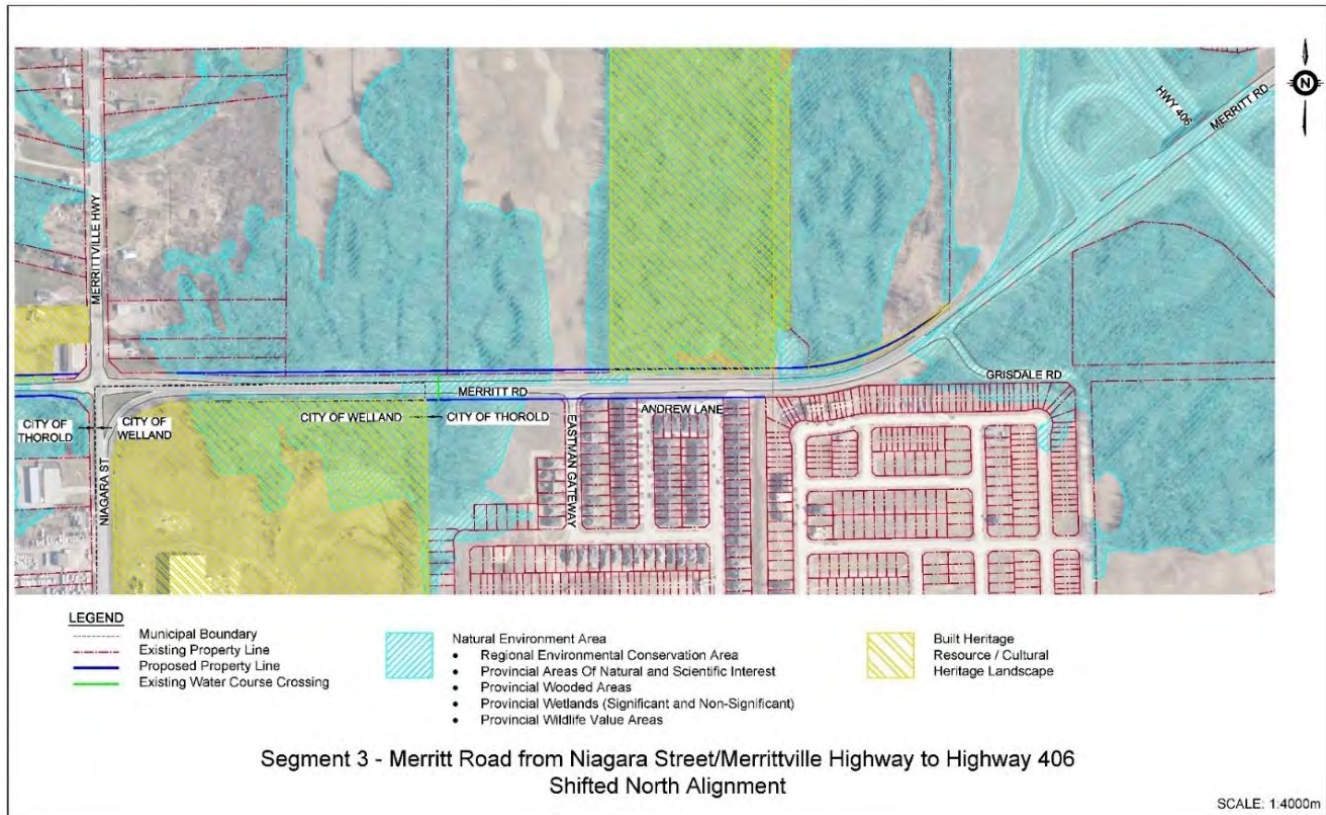


Niagara Region

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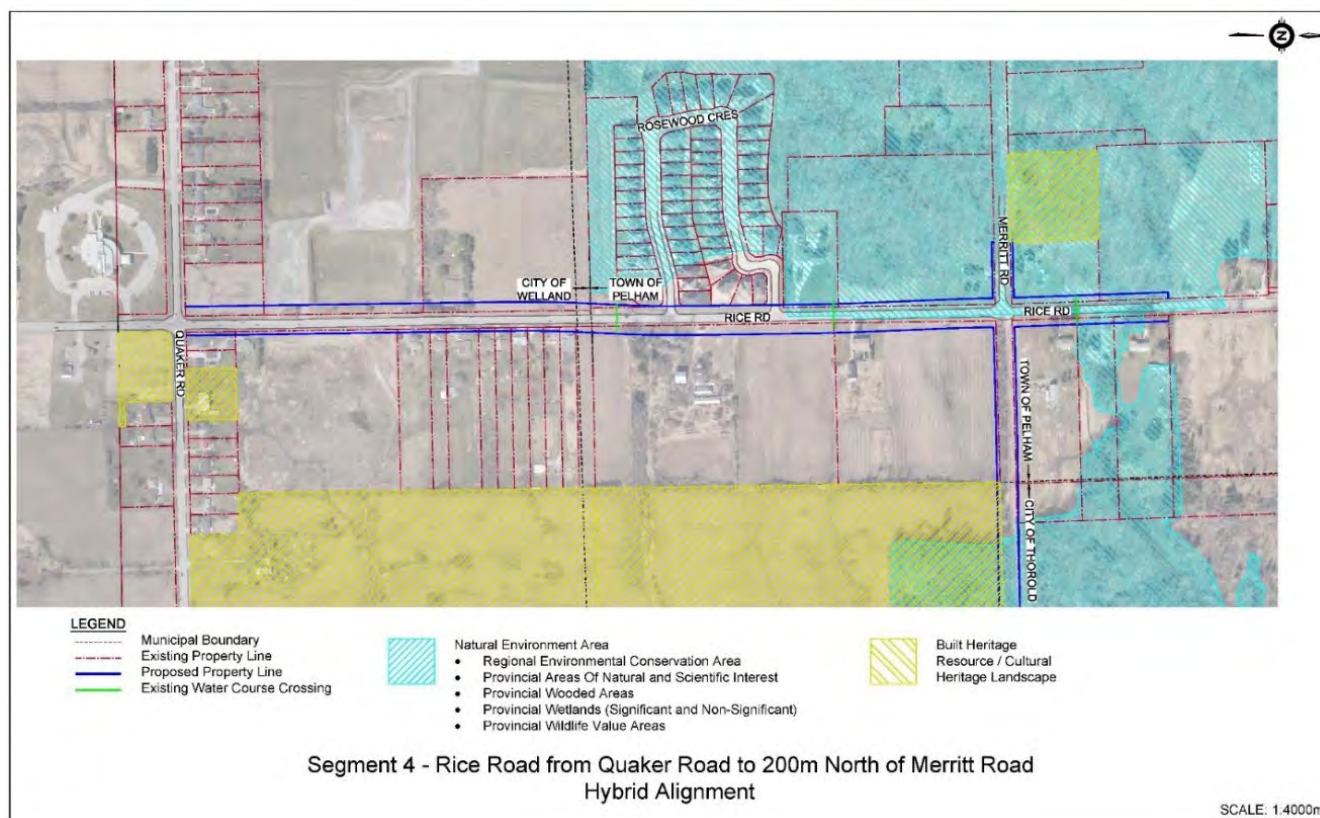
Alternative B - North Alignment was identified as the preferred alignment for **Segment 3**. This alternative would involve widening the existing Merritt Road to 36 meter wide road right of way between Merrittville Highway and Grisdale Road. The preliminary preferred alignment for Segment 3 is shown in Figure 7-3.

Figure 7-3: Segment 3 - Alternative B: North Alignment (Widen to the north)



Alternative B - Hybrid Alignment was identified as preferred alignment for **Segment 4**. This alternative would involve widening the existing road to 36 meter road right of way with the north section shifted slightly to the east. The widening would occur on Rice Road from Quaker Road to 200 meter north of Merritt Road. The preferred alignment for Segment 4 is shown in Figure 7-4.

Figure 7-4: Segment 4 - Alternative B: Hybrid Alignment



7.3.2 Road Cross-Section Alternatives

7.3.2.1 Identification of Road Cross-Section Alternatives for Segments 1, 2, 3, and 4

Two cross-section alternatives were identified and evaluated for each road segment. Cross section alternatives were designed in accordance with the Region's Complete Street Design Manual. In addition, input was obtained on the cross-section alternatives from the staff from the Niagara Region, the Town of Pelham, the City of Thorold, and the City of Welland. The cross sections also considered design recommendations of the Health Impact Assessment that was completed by the Niagara Region's staff (see Appendix T). These recommendations include provision of physically separated and continuous active transportation facilities. On-road bike lanes were not included in the cross-section alternatives as they are deemed less safe compared to off road facilities (e.g., cycle tracks, multi-use paths). As such, off-road cycle tracks and multi-use paths were considered as they are a safer option than on-road bike lanes.

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The following are the definitions of rural, urban and hybrid cross sections, which are referenced throughout the following sub-sections:

- Rural Cross Section: A cross-section with partially paved shoulders with no curbs and ditches.
- Urban Cross Section: A cross-section with curbs with a storm sewer system.
- Hybrid Cross Section: A cross-section with curbs and ditches.

The table below briefly identifies the cross-section alternatives. Additional cross sections were identified but were ruled out due to the design constraints presented at the beginning of the memo provided in Appendix P. The alternatives listed below represent those cross sections that were short listed based on discussions with Regional staff. The alternatives, including their key design features and their evaluation process are discussed in further detail in subsections below.

Table 7-7: Road Cross-Sections Alternatives

Road Segment	Alternatives for Cross-Sections
Segment 1: Merritt Road (Rice Road to Cataract Road)	Alternative A: Rural Cross-section: Two travel lanes with shoulders, ditches, sidewalk on north side and cycle track on south side Alternative B: Hybrid (Rural-Urban) Cross-section: Two travel lanes with curbs and ditches, sidewalk and cycle track on north side
Segment 2: Merritt Road (Cataract Road to Merrittville Highway / Niagara Street)	Alternative A: Rural Cross-section: Two travel lanes with shoulder, ditches, sidewalk on north side and cycle track on south side Alternative B: Hybrid (Rural-Urban) Cross-section: Two travel lanes with curbs and ditches, sidewalk and cycle track on north side
Segment 3: Merritt Road (Merrittville Highway / Niagara Street to Highway 406)	Alternative A: Urban Cross-section: Four travel lanes, sidewalk and cycle track on south side Alternative B: Urban Cross-section: Four travel lanes with curbs and sidewalk and cycle track on both sides
Segment 4: Rice Road (200 m north of Merritt Road to Quaker Road)	Alternative A: Rural Cross-section: Four drive lanes with ditches, sidewalk on both sides and cycle track on west side Alternative B: Hybrid (Rural-Urban) Cross-section: Four drive lanes with curbs and ditches, sidewalk on both sides and cycle track on west side

7.3.2.2 Evaluation Criteria for Road Cross-Sections

Evaluation criteria for road cross-section alternatives is provided in the table below.

Table 7-8: Evaluation Criteria for Road Cross-Section Alternatives

Factor	Evaluation Criteria
Transportation	Active Transportation: Potential to incorporate active transportation facilities for walking and cycling Road Safety: Potential to improve road safety and pedestrian and cyclists' safety
Engineering/Constructability	Operation and Maintenance: Feasibility of operation and maintenance Stormwater Management: Ability to provide opportunities to reduce stormwater quantity and/or improve stormwater quality
Cost	Construction Cost: Cost to construct Operations and Maintenance Cost: Cost to operate and maintain

7.3.2.3 Evaluation of Road Cross-Sections for Segments 1, 2, 3, and 4

Preferred road cross-section was selected for each road segment based on a detailed evaluation of road alignment alternatives using a set of criteria noted in the table above. Summary scoring tables are provided below. **For more details, please refer to the detailed evaluation of alternative design concepts provided in Appendix P.**

Table 7-9: Evaluation of Road Cross-Section Alternatives for Segment 1

Evaluation Criteria	Alternative A: Rural Cross-section	Alternative B: Hybrid (Rural-Urban) Cross-section
Transportation		
Active Transportation	●	●
Road Safety	◐	●
Engineering/Constructability		
Flexibility in Design	◐	●
Operation and Maintenance	◐	●
Stormwater Management	●	●
Cost		
Construction Cost	◐	●
Operations and Maintenance Cost	●	●
Overall Recommendation	Not Recommended	Recommended

Table 7-10: Evaluation of Road Cross-Section Alternatives for Segment 2

Evaluation Criteria	Alternative A: Rural Cross-section	Alternative B: Hybrid (Rural-Urban) Cross-section
Transportation		
Active Transportation	●	●
Road Safety	◐	◐
Engineering/Constructability		
Flexibility in Design	◐	◐
Operation and Maintenance	◐	●
Stormwater Management	●	●
Cost		
Construction Cost	◐	●
Operations and Maintenance Cost	●	●
Overall Recommendation	Not Recommended	Recommended

Table 7-11: Evaluation of Road Cross-Section Alternatives for Segment 3

Evaluation Criteria	Alternative A: Urban Cross-section	Alternative B: Urban Cross-section
Transportation		
Active Transportation	●	●
Road Safety	●	◐
Engineering/Constructability		
Flexibility in Design	●	◐
Operation and Maintenance	●	◐
Stormwater Management	●	●
Cost		
Construction Cost	●	◐
Operations and Maintenance Cost	●	◐
Overall Recommendation	Recommended	Not Recommended

Table 7-12: Evaluation of Road Cross-Section Alternatives for Segment 4

Evaluation Criteria	Alternative A: Rural Cross-Section	Alternative B: Hybrid (Rural-Urban) Cross-section
Transportation		
Active Transportation		
Road Safety		
Engineering/Constructability		
Flexibility in Design		
Operation and Maintenance		
Stormwater Management		
Cost		
Construction Cost		
Operations and Maintenance Cost		
Overall Recommendation	Not Recommended	Recommended

7.3.2.4 Preliminary Preferred Road Cross-sections Alternatives for Segments 1, 2, 3, and 4

The following cross-section alternatives were identified are preliminary preferred:

- Segment 1: Alternative B - Hybrid (Rural-Urban) Cross-section: Two travel lanes with curbs and ditches, sidewalk and cycle track on north side
- Segment 2: Alternative B – Hybrid (Rural-Urban) Cross-section: Two travel lanes with curbs and ditches, sidewalk and cycle track on north side
- Segment 3: Alternative A - Urban Cross-section: Four travel lanes, sidewalk and cycle track on south side
- Segment 4: Alternative B - Hybrid (Rural-Urban) Cross section: Four drive lanes with curbs and ditches, sidewalk on both sides and cycle track on west side

7.3.3 Road Intersection Alternatives

7.3.3.1 Identification of Road Intersection Alternatives

Road intersection alternatives were identified and evaluated for the following four key intersections along the study corridor:

- Merritt Road and Rice Road
- Merritt Road and Cataract Road
- Merritt Road and Merrittville Highway/Niagara Street
- Rice Road and Quaker Road

Alternative road intersection alternatives are identified in the table below.

Table 7-13: Road Intersection Alternatives

Road Intersection	Alternatives for Intersections
Merritt Road and Rice Road	Alternative A: Traffic Signal Alternative B: Roundabout
Merritt Road and Cataract Road	Alternative A: Traffic Signal Alternative B: Roundabout
Merritt Road and Merrittville Highway / Niagara Street	Alternative A: Maintain Existing Traffic Signal and Remove Northbound Right-turn Channel Alternative B: Roundabout
Rice Road and Quaker Road	Alternative A: Traffic Signal Alternative B: Roundabout

7.3.3.2 Evaluation Criteria for Road Intersection Alternatives

The evaluation criteria used to evaluate road intersection alternatives is provided below:

Table 7-14: Evaluation Criteria for Intersections

Factor	Evaluation Criteria
Transportation	Road Safety: Potential to improve road safety and pedestrian and cyclists' safety Operations: Potential to improve traffic operations Road Corridor Consistency: Consistency with upstream and downstream intersections
Socio-economic Environment	Private Property Impacts: Private property taking Public Realm: Ability to provide opportunities to enhance streetscaping, landscaping, and public realm along Merritt Road and Rice Road
Natural Environment	Terrestrial Environment: Impacts on terrestrial resources (vegetation, wetlands, trees and wildlife) Aquatic Environment: Impacts to fish and fish habitats
Cultural / Archaeological Environment	Archaeological Resources: Impacts on lands identified to retain potential archaeological resources Built Heritage and Cultural Resources: Impacts on built heritage and cultural heritage landscapes
Engineering/Constructability	Feasibility: Feasibility of access to local properties
Cost	Construction Cost: Cost to construct Operation and Maintenance Cost: Cost to operate and maintain

7.3.3.3 Evaluation of Road Intersection Alternatives and Preferred Intersection Improvements

Summary scoring tables are provided below. Please refer to Appendix P for detailed evaluation tables.

Table 7-15: Evaluation of Road Intersection Alternatives for Merritt Road and Rice Road Intersection

Evaluation Criteria	Alternative A: Traffic Signal	Alternative B: Roundabout
Transportation		
Road Safety		
Operations		
Road Corridor Consistency		
Socio-economic Environment		
Private Property Impacts		
Public Realm		
Natural Environment		
Terrestrial Environment		
Aquatic Environment		
Cultural Environment		
Archaeological Resources		
Built Heritage and Cultural Resources		
Engineering / Constructability		
Feasibility		
Implementation		
Utilities		
Cost		
Construction Cost		
Operation and Maintenance Cost		
Overall Recommendation	Recommended	Not Recommended

Table 7-16: Evaluation of Road Intersection Alternatives for Merritt Road and Cataract Road Intersection

Evaluation Criteria	Alternative A: Traffic Signal	Alternative B: Roundabout
Transportation		
Road Safety		
Operations		
Road Corridor Consistency		
Socio-economic Environment		
Private Property Impacts		
Public Realm		
Natural Environment		
Terrestrial Environment		
Aquatic Environment		
Cultural Environment		
Archaeological Resources		
Built Heritage and Cultural Resources		
Engineering / Constructability		
Feasibility		
Implementation		
Utilities		
Cost		
Construction Cost		
Operation and Maintenance Cost		
Overall Recommendation	Recommended	Not Recommended

Table 7-17: Evaluation of Road Intersection Alternatives for Merritt Road and Merrittville Highway / Niagara Street Intersection

Evaluation Criteria	Alternative A: Traffic Signal	Alternative B: Roundabout
Transportation		
Road Safety		
Operations		
Road Corridor Consistency		
Socio-economic Environment		
Private Property Impacts		
Public Realm		
Natural Environment		
Terrestrial Environment		
Aquatic Environment		
Cultural Environment		
Archaeological Resources		
Built Heritage and Cultural Resources		
Engineering / Constructability		
Feasibility		
Implementation		
Utilities		
Cost		
Construction Cost		
Operation and Maintenance Cost		
Overall Recommendation	Recommended	Not Recommended

Table 7-18: Evaluation of Road Intersection Alternatives for Rice Road and Quaker Road Intersection

Evaluation Criteria	Alternative A: Traffic Signal	Alternative B: Roundabout
Transportation		
Road Safety		
Operations		
Road Corridor Consistency		
Socio-economic Environment		
Private Property Impacts		
Public Realm		
Natural Environment		
Terrestrial Environment		
Aquatic Environment		
Cultural Environment		
Archaeological Resources		
Built Heritage and Cultural Resources		
Engineering / Constructability		
Feasibility		
Implementation		
Utilities		
Cost		
Construction Cost		
Operation and Maintenance Cost		
Overall Recommendation	Recommended	Not Recommended

Table 7-19: Preferred Intersection Improvements

Intersection	Preferred Improvement
Merritt Road and Rice Road intersection	Alternative A: Traffic Signal
Merritt Road and Cataract Road intersection	Alternative A: Traffic Signal
Merritt Road and Merrittville Highway / Niagara Street intersection.	Alternative A: Traffic Signal (Remove Northbound Right Turn Channel)
Rice Road and Quaker Road intersection	Alternative A: Traffic Signal

7.4 Consultation on Preliminary Preferred Design

As required by the Municipal Class EA process, the public, Indigenous Communities, government agencies, and key stakeholders were contacted to share the results of the evaluation of alternative design concepts and obtain input on the preferred design.

A discussion of consultation process is provided in Section 5.

Following the Public Information Centre #3, the project proceeded to Phase 4 of the Municipal Class EA process, where this Environmental Study Report was developed.

7.5 Revisions to Preferred Design following PIC #3

Following PIC #3, the preliminary preferred design was reviewed and technical studies (e.g., Stormwater Management Assessment) were advanced. A need was identified to revise the design to avoid the need to further widen the road right-of-way and minimize impacts to the natural environment and private properties and consider drainage conveyance. Revisions were made to cross-sections for Segments 1, 2, and 4, whereby two-way cycle track and sidewalks were replaced with a multi-use path. The final preferred design is discussed in the following section.

8 Description of Preferred Design

8.1 Complete Streets

The Niagara Region's TMP advances Niagara Region's vision for Complete Streets corridors for the Regional Roads. The emphasis of Complete Streets approach is to enhance walking, cycling and public transit and to accommodate automobiles and goods movement, while supporting placemaking through urban design.

The proposed improvements to Merritt Road and Rice Road were identified with vision from Niagara Region's Complete Street Design Manual that was being developed at the time of preparation of this report. Complete streets typologies of subject road segments are listed in Table 8-1.

Table 8-1: Complete Streets Classification of Subject Road Segments

Road Segment	Complete Streets Classification
Segment 1 – Merritt Road Between Rice Road and Cataract Road	Rural Scenic
Segment 02 – Merritt Road Between Cataract Road and Merrittville Highway / Niagara Street	Urban General
Segment 03 – Merritt Road Between Merrittville Highway / Niagara Street and Highway 406 Overpass	Urban General
Segment 04 – Rice Road Between Quaker Road and Merritt Road	Urban General

8.2 Design Criteria

The roadway design was developed in accordance with the Geometric Design Guide for Canadian Roads, 2017 (TAC) and Niagara Region Roadway Design Guideline (2017). Design criteria for the subject road segments is provided in tables on the following pages.

Table 8-2: Design Criteria for Merritt Road (Regional Road 37)

Classification	Existing Condition	Design Standards	Proposed	Reference
Road Classification (Minor Arterial)	RAU50/60	UAU60	UAU60	TAC Table 2.6.2
Posted Speed (km/h)	50 km/h	60 km/h	60 km/h	
Design Speed (km/h)	-	70 km/h	70 km/h	TAC Table 2.6.5
Heavy vehicle Usage	Truck Route	-	Truck Route	
Design Vehicle	Unknown		WB-19	TAC Table 2.4.4
Normal Crown (-0.02 m/m) Rmin (m)	-	1680	1680	TAC Table 3.2.3 Table 3.2.4
Curve Radius with Superelev. Rmin for e=0.04 (m)	-	200	200	
Reverse Crown (+0.02 m/m) Rmin for e = 0.04 (m)	-	290	290	
Curve Radius with Superelev. Rmin for e=0.06 (m)	-	190	190	
Reverse Crown (+0.02 m/m) Rmin for e=0.06 (m)	-	330	330	
Stopping Sight Distance (m)	-	105	105	TAC Tables 3.3.2, 3.3.4 and 3.3.5
Minimum “k” Factor	-	Crest: 17 Sag:23	Crest: 17 Sag: 23	
Right Turn Taper without Auxiliary Lane	-	21:1	21:1	TAC Table 9.14.1
Right Turn Taper with Parallel Lane (Taper Ratio)	-	17:1 – 20:1	17:1 – 20:1	TAC Table 9.14.2
Right Turn Taper with Parallel Lane (Parallel Lane Length)	-	50 - 110	50 - 110	
Left Turn Taper without Auxiliary Lane	-	15:1 - 42:1	15:1 - 42:1	TAC Table 9.17.1
Left Turn Taper with Parallel Lane	-	10:1 – 18:1	10:1 – 18:1	TAC Table 9.17.2
Through Lane	-	3.30 – 3.70	3.5	TAC Table 4.2.3
Left Turn Lane	-	3.25 – 3.50	3.25	TAC Section 4.3.2.3
Right Turn Lane	-	3.25 – 3.50	3.25	TAC Section 4.3.2.2
Curb Lane	-	3.50 – 3.75	3.50	
Bicycle Lane	-	1.80 – 2.50	1.5	TAC Table 5.3.4
Bus Bay	-	3.00	3.00	NRS 501.010-M
Min. Flush Median Width (m)	-	1.50 (Concrete) 1.00 - 4.00 (Flushed)	0.00 – 2.00 (Flushed)	TAC Section 4.5.3
Boulevard Width (m)	-	1.50 (min)	3.8 – 9.0	TAC Section 4.6.1
Sidewalk Width (m)	-	1.50 -2.30	1.8	
Clear Zone Distances (m)	-	3.0 - 3.5 (750-1500 ADT)	3.5	TAC Table 7.3.1
Tangent Section Cross Fall	Unknown	2%	2.0%	
Sidewalk Cross Fall	Unknown	2%	2.0%	TAC Section 4.6.1
Driveway Grades (max) Behind Sidewalk	Unknown	-	8.0%	TAC Figure 8.9.4
Driveway Grades (max) B/W Curb and Sidewalk	Unknown	-	8.0%	TAC Figure 8.9.4
Maximum Grade	Unknown	5%	5%	
Minimum Grade	Unknown	0.5%	0.4% (along centerline and gutter tangent road sections) (0.8% around corner Curb radii)	Niagara Region Roadway Design Guidelines - 2017
Minimum Daylighting Triangle			15 m X 15 m	Niagara Region Official Plan (2022) – Schedule

Table 8-3: Design Criteria for Rice Road (Regional Road 54) (City of Welland)

Classification	Existing Condition	Design Standards	Proposed	Reference
Road Classification (Minor Arterial)	RAU50	UAU50	UAU50	TAC Table 2.6.2
Posted Speed (km/h)	50 km/h	50 km/h	50 km/h	
Design Speed (km/h)	-	60 km/h	60 km/h	TAC Table 2.6.5
Heavy vehicle Usage	Truck Route?	-	Truck Route	
Design Vehicle	Unknown		WB-19	TAC Table 2.4.4
Normal Crown (-0.02 m/m) R _{min} (m)	-	1290	1290	TAC Table 3.2.3 Table 3.2.4
Curve Radius with Superelev. R _{min} for e=0.04 (m)	-	150	150	
Reverse Crown (+0.02 m/m) R _{min} for e = 0.04 (m)	-	185	185	
Curve Radius with Superelev. R _{min} for e=0.06 (m)	-	130	130	
Reverse Crown (+0.02 m/m) R _{min} for e=0.06 (m)	-	220	220	
Stopping Sight Distance (m)	-	85	85	TAC Tables 3.3.2, 3.3.4 and 3.3.5
Minimum “k” Factor	-	Crest: 11 Sag: 18	Crest: 11 Sag: 18	
Right Turn Taper without Auxiliary Lane	-	18:1	18:1	TAC Table 9.14.1
Right Turn Taper with Parallel Lane (Taper Ratio)	-	14:1 – 17:1	14:1 – 17:1	TAC Table 9.14.2
Right Turn Taper with Parallel Lane (Parallel Lane Length)	-	50 - 110	50 - 110	
Left Turn Taper without Auxiliary Lane	-	15:1 - 36:1	15:1 - 36:1	TAC Table 9.17.1
Left Turn Taper with Parallel Lane	55 - 65	10:1 – 12:1	10:1 – 12:1	TAC Table 9.17.2
Through Lane	3.30	3.00 – 3.70	3.5	TAC Table 4.2.3
Left Turn Lane	3.00 - 3.30	3.25 – 3.50	3.25	TAC Section 4.3.2.3
Right Turn Lane	3.00 – 3.30	3.25 – 3.50	3.25	TAC Section 4.3.2.2
Curb Lane	-	3.50 – 3.75	3.50	
Bicycle Lane	-	1.80 – 2.50	1.5	TAC Table 5.3.4
Boulevard Width (m)	-	1.50 (min)	5.5	TAC Section 4.6.1
Sidewalk Width (m)	-	1.50 -2.30	2.0	
Clear Zone Distances (m)	-	3.0 - 3.5 (750-1500 ADT)	3.5	TAC Table 7.3.1
Tangent Section Cross Fall	Unknown	2%	2.0%	
Sidewalk Cross Fall	Unknown	2%	2.0%	TAC Section 4.6.1
Driveway Grades (max) Behind Sidewalk	Unknown	-	8.0%	TAC Figure 8.9.4
Driveway Grades (max) B/W Curb and Sidewalk	Unknown	-	8.0%	TAC Figure 8.9.4
Maximum Grade	Unknown	5%	5%	
Minimum Grade	Unknown	0.5%	0.4% (along centerline and gutter tangent road sections) (0.8% around corner Curb radii)	Niagara Region Roadway Design Guidelines - 2017
Minimum Daylighting Triangle			15 m X 15 m	Niagara Region Official Plan (2022) – Schedule M

Table 8-4: Design Criteria for Rice Road (Regional Road 54) (Town of Pelham)

Classification	Existing Condition	Design Standards	Proposed	Reference
Road Classification (Minor Arterial)	RAU60	UAU60	UAU60	TAC Table 2.6.2
Posted Speed (km/h)	60 km/h	60 km/h	60 km/h	
Design Speed (km/h)	70 km/h	70 km/h	70 km/h	TAC Table 2.6.5
Heavy vehicle Usage	Truck Route	-	Truck Route	
Design Vehicle	Unknown		WB-19	TAC Table 2.4.4
Normal Crown (-0.02 m/m) R _{min} (m)	-	1680	1680	TAC Table 3.2.3 Table 3.2.4
Curve Radius with Superelev. R _{min} for e=0.04 (m)	-	200	200	
Reverse Crown (+0.02 m/m) R _{min} for e = 0.04 (m)	-	290	290	
Curve Radius with Superelev. R _{min} for e=0.06 (m)	-	190	190	
Reverse Crown (+0.02 m/m) R _{min} for e=0.06 (m)	-	330	330	
Stopping Sight Distance (m)	-	105	105	TAC Tables 3.3.2, 3.3.4 and 3.3.5
Minimum “k” Factor	-	Crest: 17 Sag:23	Crest: 17 Sag: 23	
Right Turn Taper without Auxiliary Lane	-	21:1	21:1	TAC Table 9.14.1
Right Turn Taper with Parallel Lane (Taper Ratio)	-	17:1 – 20:1	17:1 – 20:1	TAC Table 9.14.2
Right Turn Taper with Parallel Lane (Parallel Lane Length)	-	50 - 110	50 - 110	
Left Turn Taper without Auxiliary Lane	-	15:1 - 42:1	15:1 - 42:1	TAC Table 9.17.1
Left Turn Taper with Parallel Lane	-	10:1 – 18:1	10:1 – 18:1	TAC Table 9.17.2
Through Lane	-	3.30 – 3.70	3.5	TAC Table 4.2.3
Left Turn Lane	-	3.25 – 3.50	3.25	TAC Section 4.3.2.3
Right Turn Lane	-	3.25 – 3.50	3.25	TAC Section 4.3.2.2
Curb Lane	-	3.50 – 3.75	3.50	
Bicycle Lane	-	1.80 – 2.50	1.5	TAC Table 5.3.4
Boulevard Width (m)	-	1.50 (min)	5.5	TAC Section 4.6.1
Sidewalk Width (m)	-	1.50 -2.30	2.0	
Clear Zone Distances (m)	-	3.0 - 3.5 (750-1500 ADT)	3.5	TAC Table 7.3.1
Tangent Section Cross Fall	Unknown	2%	2.0%	
Sidewalk Cross Fall	Unknown	2%	2.0%	TAC Section 4.6.1
Driveway Grades (max) Behind Sidewalk	Unknown	-	8.0%	TAC Figure 8.9.4
Driveway Grades (max) B/W Curb and Sidewalk	Unknown	-	8.0%	TAC Figure 8.9.4
Maximum Grade	Unknown	5%	5%	
Minimum Grade	Unknown	0.5%	0.4% (along centerline and gutter tangent road sections) (0.8% around corner Curb radii)	Niagara Region Roadway Design Guidelines - 2017
Minimum Daylighting Triangle			15 m X 15 m	Niagara Region Official Plan (2022) – Schedule M

8.3 Proposed Road Design

The preferred design for Merritt Road and Rice Road is described in this section, and depicted on plans included in Appendix Q. As noted in Section 7.5, following PIC #3, the preliminary preferred design was reviewed and technical studies (e.g., Stormwater Management Assessment) were advanced. A need was identified to revise the design to avoid the need to further widen the road right-of-way and minimize impacts to the natural environment and private properties and consider drainage conveyance.

8.3.1 Segment 1

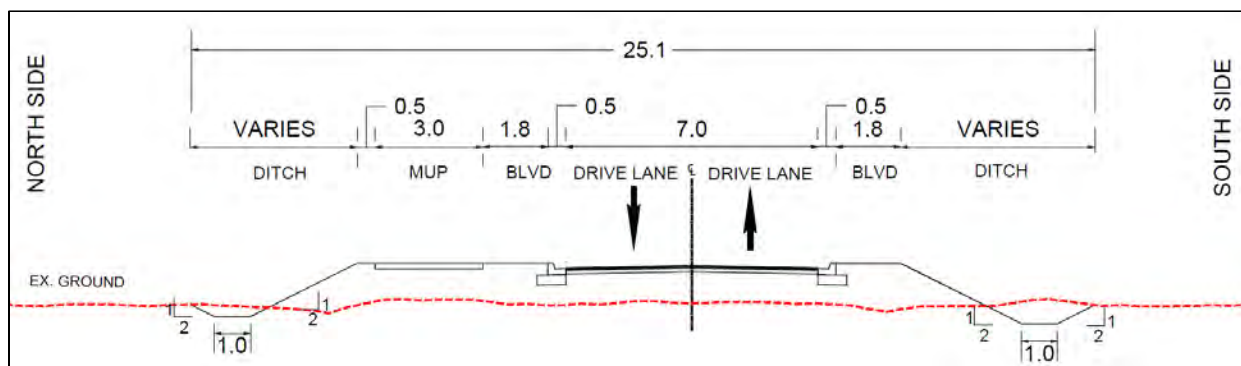
The proposed cross-section for Segment 1, Merritt Road from Rice Road to Cataract Road is a Hybrid (Rural-Urban) Cross-section with following design features (based on Rural Scenic typology):

- Two 3.5 meter drive lanes with curbs
- A 3.0 meter multi-use path on the north side
- Ditches on both sides

This segment is located within the Town of Pelham and City of Thorold with a proposed right-of-way (ROW) of 25.1 metres to accommodate a multiuse path along the north side allowing space for a utility corridor, boulevard space for street furniture, and landscape treatment. The proposed cross-section for Segment 1 is shown below. The ultimate configuration for lighting for roadway and active transportation facilities will be determined during detailed design phase.

Segment 1 is currently under the ownership of the Town of Pelham and the City of Thorold. Following the completion of the Class EA Study, the ownership will need to be transferred to the Niagara Region.

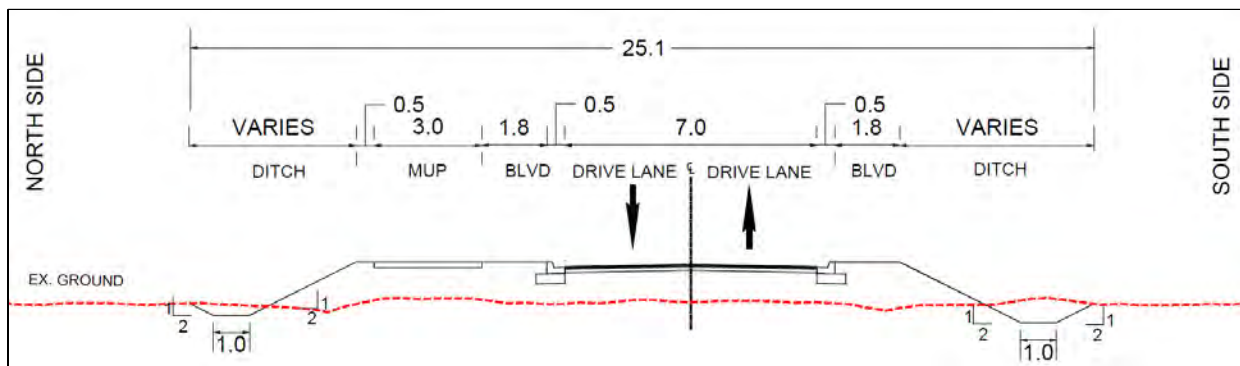
Figure 8-1: Proposed Cross-Section for Segment 1 – Merritt Road, from Rice Road to Cataract Road



The proposed cross-section for Segment 2, Cataract Road to Merrittville Highway / Niagara Street is a Hybrid (Rural-Urban) Cross-section with following design features (based on Urban General - typology):

- Two 3.5 meter drive lanes with curbs
- A 3.0 meter multi-use path on the north side
- Ditches on both sides

Figure 8-2: Proposed Cross-Section for Segment 2 - Merritt Rd from Cataract Rd to Merrittville Hwy/Niagara St



8.3.3.1 Merritt Road (Merrittville Highway / Niagara Street to Grisdale Road)

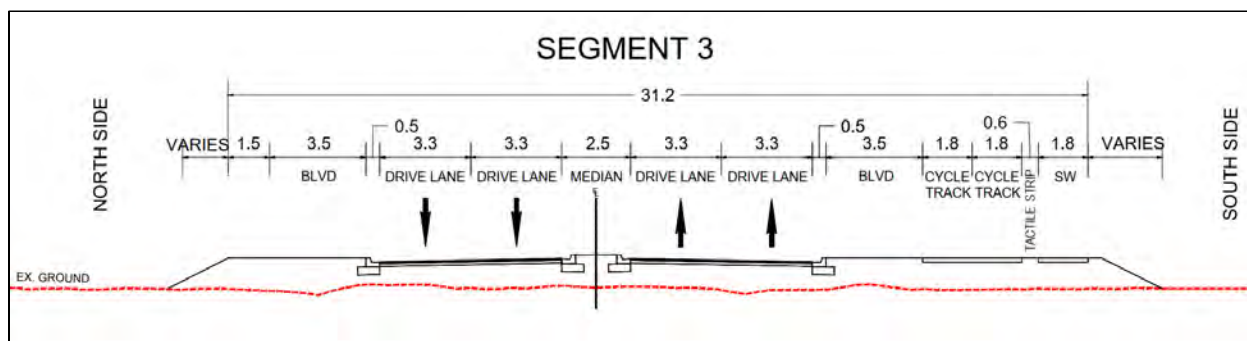
The proposed cross-section for Merritt Road from Merrittville Highway / Niagara Street to Grisdale Road is an Urban Cross-section with following design features (based on Urban General typology):

- Four 3.3 meter drive lanes separated by a 2.5 meter median
- 1.8 meter sidewalk on the south side
- A 3.6 meter separated two-way cycle track on the south side

This segment is located within the City of Welland and City of Thorold with a proposed ROW of 31.2 metres to accommodate a cycle track and sidewalk along the south side allowing space for a utility corridor, boulevard space for street trees, and landscape treatment. The sidewalk and cycle track are separated by a tactile strip inlay to create two safe corridors while

maintaining a uniform ground plane for snow removal in the winter months. Roadway lighting will be located along a centre median with a series of double luminaire poles. The ultimate configuration for lighting for roadway and active transportation facilities will be determined during detailed design phase. The widened solution will allow for the accommodation of a cycle track and sidewalk. The proposed cross-section for Segment 3 is shown below.

Figure 8-3: Proposed Cross-Section for Segment 3 – Merritt Rd from Merrittville Hwy / Niagara St to Grisdale Rd



8.3.3.2 Merritt Rd (Grisdale Road to Highway 406 Overpass / Kottmeier Road)

The design for Merritt Road east of Grisdale Road over Highway 406 overpass and up to Kottmeier Road was determined in consultation with the MTO. A total of six design options were developed and presented to the Ministry. Ultimately, Design Option 6 was identified as preferred by the Ministry staff based on several factors.

An Executive Review Meeting was held with MTO's senior management on March 21, 2023, to present the preferred Option 6 and receive MTO's approval. Option 6 was accepted in principle by MTO senior management during the meeting with provision of minor comments. The Project Team subsequently updated the Option 6 to address MTO Senior Management's comments. On May 23, 2023, the MTO staff confirmed that they have no more comments on Option 6, and the Project Team could proceed with including the preferred Option 6 in the environmental assessment reporting. Key features of MTO approved preferred design of Merritt Road, east of Grisdale Road over Highway 406 overpass and up to Kottmeier Road are discussed below:

- Provision of a multi-use path on the south side, which would transition to the north side at Highway 406 off-ramp and on-ramp intersection. Provision of a traffic signal at Highway 406 off-ramp and on-ramp intersection. The multi-use path east of this intersection would be a raised facility. This option will provide safer pedestrian crossing at the proposed signalized intersection and not yielding at on-ramps.
- Maintaining an existing eastbound left turn and providing additional eastbound through lane at off-ramp and on-ramp intersection at Merritt Road., while matching eastbound lanes prior to bridge westerly abutment to avoid impacts and widening of the existing bridge structure over the highway.

Niagara Region

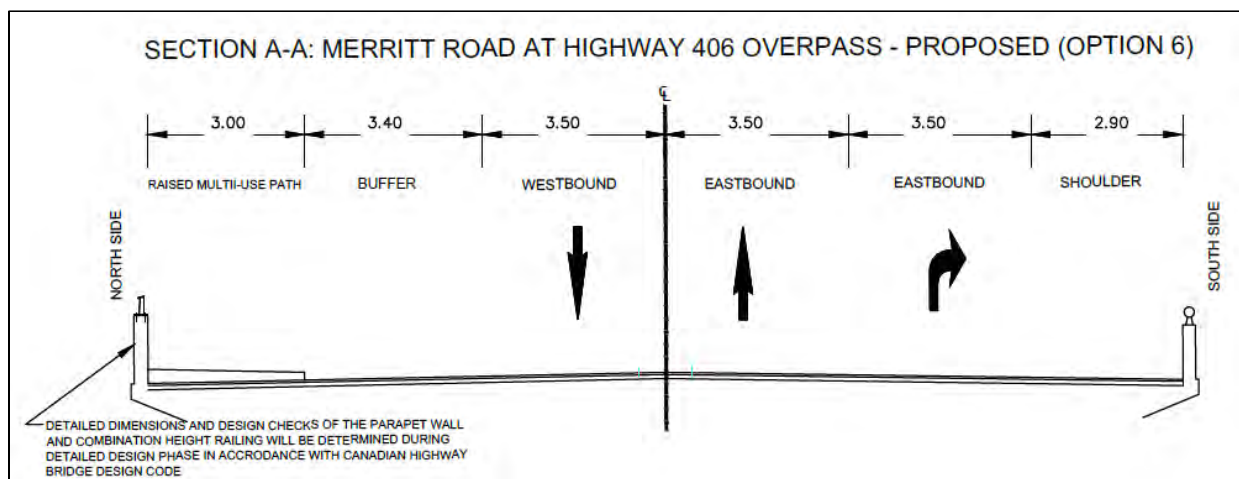
Schedule 'C' Municipal Class Environmental Assessment for Merritt Road (Regional Road 37) and Rice Road (Regional Road 54)

- Permitting a westbound left turn at Grisdale Road/Merritt Road intersection along with eastbound right and northbound right turning movements, in other words a right-in right-out plus westbound left turn (left-in). Northbound left turn from Grisdale Road to Merritt Road is not permitted under this option. The median island and right-turn channel have been proposed to ensure that northbound left turn is completely restricted. This option would facilitate safer turn onto Grisdale Road from Merritt Road with a provision of a dedicated westbound left turn lane.
- Removal of westbound right turn channel (due to low traffic volumes) and provision of a short westbound right turn lane instead at the Highway 406 southbound ramp. Removal of westbound right turn lane over the bridge will be a cost-effective solution where the MUP could be provided without widening bridge structure. Initially, a concrete median was proposed between the vehicular traffic lanes and the MUP. However, based on the feedback provided by MTO Executive Review Meeting (held March 21, 2023), the concrete median was removed from the proposed cross-section. Further, the multi-use path was proposed as a raised multi-use path.

Provision of a raised MUP over Highway 406 overpass will require adjustment to the existing parapet wall and replacement of the railing system to accommodate the raised MUP. Detailed dimensions and design checks of the parapet wall and combination height railing will need to be determined during detailed design phase. In addition, a structural evaluation of the exterior girder will be required during detailed design phase to determine whether it can take the additional dead load from the raised multi-use path. The maintenance of the widened Merritt Road and the multi-use path would be Niagara Region's responsibility.

Figure 8-4 provides a cross-section showing the proposed lane configuration and multi-use path east of Highway 406 off-ramp and on-ramp intersection. A detailed memo describing all six (6) design options for Merritt Road at Grisdale Road and Highway 406 is provided in Appendix R.

Figure 8-4: Proposed Cross-Section for Merritt Rd at Hwy 406 Overpass



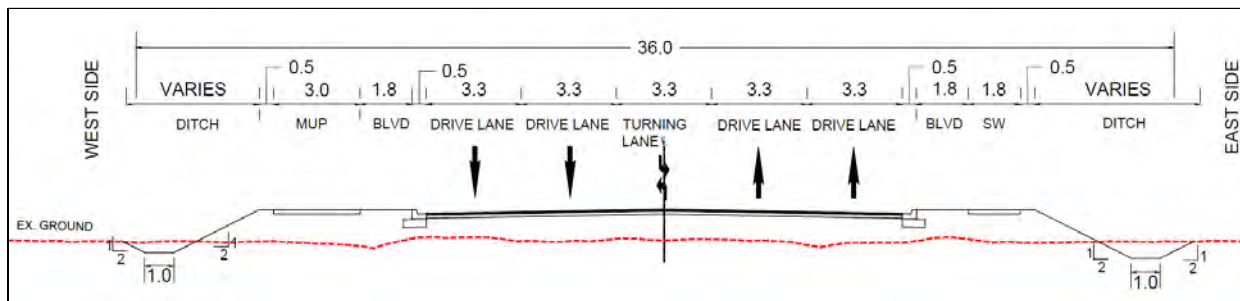
8.3.4 Segment 4

The proposed cross-section for Segment 4, Rice Road from Quaker Road to Merritt Road is an Urban Cross-section with following design features (based on Urban General typology):

- Four 3.3 meter drive lanes with a 2.5 meter median or 3.3 meter two-way left turn lane in centre
- 1.8 meter sidewalk on the east side
- A 3.0 meter multi-use path on the west side
- Ditches on both sides

This segment is located within the City of Pelham and City of Welland with two proposed ROW versions of 35.2 metres and 36.0 metres to study the option of a centre median and to accommodate a multiuse path along the west side and sidewalk along the east side to service the developed areas. These options allowed space for a utility corridor, boulevard space for street trees, and landscape treatment with street furniture locations. The proposed cross-sections for Segment 4 are shown below.

Figure 8-5: Proposed Cross-Section for Segment 4 – Rice Rd from Merritt Rd to Quaker Rd (with Centre Turning Lane)



8.4 Horizontal Alignment and Vertical Profile

The proposed horizontal alignments and vertical profiles for Merritt Road and Rice Road are depicted on plans included in Appendix Q. The horizontal alignments and vertical profiles will be reviewed and finalized during detailed design phase and may be subject to refinement at that time.

Horizontal Alignment

Segment 1 (Merritt Road extension between Rice Road and Cataract Road) - The proposed horizontal alignment for the proposed will generally follow the existing unopened road allowance.

Segment 2 (Merritt Road between Cataract Road and Merrittville Highway / Niagara Street) - The existing horizontal alignment will generally be maintained, but shifted to the south to accommodate the proposed widening which will occur to the south side of the existing roadway.

Segment 3 (Merritt Road between Merrittville Highway / Niagara Street and Highway 406)

- The existing horizontal alignment will generally be maintained, but shifted to the north to accommodate the widening which will occur to the north side of the existing roadway.

Segment 4 (Merritt Road between Quaker Road and approximately 200 metres north of Merritt Road) - The existing horizontal alignment will generally be maintained. The widening will generally occur on both side of the roadway, with the exception in the vicinity of Rosewood Crescent, where the widening will occur to the east side of the roadway.

Vertical Alignment

The vertical profile for all road segments will generally follow the existing ground profile to minimize grading and property impacts, and to match into the existing grades. Specific locations may require a slight raise in road profile to provide sufficient cover over the proposed culverts.

8.5 Intersection Improvements

Signalized intersections (traffic signals) with dedicated turn lanes are recommended for the following:

- Rice Road and Quaker Road intersection
- Rice Road and Merritt Road intersection
- Merritt Road and Cataract Road intersection

The existing signalized intersection at Merritt Road and Merrittville Highway / Niagara Street intersection is recommended to be maintained and the right turn channel on that intersection is recommended to be removed to improve future pedestrian and cyclist safety. Recommended configurations of intersections are shown in the preferred design plans in Appendix Q.

Detailed intersection design will be developed during detailed design phase. Intersections will be designed and constructed to fulfill *Accessibility for Ontarians with Disabilities Act (AODA)* requirements.

8.6 Pedestrian and Cycling Facilities

A 3.0 meter multi-use path is recommended along north side of Merritt Road, that would run in an east-west direction between Rice Road and Merrittville Highway / Niagara Street (i.e., Segments 1 and 2). In this stretch, the multi-use path is recommended on the north side of Merritt Road to provide direct access to the existing residences and commercial development that are located along that side of the road.

This active transportation facility transitions to the south side of Merritt Road into a two-way cycle track, which runs in an east-west direction until Grisdale Road. For this stretch, the sidewalk and the cycle track are recommended along the south side of Merritt Road to provide direct access to the existing Merritt Meadows subdivision and any future development on that side of the road. East of the Grisdale Road, the two-way cycle track transitions into a multiuse path. This facility transitions to the north side at Highway 406 off-ramp and on-ramp intersection and continues on to end at Kottmeier Road.

Along Rice Road, between Quaker Road and Merritt Road, a 1.8 meter sidewalk is being recommended on the east side of the road, and a 3.0 multi-use path is being recommended on the west side.

The design of the pedestrian and cyclist crossings, including pavement markings, signage, and lights, will follow design standards from the Ontario Traffic Manual (OTM) Book 15 and Book 18.

8.7 Urban Design / Streetscaping

The proposed streetscape treatment considered the following design criteria to create a functional and responsive design for the four segments of the roadways:

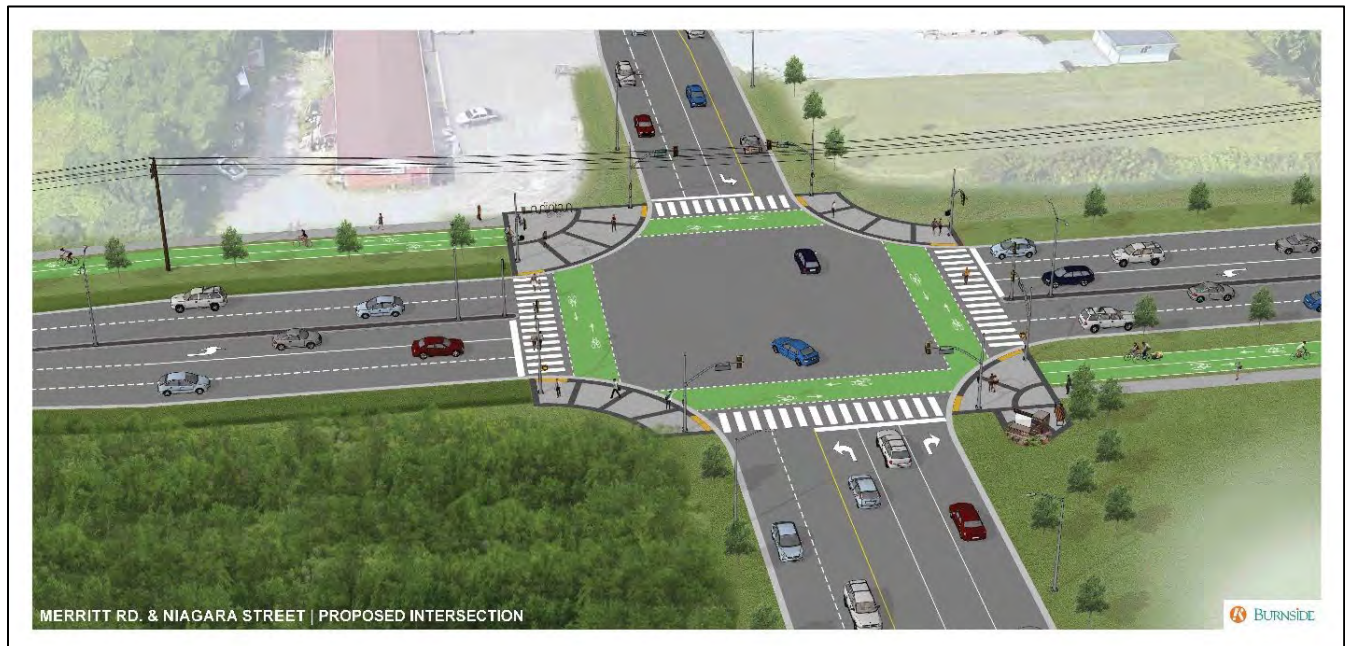
- Vegetated Swales and Low Impact Development Best Management Practices are adopted in the rural sections to encourage sustainable designs for storm water management and ground water recharge as a climate adaptation solution for this region.
- Proposed Natural Heritage System woodlot buffer zones to be planted with a mix of deciduous trees and medium shrubs to offer an enhanced environmental buffer to manage salt spray and urban pollution, to protect the NHS edges. Salt and pollution resistant species shall be in conformance to the approved list of species identified by the Niagara Peninsular Conservation Authority.
- The various site furniture typologies identified through Region's Complete Streets Manual shall be composed in a linear fashion to enhance the streetscapes and responsive to public and pedestrian safety criteria (The Complete Streets Manual was being developed at the time of preparation of this report). The functional composition of these street furniture shall be responsive to the municipal operations and maintenance requirements and winter maintenance and snow storage practices. Street furnishings may include benches, trash bins, municipal street signs, bicycle racks/parking units, destination identification and wayfinding. These furnishings may be located between tree plantings and aboveground service infrastructures, where spatially available. The frequencies, types and locations of these amenities shall require further discussions with the local municipalities during the design stages.
- Street tree placements shall be linear along the alignments of each roadway and spaced in accordance to proposed and existing built forms. High branching canopy trees are encouraged for areas clear of overhead utilities to provide protection from sun and wind. However, in areas where overhead utilities are present, small to medium sized trees planted in closer proximity may be used. All street trees specifications and species shall be subject to municipal and Niagara Peninsular Conservation Authority requirements and reviews, as well as in accordance with the Niagara Region's Master Street Tree Planting list.
- A composition of a cycle track and sidewalk shall be hard surfaces in conformance with Accessibility for Ontarians with Disabilities Act (AODA) requirements. At intersections, the project scope's street names may be etched/embossed into the surfaces to provide an identifiable signature to the proposed active transportation features within the study area. There shall be a 0.6 metre textured and coloured pavement strip to separate the cycle track and pedestrian sidewalk to negate potential user conflicts. The overall ground plane of the

proposed cycle track and sidewalk shall be at the same grade to facilitate maintenance such as sweeping and snow removal with minimal encumbrances to municipal and regional service levels.

Merritt Road and Niagara Street Intersection

The following aerial oblique rendering (developed by R. J. Burnside) illustrates an example of a logistical and functional design proposed for the flow of active transportation / cycle track, pedestrian sidewalk, crosswalk, and crossride in coordination with the live lanes of traffic. The four corners of the intersection present an ideal location for public realm placemaking treatment and an opportunity for a gateway/entrance feature with enhanced landscape treatment at the transition point of two municipalities.

Figure 8-6: Conceptual Rendering of Merritt Rd and Merrittville Hwy / Niagara St Intersection



8.8 Street Lighting

Niagara Region is responsible for the design and installation of roadway lighting on all roadways under its jurisdiction. Streetlights shall be installed along the subject road segments, in the ditches or in median, as appropriate. Illumination requirements shall be determined during detailed design in accordance with appropriate guidance documents, e.g., Niagara Region [Traffic Signal and Illumination Standards](#), Ontario Traffic Manual - Book 18 - Cycling Facilities (2021), and Transportation Association of Canada's Guide for the Design of Roadway Lighting (2006). Street lighting shall be designed such that it effectively illuminates the entire roadway as well as the cycle tracks and the sidewalk.

8.9 Access Management

As part of the Niagara Region's TMP, the Region has developed a policy to manage access on Regional Roads. Region's goal is to maintain effective traffic flow on Regional Roads by minimizing entrances, where reasonable. The policy specifies that "*Direct access to/from Regional roads should be discouraged or denied except where no alternative exists.*"

In accordance with Region's access management policy, existing accesses along Segments 1-3 (Merritt Road from Rice Road to Highway 406) have been maintained. A 2.5 meter wide raised median has been recommended along portions of Segment 4 (Rice Road from Merritt Road to Quaker Road), where current accesses do not exist. For any future development along this segment, the Niagara Region will review future site plan applications, when submitted, and related accesses in accordance with the applicable standards. Where there are existing entrances and public road intersections along Rice Road, a two-way left turn lane is being recommended to maintain left turns.

8.10 Municipal Services and Private Utilities

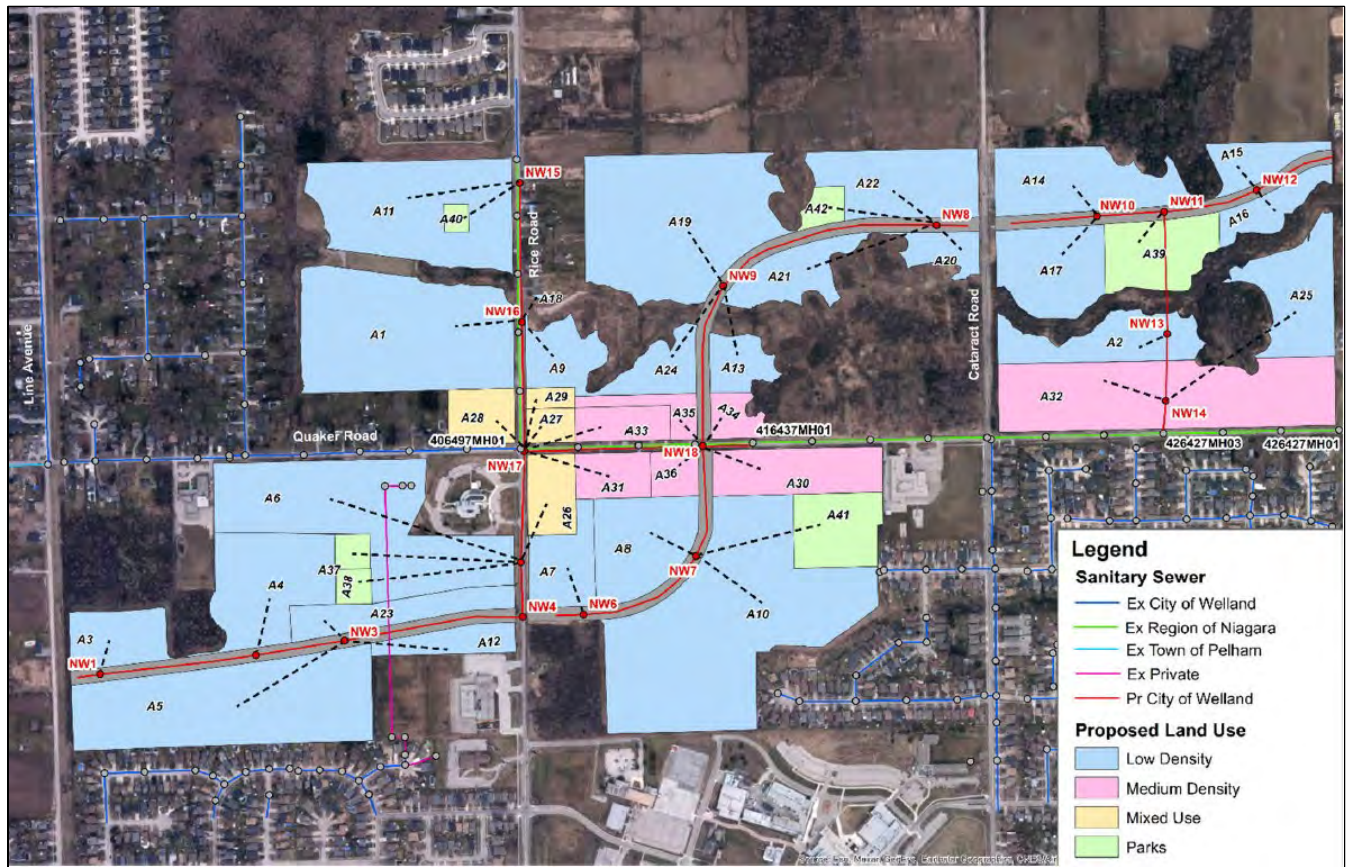
8.10.1 Municipal Services

Known planned municipal service within the Study Area include City of Welland's trunk sanitary gravity sewer, along Rice Road, north of Quaker Road, within the Northwest Welland Secondary Plan area. This sanitary trunk sewer was recommended as part of the Northwest Welland Secondary Plan Municipal Servicing Conceptual Design Report (May 2021) (Associated Engineering (Ont.) Ltd., 2021). Figure 8-7 shows the approximate location of future City trunk sanitary gravity sewer and the location where this City trunk will connect to Niagara Region's existing trunk sewer on Quaker Road.

In addition, in 2021 the Niagara Region initiated a Municipal Class Environmental Assessment to update its Water and Wastewater Servicing Plan that was developed in 2016. The Public Information Centre #2 for this Update Study was hosted on January 18, 2023, and it identified watermain along Merritt Road, from Rice Road to Niagara Street, to support growth. No wastewater infrastructure is recommended along subject road segments, although a sanitary sewer is recommended along Quaker Road, west of Rice Road. The location of these proposed water and wastewater infrastructure is shown on excerpts from 2021 Water and Wastewater Servicing Plan Update provided in Figure 8-8 and Figure 8-9. It is important to note that these infrastructure recommendations are preliminary and may be subject to change.

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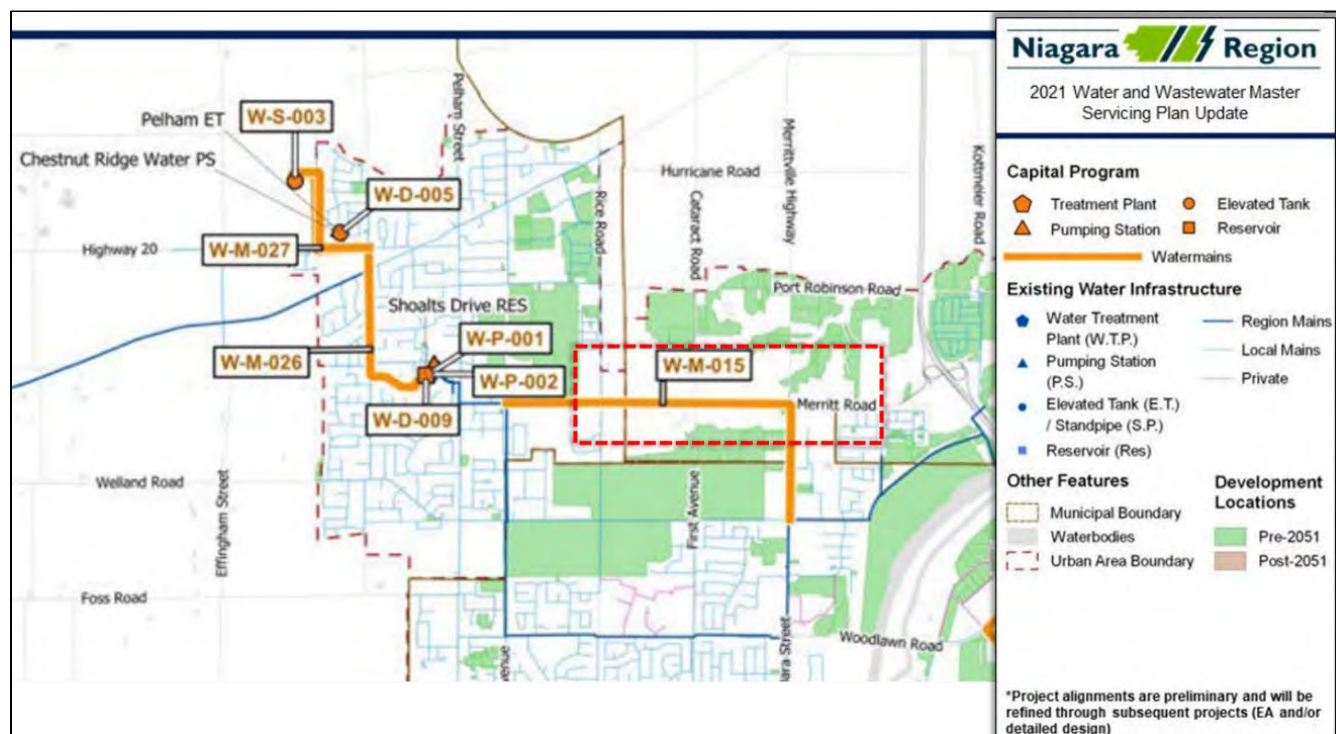
Figure 8-7: Proposed Sanitary System and Drainage Areas⁴



⁴ Source: Northwest Welland Secondary Plan Municipal Servicing Conceptual Design Report (May 2021).

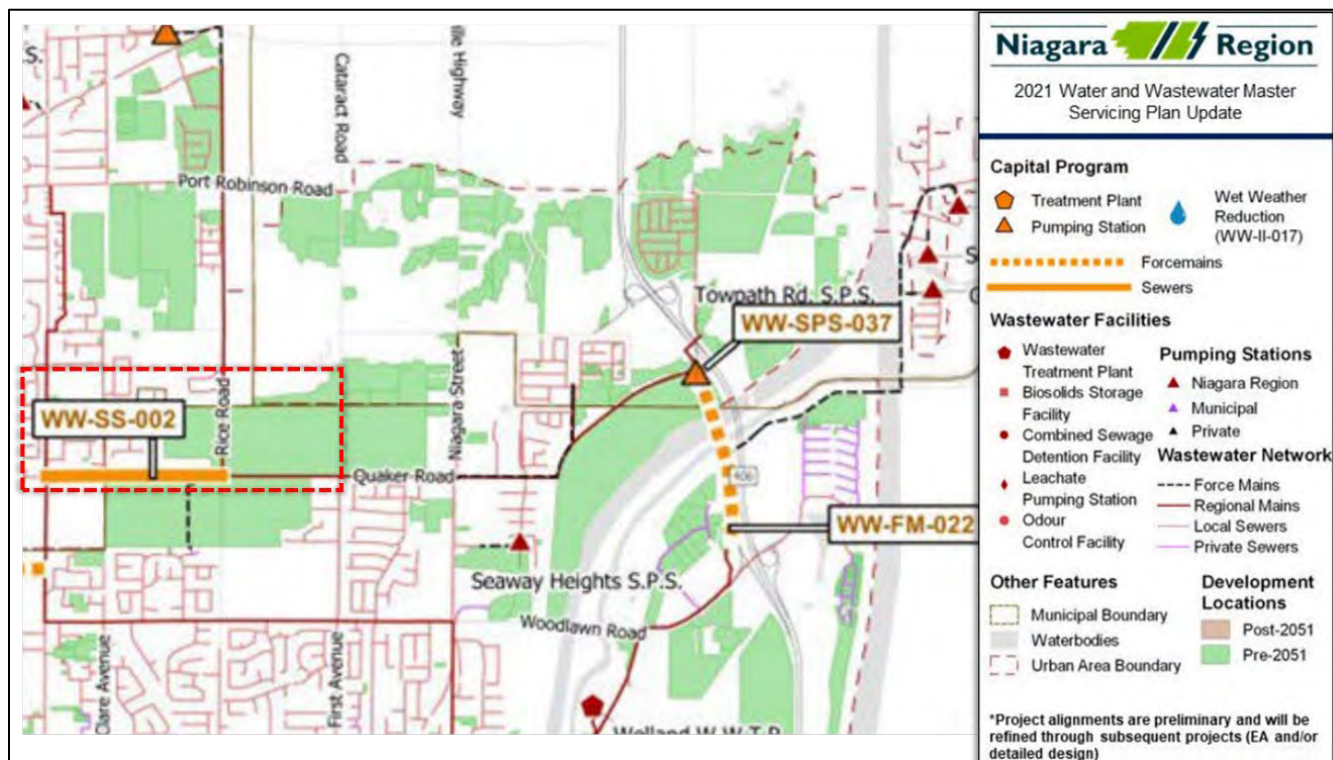
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Figure 8-8: Proposed Watermain along Merritt Road, between Rice Road and Niagara Street⁵



⁵ Source: 2021 Water and Wastewater Servicing Plan Update - Public Information Centre (PIC) No. 2 - Wednesday, January 18, 2023

Figure 8-9: Proposed Sanitary Sewer along Quaker Road, west of Rice Road⁵



8.10.2 Private Utilities

Apart from municipal services, the existing utilities along the subject road segments will require relocation to implement proposed improvements. Utility companies were contacted as part of the Class EA Study to share project information. Further consultation and coordination will be completed with the utility companies during detailed design for relocation of their infrastructure, where required.

8.11 Stormwater Management Strategy

8.11.1 Stormwater Management Design Criteria

The following documents were reviewed to identify the applicable stormwater management criteria and design requirements for this project:

- Niagara Region Stormwater Management Guidelines (December 2022)
- City of Thorold Official Plan (April 2016)
- City of Welland Municipal Standards (February 2013)
- Town of Pelham Municipal Engineering Design Criteria and Standard Drawings (August 2016)
- NPCA Stormwater Management Guideline (2010)

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- MECP Stormwater Management Practices Planning and Design Manual (2003)
- MECP Draft LID Stormwater Management Guidance Manual (2017)
- MTO's Highway Drainage Standards (2008)

The following stormwater management criteria were considered in the design:

Quantity Control: Post-development runoff peak flows are to be controlled to pre-development levels (consistent across various guidelines).

Erosion Control: The Niagara Region Guidelines identify the following options:

- Guidance from preceding studies including the assessment of downstream erosion susceptibility and critical flow values in conjunction with event modeling and assessment of downstream erosion critical velocity or shear forces in conjunction with continuous simulation techniques (duration analysis); or,
- Extended Detention storage for the 4-hour 25 mm rainfall event, or
- Retention of the geographically specific 90th percentile precipitation storm event, which for the Niagara Region is between 28-29 mm (i.e., Runoff Volume Control Target, as per the MECP Draft LID SWM Guidance Manual).

Note, the current study has not included a stream morphological assessment to determine critical flows or erosion susceptibility of the receiving watercourses. Therefore, for the current assessment this option has been screened.

Water Quality Control: 80% average annual removal of Total Suspended Solids (TSS) removal, equivalent to the MECP "Enhanced" criteria, achieved through the treatment train process. Engineered technologies such as Oil-Grit Separators and Catch Basin inserts should be ETV certified.

Water Budget: Retention of the first 5 mm of rainfall (ref. Niagara Region, 2022).

Conveyance Criteria: Minor Systems are to be designed to accommodate the 5-year return period storm event; note that Region owned sewer systems should limit surcharging during the 100-year event. Major Systems are to be designed to accommodate the 100-year storm event and will adhere to the maximum depth of flooding requirements based upon road classification.

Watercourse Crossings:

- Roadway crossings shall be designed in accordance with the MTO's Highway Drainage Standards (2008).
- Consideration for the Regulatory event shall be given, to ensure no impact to the Regulatory floodplain regulated by NPCA.

8.11.2 Hydrologic Impacts

From a hydrologic and hydraulic perspective, the proposed roadway designs will have impacts on the local conveyance system, as well as the downstream systems if left uncontrolled. The PCSWMM modelling developed for existing conditions was modified based upon the proposed roadway designs, to generate an “uncontrolled” proposed conditions model to identify the potential hydrologic impacts to the local system. A summary of the changes within each roadway segment is outlined as follows:

Segment 1: Under the existing condition, there is no constructed road in Segment 1. Consequently, the amount of additional impervious area that will drain into each outlet will be considerably higher, ranging between 5.2% and 34.8% under the proposed conditions. This substantial increase highlights the larger impact that the proposed condition will have on the overall imperviousness of the area if left uncontrolled.

The proposed roadway profile for Segment 1 has identified four low spots / outlet locations, including a total of three required cross-culverts (for both regulated watercourses / connections through the Provincially Significant Wetland), as well as the eastern portion of Segment 1 draining to Cataract Road and continuing north to the main branch of Singers Drain.

Segment 2: In Segment 2, there will be an estimated increase of approximately 2.4% in impervious areas under the proposed conditions. It is crucial to emphasize that this specific area has a history of recurrent flooding issues, mainly due to localized low points and very flat topography on Merritt Road, resulting in standing water.

The proposed roadway profile for Segment 2 has attempted to rectify the local grading issues by providing a positive slope towards both Cataract Road and Merrittville Highway, however there are limitations given the grading impacts to the adjacent properties.

Segment 3: Road improvements in this segment will increase approximate total impervious area by 6.8% and the storm drainage will be collected through a future storm sewer system. The roadway profile is generally maintained as per existing conditions; Therefore, the impacts are expected to be a result of the increased impervious areas only.

Segment 4: Segment 4 roadway improvements would increase the total impervious area draining to each outlet between 0.4% and 5.6%. As this is an existing roadway with several watercourse crossings, the drainage divides amongst the existing roadway profile should be maintained to the best extent possible. This should be further reviewed as part of the detailed design phase in terms of offsite grading impacts.

The following table presents the existing and proposed conditions drainage area comparison to quantify changes in the contributing impervious areas to each drainage outlet within each roadway segment.

Table 8-5: Existing and Proposed Conditions Drainage Area Comparison

Road Segment	Location	Station	Existing Total Area (ha)		Proposed Total Area (ha)		Difference (ha)		Difference (%)	
			Total	Imp.	Total	Imp.	Total	Imp.	Total	Imp.
4	South side of Quaker Rd.	Rice Rd. 10+140	11.66	3.23	11.66	3.23	0	0	0	0
	North side of Quaker Rd.	Rice Rd. 10+160	15.99	7.51	15.97	7.63	-0.019	0.122	-0.1%	1.6%
	Private Property @ Rice Rd.	Rice Rd. 10+390	72.88	36.48	72.80	36.63	-0.085	0.151	-0.1%	0.4%
	South Trib. @ Rice Rd.	Rice Rd. 10+720	76.19	30.68	76.47	30.96	0.279	0.280	0.4%	0.9%
	Center Trib. @ Rice Rd.	Rice Rd. 10+966	9.83	3.11	9.83	3.29	0.008	0.174	0.1%	5.6%
	North Trib. @ Rice Rd.	Rice Rd. 11+270	30.72	4.26	30.67	4.34	-0.051	0.079	-0.2%	1.9%
1	Center Trib. @ Merritt Rd.	Merritt Rd. 20+640	17.78	2.41	17.74	2.80	-0.041	0.398	-0.2%	16.5%
	South Trib. @ Merritt Rd.	Merritt Rd. 20+715	13.19	1.23	13.10	1.30	-0.083	0.064	-0.6%	5.2%
	Wetland feature @ Merritt Rd.	Merritt Rd. 20+880	9.81	0.50	9.68	0.66	-0.133	0.161	-1.4%	32.3%
	West side of Cataract Rd.	Merritt Rd. 20+960	0.47	0.23	0.59	0.31	0.123	0.081	26.3%	34.8%
2	East side of Cataract Rd.	Merritt Rd. 20+980	6.35	1.12	7.65	1.69	1.302	0.573	20.5%	51.2%
	Wetland south of Merritt Rd.	Merritt Rd. 21+235	12.15	1.28	10.82	0.72	-1.330	-0.565	-10.9%	-44.0%
	West side of Merrittville Hwy.	Merritt Rd. 21+790	10.71	2.67	10.74	2.78	0.029	0.112	0.3%	4.2%
3	East side of Merrittville Hwy.	Merritt Rd. 21+810	6.82	1.89	4.93	1.74	-1.887	-0.145	-27.7%	-7.7%
	South side of Merrittville Hwy.	Merritt Rd. 21+820	3.38	1.16	3.35	1.15	-0.033	-0.007	-1.0%	-0.6%
	Wetland south of Merritt Rd.	Merritt Rd. 22+220	3.49	0.80	3.19	0.75	-0.295	-0.046	-8.5%	-5.8%
	Eastman Gateway @ Merritt Rd.	Merritt Rd. 22+480	0.34	0.17	0.39	0.31	0.052	0.140	15.4%	82.8%
	West side of Grisdale Rd.	Merritt Rd. 22+860	0.46	0.23	5.28	1.64	4.473	1.259	555.7%	327.0%
	East side of Grisdale Rd.	Merritt Rd. 22+880	0.35	0.16						
	Wetland east of Grisdale Rd.	Merritt Rd. 23+010	17.72	2.65	13.36	1.93	-4.357	-0.722	-24.6%	-27.2%
Total Model Summary			320.27	101.75	318.23	103.86	-2.048	2.109	-0.6%	2.1%

The data in Table 8-5 indicates that the proposed roadway design results in a range of differences in both total contributing drainage area (due to any grading / high point shifts), as well as changes to the level of imperviousness for each respective outlet. Most outlets experience increases in either drainage area or level of imperviousness, however, some outlets experience a decrease in contributing drainage area or imperviousness due to any grading changes which might impact the outlet locations. These changes in drainage area will inherently have an impact on both the amount and quality of stormwater runoff, resulting in a need for stormwater management controls to minimize any risk to downstream receivers.

8.11.3 Proposed Stormwater Management Strategy

This section provides a summary of the proposed stormwater management strategy. For detailed information, please refer to the Stormwater Management and Hydraulic Assessment Report provided in Appendix F.

The proposed stormwater management strategy for the proposed road improvements includes the following elements:

- Water quantity controls are required for all individual outlets within the road ROW to control post-development flows to pre-development conditions. The recommended strategies to provide water quantity control include:
 - Temporary storage through the roadside ditches, and through the implementation of rock check dams / orifice controls for the Segments 1, 2 and 4.
 - Application of underground storage (i.e., super pipe or cellular tank storage, etc.) as part of the proposed storm sewer within Segment 3. Storm sewers for Segment 3 shall be designed as part of detailed design phase.
- Erosion control is to be provided through the application of Low Impact Development (LID) Best Management Practices (BMPs) designed to retain the Runoff Volume Control Target as identified through the Ministry of the Environment, Conservation and Parks' Draft Low Impact Development Stormwater Management Guidance Manual (i.e., 28-29 mm) for the increased impervious area within each roadway Segment. The LID BMPs may include infiltration trenches beneath the roadside ditches (hybrid segments), or Silva Cells / Bioretention features within the urban segment. The subsurface soil and groundwater conditions are required to be confirmed through detailed design phase throughout the project area to confirm that the LID BMPs can be designed to provide the required infiltration / retention.
- The Runoff Volume Control Target of 28-29 mm is to be provided to the extent feasible based on physical and site constraints with a flexible approach to both surface and subsurface storage systems, and that the target may not be feasible in some locations due to local constraints.
- Enhanced Level of water quality control is to be provided for the increased impervious area within each roadway segment through the implementation of LID BMPs such as enhanced grass swales within the hybrid roadway segments, or the combination of conventional practices (i.e., Oil and Grit Separator units, Catch Basin shields, etc.) acting as pre-treatment with LID BMPs as part of the urban segment.

- The water balance criteria of 5 mm retention can be achieved through the implementation of the infiltration trenches identified for the erosion control criteria.

8.11.4 Preliminary Culvert Sizing

8.11.4.1 Replacement of Existing Culverts

There are various cross-culverts located within the Study Area, which include both watercourse crossings as well as general ditch conveyance culverts. The PCSWMM model was used to identify preliminary culvert upgrades for the cross-culverts within the Study Area, in order to convey the major system (100-year storm), as several of them are considered to be undersized under existing conditions.

The existing culvert sizes and the resulting preliminary proposed structure upgrades are summarized in Table 8-6. The culverts are also shown visually on the Drainage Plans in Appendix A and Appendix E, with a list in Appendix F of the Stormwater Management and Hydraulic Assessment Report (provided in Appendix F).

Table 8-6: Existing and Proposed Conditions Culvert Sizes

Segment	Culvert ID	Existing Conditions		Proposed Conditions	
		Type	Size (m)	Type	Size (m)
4	R02	CIRCULAR	0.4	CIRCULAR	0.9
	R03-1	CIRCULAR	0.6	CIRCULAR	0.9
	R05	CIRCULAR	0.45	CIRCULAR	0.6
	R06	CIRCULAR	0.45	CIRCULAR	0.6
	R07	CIRCULAR	0.5	CIRCULAR	0.75
	R08	CIRCULAR	0.6	CIRCULAR	0.75
1	M04	CIRCULAR	0.3	CIRCULAR	0.6
2	M05	CIRCULAR	0.4	CIRCULAR	0.75
	M07	CIRCULAR	0.5	CIRCULAR	0.9

The sizes noted in the table above are considered preliminary and are to be confirmed at the detailed design phase, to ensure that minimum cover requirements are met with the proposed roadway profile and that the ditch grading can accommodate positive drainage to each of the culvert locations.

8.11.4.2 New Culverts

The updated existing conditions HEC-RAS model was refined to represent proposed conditions. The changes reflected in the proposed conditions modelling included updating the road deck information at the three existing culverts along Rice Road, and the addition of the two new roadway crossings within Segment 1, associated with the Centre and South Tributaries, which drain north to Cataract Road. The crossings at both Cataract Road and Merrittville Highway have remained as per existing conditions.

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The design event and freeboard requirements for hydraulic crossings are dependent upon the roadway class, and proposed structure size. Based upon the proposed roadway being a hybrid (urban/rural) cross-section and crossing design, the following MTO drainage design criteria apply:

- Culverts / bridges crossing beneath roads classified as Major Collector, with a span less than 6.0 m, are to convey the peak flow generated from a 25-year storm event;
- Culverts / bridges crossing beneath roads classified as Major Collector, with a span greater than 6.0 m, are to convey the peak flow generated from a 50-year storm event; and
- Culverts / bridges crossing beneath roads classified as Major Collector are required to provide a freeboard greater than or equal to 1.0 meter for the 50-year storm.

The preliminary structure sizing has been determined through an iterative analysis in attempt to achieve the design criteria mentioned above, as well as to minimize any impacts to the 100-year floodplain within Segment 1. The proposed conditions HEC-RAS model was simulated for the 2, 5, 10, 25, 50 and 100-year events, to complete a validation of the aforementioned design criteria, and indicate any potential impacts for local flood hazards. A summary of the evaluation of design criteria for each new or upgraded structure has been summarized in Table 8-7, documenting the water surface elevation and freeboard during the 25-year, 50-year as well as the 100-year events. The culverts are shown visually on the Drainage Plans in Appendix E of the Stormwater Management and Hydraulic Assessment Report (provided in Appendix F).

Table 8-7: Preliminary Structure Size Performance – Clearance and Freeboard

Structure ID (Road)	Preliminary Structure Size	Storm Event	Q (m ³ /s)	U/S WSE (m)	Upstream Soffit Elev. (m)	Sag Point in Road (m) ¹	Freeboard From Sag Point (m)	Meeting MTO Criteria?
N1 (Rice Rd)	3 m (W) x 0.9 m (H)	25Y	2.18	185.48	185.82	186.36	+0.88	No
		50Y	2.64	185.58	185.82	186.36	+0.78	No
		100Y	3.11	185.67	185.82	186.36	+0.69	No
C1 (Rice Rd)	3 m (W) x 0.6 m (H)	25Y	0.64	186.93	187.10	188.00	+1.07	Yes
		50Y	0.74	186.95	187.10	188.00	+1.05	Yes
		100Y	0.84	186.98	187.10	188.00	+1.02	Yes
C2 (Merritt Rd)	6 m (W) x 0.9 m (H)	25Y	0.69	182.04	182.63	183.22	+1.18	Yes
		50Y	0.80	182.08	182.63	183.22	+1.14	Yes
		100Y	1.07	182.13	182.63	183.22	+1.09	Yes
S1 (Rice Rd)	6 m (W) x 0.9 m (H)	25Y	5.93	186.78	186.68	187.12	+0.34	No
		50Y	6.89	186.82	186.68	187.12	+0.30	No
		100Y	7.85	186.87	186.68	187.12	+0.25	No
S2 (Merritt Rd)	15 m (W) x 0.9 m (H)	25Y	5.93	182.1	182.44	182.62	+0.52	No
		50Y	6.89	182.14	182.44	182.62	+0.48	No
		100Y	7.85	182.17	182.44	182.62	+0.45	No

Note: ¹ Sag point elevation is based upon the preliminary road profile. The sag points may be offset from the culvert crossing and may not be indicative of cover on top of the culvert.

Based upon the performance results provided in Table 8-7, the preliminary structure sizing includes open bottom concrete box culverts ranging in span from 3 meter wide, upwards of 15 meter wide, and relatively shallow depths of 0.6 meter or 0.9 meter. In terms of the MTO criteria, the two structures along the Center Tributary are capable of providing the 1 meter freeboard for the 25-year, 50-year and 100-year storm events. The North Tributary structure has a freeboard of approximately 0.7 meter up to 0.9 meter, through the range of events. This does not meet the MTO requirements, however through some minor refinement of the road profile and localized grading at the culvert crossing, it is likely that the 1 meter minimum could be met for the 25-year storm. These design modifications should be assessed at detailed design.

The South Tributary has the highest design flows, and therefore has the largest preliminary structure sizes. Both structures (on Rice Road and Merritt Road) are capable of conveying storms up to the 100-year without overtopping the roadway, however, do not currently achieve the minimum freeboard requirements of 1 meter. This can likely be remedied through a review of the sag points within the road profile, as well as the invert elevations within the watercourses to identify potential modifications as part of detailed design. A review of the minimum cover requirements should also be reviewed as part of the future detailed design; this may include a refinement of the roadway profile, applying a distribution slab on top of the culverts, and/or reducing the rise of the culverts and potentially increasing the span as required.

It should be noted that the floodplain within the Segment 1 ROW area is very shallow (generally less than 0.5 meter in depth) and very wide (over 250 m) due to the area's flat topography. As a result of the new proposed roadway within this area, the required structure sizing not only needs to provide the necessary flow capacity, but has also been sized to minimize any impacts to the 100-year floodplain. Due to the wide and shallow floodplain, the preliminary size determined for Structure S2 within the Segment 1 ROW resulted in a wide and shallow structure (approx. 15 meter x 0.9 meter), with the sizing minimizing the impacts of the new ROW within the 100-year floodplain. The difference in the sizing of S1 further upstream versus S2, which both convey the same peak flows, is due to the fact that Rice Road is an existing roadway, and therefore the proposed adjustments to the road profile do result in significant changes to the grades within the floodplain. Therefore, the size of the S2 structure has been primarily based upon MTO design flow requirements, instead of a new roadway acting as a flow obstruction within a wide shallow floodplain as per the S2 crossing.

8.12 Preliminary Construction Cost Estimate

A high-level preliminary construction cost estimate was developed for the proposed road improvements. It is important to note that the construction cost estimate was based on the preliminary design and is subject to refinement during detailed design phase. This cost estimate includes cost for construction, and contingency for engineering design, material testing, utility relocation, and property acquisition. The cost estimate does not include cost for any LID measures, and project permits and approvals, and associated studies and compensation requirements, as may be required. A high-level breakdown of cost estimate is provided in the following table. Detailed cost estimate is provided in Appendix S.

Table 8-8: Preliminary Cost Estimate of Proposed Works

Road Segment	Estimated Cost
Segment 1: Merritt Road from Rice Road to Cataract Road	\$8,667,574.00
Segment 2: Merritt Road from Cataract Road to Merrittville Highway / Niagara Street	\$8,802,647.00
Segment 3: Merritt Road from Merrittville Highway / Niagara Street to Highway 406	\$21,578,238.00
Segment 4: Rice Road from 200 metres north of Merritt Road to Quaker Road	\$13,523,091.00
Total	\$52,571,549.00

8.13 Construction Phasing / Implementation Strategy

8.13.1 Construction Phasing / Implementation Strategy

Based on the findings of the transportation assessment, the road improvements are recommended to be implemented as below. This construction phasing / implementation strategy is subject to review and refinement, based on completion of detailed design, acquisition of permits and approvals, property acquisition, availability of funding, and/or Regional Council approval.

Improvements to enhance vehicular traffic operations and enhance active transportation by 2031:

- Extend Merritt Road between Rice Road and Cataract Road (Niagara Region).
- Widen Merritt Road between Niagara Street/Merrittville Highway and the Highway 406 interchange to a four-lane cross-section (Niagara Region).
- Provide 3.0 meter multi-use path on the north side along Merritt Road from Rice Road to Merrittville Highway/Niagara Street.
- Provide 1.8 meter sidewalk and 3.6 meter separated two-way cycle track on the south side along Merritt Road from Merrittville Highway /Niagara Street to Grisdale Road.
- Provide 3.0 meter multi-use path on the south side along Merritt Road from Grisdale Road to Highway 406 Overpass/Kottmeier Road, which would transition to the north side at Highway 406 off-ramp and on-ramp intersection.
- Signalize the intersection of the Highway 406 southbound ramp and Merritt Road, replace the channelized westbound and southbound right turn lanes with exclusive right turn lanes at the stop bar, and widen the ramp to add a second southbound left turn lane (Niagara Region).
- At the Merrittville Hwy/Niagara Street and Merritt Road intersection, add a second westbound through lane carrying through the intersection and terminating on the departing leg, a second eastbound through lane on the west approach, a dedicated eastbound left-turn, and convert northbound right channelized lane to a regular right turn lane (Niagara Region).

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- Add a westbound left turn lane and an eastbound left turn lane at the intersection of Merritt Road and Cataract Road (Niagara Region).
- Signalize the intersections of Rice Road and Merritt Road, and Rice Road and Quaker Road, and add dedicated left-turn lanes on all approaches as per the Niagara Region's policy for signalized intersection (Niagara Region).

Improvements to enhance vehicular traffic operations and enhance active transportation by 2041:

- Widen Rice Road between Quaker Road and Merritt Road to a four-lane cross-section by 2031 (Niagara Region).
- Provide 1.8 meter sidewalk on the east side and 3.0 meter multi-use path on the west side
- Signalize the intersection of Merritt Road and Cataract Road (Niagara Region).
- At the intersection of Merritt Road at Rice Road, add a westbound protected-permitted left turn phase to the traffic signal operation (Niagara Region).
- At Rice Road and Quaker Road, add an eastbound protected-permitted left turn phase to the traffic signal operation (Niagara Region).
- Either signalize the intersection of First Avenue/Cataract Road and Quaker Road with left turn lanes on each approach or install a roundabout at the intersection (City of Thorold/City of Welland).
- Improvements to enhance vehicular traffic operations beyond 2041:
- Consider an addition southbound through lane through the intersection of Niagara Street and Quaker Road to accommodate high forecast southbound through volumes (City of Welland).

Improvements to enhance vehicular traffic operations beyond 2041:

- Consider a second westbound left turn lane for the intersection of Niagara Street/Merrittville Highway and Merritt Road to accommodate high forecast westbound left turn volumes (Niagara Region).

8.13.2 Construction Staging

Segment 1

No staging is required. New roadway will be constructed in a single stage through open field.

Segments 2, 3 and 4

These segments will be constructed under a stage approach while maintaining traffic movement along the road. To accommodate the roadway widening and proposed grade raise, it is anticipated that the roadway construction will be completed in the following stages.

Stage One: The new widened road platform for the proposed active transportation facility will be constructed on one side of the road while maintaining traffic on the existing traffic lanes. Temporary asphalt will be placed on the platform to accommodate Stage 2 traffic.

Stage Two: One lane of traffic will be shifted onto the new platform, while maintaining the second lane of traffic on the existing roadway. The new roadway platform will be widened towards the existing road centerline to accommodate the 2nd lane of traffic for Stage 3.

Stage Three: In this final stage of construction, both lanes of traffic will be shifted to the new roadway platform. The new roadway cross section width will be constructed.

Stage Four: Both lanes of traffic will be shifted to the final lane configuration. Proposed curbs and active transportation facility will be finalized into the ultimate cross-section design.

Access to existing entrances associated with private properties and road intersections will be maintained during construction so that road users may access these access/egress points from the roadway and/or their properties. Where entrances may be impacted significantly (temporarily closed), the Region will notify the private property owners in advance of the timelines for the construction so that arrangements can be made by the property owners. In these instances, efforts will be made to stage works to minimize access impacts, if possible and construction is expedited so that the inconvenience to the private property owners is minimized.

Details of the traffic staging will be designed in the detailed design phase of the project.

8.13.3 Natural Environment Timing and Permitting Constraints for Construction

This report (Section 9 and Section 10) and the Environmental Impact Study (Appendix E) identified a number of timing restriction windows and permitting / approval requirements for the project. These timing restriction windows and permitting / approval requirements (including timelines for associated technical studies and monitoring measures) will need to be reviewed during detailed design phase and may be subject to refinement and confirmation through permitting and approval process. These requirements shall be incorporated into the project construction approach and schedule. The timing windows include, but are not limited to the following:

Migratory and Breeding Birds:

- Removal of vegetation to accommodate the construction of the project could directly harm nesting birds. This impact can be avoided by removing vegetation outside of the typical bird nesting period in this area (late March to late August). These timing constraints shall not be perceived as absolutes. This period represents the core breeding period, although some species may nest in March and September. Ultimately, the objective from a compliance perspective is to not circumvent the *Migratory Birds Convention Act* and its regulations. Due diligence measures should be implemented and documented for any nest searching efforts, including record control, to ensure compliance with the *Migratory Birds Convention Act*.
- Additionally, the nests of the Pileated Woodpecker, Great Blue Heron, and Green Heron have year-round protection from destruction unless they have been shown to be abandoned. If the nest of these species has not been occupied by a migratory bird for the entirety of the waiting time indicated, it is considered to be abandoned and no longer has high conservation value for migratory birds. The waiting time for Pileated Woodpecker is

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36 months, and the waiting time for Great Blue Heron and Green Heron is 24 months. To avoid contravention of the *Migratory Birds Convention Act* and updated regulations, it is recommended that breeding bird surveys continue for three successional years before vegetation removal and included search effort for Pileated Woodpecker, Great Blue Heron, and Green Heron nests (i.e., wildlife sweeps).

Species at Risk Bats:

- No vegetation removal shall occur from April 1 to September 30 to avoid impacts to species at risk bats (permitting and consultation with MECP are required).

Fish and Fish Habitat:

- Any in-water works shall be avoided from March 1 to July 1 of any given year to protect critical life stages of the resident fish species. This in-water works restriction timing window was identified by the Ministry of Natural Resources and Forestry.

Environmental permitting / approval requirements include:

- Request for Review Form submission to Fisheries and Oceans Canada under *Fisheries Act*.
- Authorization from the Ministry of the Environment, Conservation, and Parks under *Endangered Species Act*.
- Work Permit from the NPCA for works within regulated areas and floodplain areas under *Conservation Authorities Act*.

Please refer to Section 9 and Section 10 of this report, and the Environmental Impact Study provided in Appendix E for more information on these permits. Detailed technical study requirements will need to be established for species at risk authorization and permit for works in regulated areas during detailed design phase. Consultation will be required with corresponding agencies (MECP and NPCA) to inform the technical study requirements. Timelines for the completion of any additional technical study requirements, acquiring of permits / approvals, and associated compensation and monitoring measures will need to be factored in the planning of construction schedule.

9 Potential Environmental Effects and Mitigation Measures

9.1 Transportation

9.1.1 Potential Effects

During construction of the proposed road improvements works, there is potential for temporary short-term effects on the transportation system. It is anticipated that the construction activities will result in potential traffic delays along Merritt Road and Rice Road. There is potential for delays to the travel time of the school buses and response time of the emergency response providers during construction. There is also potential for disturbance and potential safety concerns on the area students that take school buses. Lastly, there are various properties that have driveway access along the subject road segments. These driveway accesses will be temporarily affected during construction, when the driveways will need to be tied into the roadway.

9.1.2 Mitigation Measures

Following measures are being proposed for the detailed design and construction phases:

- During detailed design, a Construction Staging Plan and a Traffic Management Plan shall be developed to be included in the Tender Documents. These plans shall identify how construction will be staged, and how vehicular, pedestrian and cycling traffic will be managed during construction, recognizing the need for maintaining traffic flow to minimize traffic delays, and associated effects on the school bus travel time and emergency response time. Efforts should be made to maintain driveway accesses and reduce the length of time during which the driveway accesses will be impacted.
- The road users (including, area residents, businesses, local schools, emergency service providers and other key parties) shall be notified of proposed construction well in advance. Attempts shall be made to inform residents and businesses in a larger area, not just in the immediate vicinity of the subject road segments. Construction notifications could be issued via means to be determined by the Niagara Region and may include mailout of direct letters to the area residents and businesses, installation of signages, newspaper ads, and/or notification posting on the Niagara Region's website, and social media platforms (e.g., Facebook and Twitter).

9.2 Social and Economic Environment

9.2.1 Property Requirements

There may be temporary impacts on the adjacent properties to tie-in the grade of the roadways to the existing grade of the adjacent properties. There may also be need for land for temporary laydown areas to store and assemble construction equipment and materials. In addition, some property along Merritt Road and Rice Road will be required to accommodate the proposed road improvements. Table 9-1 provides a list of impacted private properties, whereas Appendix Q identifies the property requirements to accommodate the proposed road improvements.

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In terms of MTO right-of-way, there will be some modifications to the configuration of traffic lanes on Merritt Road across Highway 406 interchange to accommodate a sidewalk and two-way cycle track active transportation facility. These modifications will occur within the existing limits of the road right of way, and no additional property or widening of the Highway 406 interchange will be required.

Table 9-1: List of Impacted Private Properties

Property Address
1100 Niagara Street North, Welland, ON L3C 1M6
1165 Niagara Street, Thorold, ON, L3B 5N5
1376 Hansler Road, Thorold, ON, L3B 5N5
2243 Port Robinson Road, Thorold, ON, L3B 5N5
235 Merritt Road, Pelham, ON L3B 5N5
2415 Merritt Road, Thorold, ON, L3C 1M5
2483 Merritt Road, Thorold, ON, L3C 1M5
2540 Merritt Road, Thorold, ON, L3C 1M5
494 Quaker Road, Welland, ON L3C 3G8
402 Rice Road, Welland, ON L3C 3G7
427 Rice Road, Welland, ON, L3C 7C1 (Niagara Catholic District School Board)
450 Rice Road, Welland, ON, L3C 2W1
469 Rice Road, Welland, ON, L3C 2W2
494 Rice Road, Welland, ON, L3C 2W1
502 Rice Road, Welland, ON, L3C 2W1
509 Rice Road, Welland, ON, L3C 2W2
510 Rice Road, Welland, ON, L3C 2W1
516 Rice Road, Welland, ON, L3C 2W1
520 Rice Road, Welland, ON, L3C 2W1
524 Rice Road, Welland, ON, L3C 2W1
528 Rice Road, Welland, ON, L3C 2W1
538 Rice Road, Welland, ON, L3C 2W1
1131 Rice Road, Pelham, ON, L3C 2W2
1144 Rice Road, Pelham, ON, L3B 5N5
1155 Rice Road, Pelham, ON L3B 5N5
1155 Rice Road, Pelham, ON, L3B 5N5
1165 Rice Road, Pelham, ON L3B 5N5
1180 Rice Road, Pelham, ON L3B 5N5

9.2.1.1 Mitigation Measures

The impacted property owners were contacted as part of the Class EA Study, and where a response was received from the impacted property owners, the Study Team held meetings with those property owners to hold preliminary discussions related to property requirements. A summary of consultation with the impacted property owners is provided in Section 5.1.3.4 and Section 5.2.5 of this report.

Where possible, efforts were made to minimize the amount of property required. The details of property requirements (e.g., required area) shall be confirmed and refined during detailed design. The Niagara Region shall undertake further consultation with the impacted property owners during detailed design to confirm property requirements and discuss the process for property acquisitions. Where property is required, property acquisition shall be completed in accordance with the Region's realty policies and procedures.

Grading limits of the proposed road improvements shall be identified during detailed design.

The location and size of temporary laydown areas shall be confirmed during detailed design. Where possible, road right-of-way should be used for temporary laydown areas. If temporary laydown areas required on private properties, the impacted private property owners shall be consulted to obtain permission to access their properties.

For works within the right-of-way of Highway 406, an Encroachment Permit will be required from the MTO.

9.2.2 Health

A Health Impact Assessment (HIA) was completed by Niagara Region's Public Health staff during the Class EA Study. A HIA is a combination of procedures, methods, and tools by which a policy, program, or project may be judged as to its potential effects on the health of a population. HIAs evaluate potential positive and negative public health impacts prior to the implementation of a project. Within Niagara Region, HIAs are part of the Health Equity-Informed Planning Project. The work of this project aligns with Niagara Region's Strategic Plan and aims to address the unintended impacts on health and health inequities in non-health sectors.

HIA recommendations were themed into five categories: design, connectivity, accessibility, education & promotion, and partnership. Key recommendations of the HIA include the following:

- Physically separated active transportation facility is the best practice for reducing collisions (fully segregated cycle tracks or multi-use path). A combination of both facilities is recommended to best suit each road segment.
- Advocate for continuous sidewalk network within the area where cycle tracks are the selected cycling facility to prevent pedestrians from having to walk on roadways or within cycle tracks.
- Ensure adequate connection to and over the Highway 406 to Kottmeier Road for improved access to and between new neighbourhood development (with AT facilities).
- Ensure sidewalk and AT network connects to Steve Bauer Trail as well as adjacent cycling and sidewalk facilities.
- Consider a minimum width of 1,800 mm on both sidewalk and multi-use path to allow wheelchairs and scooters to pass when utilizing facility.

With the exception of connectivity to Steve Bauer Trail, the preferred design, as described in Section 8, incorporates the above noted recommendations of the HIA. It is important to clarify that Steve Bauer Trail is outside of the Study Area for the Class EA Study. Health Impact Assessment is provided in Appendix T.

9.2.3 Noise

9.2.3.1 Potential Effects

The properties along subject road segments are anticipated to experience higher noise levels during construction. Noise effects during construction will be associated with excavation, drilling, vehicular truck traffic and operation of heavy machinery. These impacts will be temporary in nature and largely unavoidable.

9.2.3.2 Mitigation Measures

To minimize the potential for construction noise effects, it is recommended that provisions be written into the contract documentation for the contractor, as outlined below:

- All equipment shall be properly maintained to limit noise emissions. As such, all construction equipment shall be operated with effective muffling devices that are in good working order.
- There shall be explicit indication in contract documents that Contractors are expected to comply with all applicable requirements of the contract and noise control by-laws of the Town of Pelham, City of Thorold and City of Welland, as may be applicable.
- Enforce lower speed limits during construction, if needed.
- Construction machinery shall adhere to the speed limits.
- The Contract documents should contain a provision that any initial noise complaint will trigger verification that the general noise control measures agreed to above are in effect.

9.2.4 Air Quality

9.2.4.1 Potential Effects

The construction activities are anticipated to affect the local air quality. These effects include dust from various material handling operations and combustion emissions from construction equipment. Such emissions will be of a temporary nature and the effects are not predicted to move far from the immediate vicinity of the construction activities.

9.2.4.2 Mitigation Measures

Recommendations for mitigation measures for reducing construction related air quality impacts are discussed in the “Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities” (Cheminfo Services Inc., 2005). Standard mitigation measures and non-chloride dust suppressants identified in this document should be utilized during construction to mitigate impacts on air quality. Typical mitigation measures include the following:

- Scheduling of construction works to consider weather forecast to take advantage of precipitation for natural dust suppression.

- Construction activities and the site shall be monitored for wind direction and weather conditions to ensure that high-impact activities be reduced when the wind is blowing consistently towards nearby critical and sensitive receptors. Visible fugitive dust shall also be monitored and immediate action shall be taken to determine the root-cause in order to counteract this.
- Each area of the construction site shall be graded separately (i.e., not all at once), timed to coincide with the actual construction in that area. This allows vegetation and cover to remain intact within the construction zone, until just prior to construction occurring on that segment of the construction site.
- Construction activities shall be scheduled and planned to limit areas of exposed soil at any given time (i.e., clear vegetation, but strategically grub).
- Site layout shall be planned to maximize separation from machinery and dust-causing activities.
- Ensure that equipment (and adequate water supply, if applicable) required for dust control and trained workers are available at work site prior to commencing construction activities with potential for dust generation.
- Exposed ground surfaces shall be stabilized with non-erodible material as soon as practicably possible after construction in the affected area where soil surfaces will remain exposed for extended periods.
- Construction vehicles / machinery and equipment shall be in good repair, equipped with emission controls, as applicable, properly maintained and operated within regulatory requirements.
- A minimal number of machines operating in any one area should be carefully considered during construction activities.
- Minimize idling of equipment and trucks located in queuing areas in proximity of residences and other establishments.

9.3 Cultural Environment

9.3.1 Built Heritage Resources and Cultural Heritage Landscape

9.3.1.1 Potential Effects

There is potential for direct impacts to one potential heritage property, CHR 8 (1100 Niagara Street) as a result of the construction of a proposed sidewalk, bike path and grass path within the property.

There is potential for indirect impacts to three potential heritage properties, CHR 1 (402 Rice Road (Regional Road 54)), CHR 3 (436 Quaker Road) and CHR 5 (1173 Merrittville Highway) resulting from minor property acquisitions.

9.3.1.2 Mitigation Measures

Should direct impacts to the potential heritage property CHR 8 (1100 Niagara Street) be required and no other technically feasible options are available, then a Heritage Impact Assessment shall be prepared for this property at the outset of the detailed design phase of the project.

The project shall be planned in a manner that minimizes encroachment on potential heritage properties CHR 1 (402 Rice Road (Regional Road 54)), CHR 3 (436 Quaker Road) and CHR 5 (1173 Merrittville Highway).

In addition, post-construction landscaping shall be completed to return the landscape to pre-construction conditions. If feasible, post-construction landscaping should use plant species that are native to Ontario.

The locations of identified CHRs shall be identified on construction mapping so that project personnel are aware of the presence of potential heritage properties within, and adjacent to, the proposed work.

9.3.2 Archaeological Resources

9.3.2.1 Potential Effects

As discussed in Section 4.4.2, a Stage 1 Archaeological Assessment was carried out in accordance with the Ministry of Heritage, Sport, Tourism and Culture Industries' 2011 Standards and Guidelines for Consultant Archaeologists. The Stage 1 Archaeological Assessment indicated that the Study Area has general archaeological potential and requires Stage 2 Archaeological Assessment. Further, no development or site alteration (including, but not limited to, grading, excavation or the placement of fill that would change the landform characteristics) is permitted on lands containing areas of archaeological potential unless significant archaeological resources have been conserved (Ministry of Municipal Affairs and Housing, 2020). During construction, there may be a potential of uncovering archaeological resources.

9.3.2.2 Mitigation Measures

The areas of archaeological potential will require a Stage 2 Archaeological Assessment prior to any land disturbance activities. The areas of archaeological potential are shown on Figure 4-30 and Figure 4-31.

As recommended in the Stage 1 Archaeological Assessment, a portion of the Study Area is located within actively cultivated agricultural fields. These portions of the Study Area will require Stage 2 property survey by means of pedestrian survey, as per Section 2.1.1 Standard 1 of the Standards and Guidelines for Consultant Archaeologists (2011). The Stage 1 Archaeological Assessment also noted that a portion of the Study Area is manicured lawns, forested or tree-lined areas where ploughing is not viable as per Section 2.1.2 Standards 1.a, 1.d and 1.e of the MHSTCI's 2011 Standards and Guidelines for Consultant Archaeologists. These portions of the Study Area shall be subject to Stage 2 property survey by means of hand shovel test pitting at 5 meter grid intervals.

It is important to note that the Stage 2 Archaeological Assessment for Segment 1 was completed as part of this Class EA Study. Stage 2 Archaeological Assessment for

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Segments 2, 3, and 4 will be completed as part of detailed design phase. Based on the results of the Stage 2 field investigation, the Stage 2 Archaeological Assessment will recommend next steps.

The Niagara Region is committed to continued engagement with Indigenous Communities. The MECP were consulted to receive a list of the Indigenous Communities to be contacted for this project. To continue to engage with Indigenous Communities, the Niagara Region will invite the following Indigenous Communities to participate in the monitoring of the Stage 2 Archaeological Assessment:

- Mississaugas of the Credit First Nation
- Six Nations of the Grand River
- Haudenosaunee Development Institute, on behalf of Haudenosaunee Confederacy

Following standard measures will apply during construction:

- Should previously undocumented archaeological resources be discovered, they may indicate 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 licensed consultant archaeologist to carry out archaeological assessment, in compliance with Section 48 (1) of the Ontario Heritage Act.
- The Funeral, Burial and Cremation Services Act, 2002, S.O. 2002, c.33 requires that any person discovering human remains must cease all activities immediately and notify the police or coroner. If the coroner does not suspect foul play in the disposition of the remains, in accordance with Ontario Regulation 30/11, the coroner shall notify the Registrar, Ontario Ministry of Public and Business Service Delivery, which administers provisions of that Act related to burial sites. In situations where human remains are associated with archaeological resources, the Ministry of Citizenship and Multiculturalism (MCM) shall also be notified (at archaeology@ontario.ca) to ensure that the archaeological site is not subject to unlicensed alterations which would be a contravention of the Ontario Heritage Act.
- Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the Ontario Heritage Act and may not be altered, or have artifacts removed from them, except by a person holding an archaeological license.

9.4 Natural Environment

Project's potential effects on natural environment were assessed and mitigation measures were proposed as part of EIS. As noted previously, the EIS was completed in accordance with the Terms of Reference developed in consultation with the NPCA and in accordance with Niagara Region's Environmental Impact Study Guidelines (Niagara Region, 2018). The EIS was shared with the NPCA on April 28, 2023, for their review. The EIS was accepted by the authority on June 15, 2023.

9.4.1 Fisheries and Aquatic Resources

9.4.1.1 Potential Effects

Watercourses containing fish habitat were documented in the Study Area; therefore, *Fisheries Act* applies to this Project. The death of fish and the harmful alteration, destruction, and displacement of fish habitat must be prevented or permitted through an authorization by Fisheries and Oceans Canada. Consultation with Fisheries and Oceans Canada will inform appropriate timing windows to complete the work and the effort required (i.e., fish salvage). Sediment and erosion control measures installed in adjacent areas to wetlands and the watercourse should aid in preventing sediment spills in aquatic habitats. Additionally, the Ministry of Natural Resources and Forestry has identified restricted in-water works timing windows for tributaries of the Welland Canal from March 1st to July 1st.

Crossings 1, Crossing 3, Crossing 4, Crossing 5, Crossing 7, Crossing 8, and Crossing 9 have been identified as suitable or seasonally suitable fish habitat. Dewatering activities could cause impacts on fish and fish habitat by:

- Direct mortality if fish are present or spawning occurs in the watercourses
- The introduction of warmer water from ponds into colder surface watercourses
- Modification or removal of aquatic habitat; displacement of plants and animals
- Increased nutrient loading of existing habitats

If the connectivity of watercourses is maintained in detailed design, these effects are expected to remain as short-term; they could become long-term if not mitigated properly. The death of fish and the harmful alteration, destruction, and displacement of fish habitat must be permitted through a Fisheries and Oceans Canada authorization as impacts can not be avoided. During detailed design, the following must be provided during Fisheries and Oceans Canada consultation/Request for Review (RFR):

- Whether the project includes work in water – if so, whether the work will be below the high-water mark;
- Project components that are proposed in or near water for each crossing (including riparian vegetation; or
- Sediment removal, temporary or permanent shoreline protection and ESC measures, temporary re-routing of the during construction, etc.).
- A brief description/list of the construction materials, methods, and equipment that is planned to be used; and
- Detailed design drawings.

9.4.1.2 Mitigation Measures

Proposed mitigation measures include:

- Appropriate selection of erosion and sediment control measures on ponding sites and design (if applicable) and choose suitable sites for stream diversions;

- Any drainage should infiltrate into the groundwater system;
- Stage work to non-critical fishery time window;
- Restoration of stream substrate; and
- Provisions for spill control.

9.4.2 Terrestrial Resources – Short-term Effects

Specific short-term impacts are described below and summarized with mitigation measures. If mitigation measures such as removing vegetation outside of the active window, wildlife sweeps, and appropriate selection and enforcement of erosion and sediment control measures and other plans are implemented, the short-term impacts listed below are expected to be mitigated and not result in a negative impact.

9.4.2.1 Potential Effects on Migratory Birds

Most species of birds in Canada are protected under the *Migratory Birds Convention Act*, through the *Migratory Birds Regulations* and the *Migratory Birds Sanctuary Guidelines*. These policies and regulations protect listed migratory bird species, their nests, eggs, and offspring. They protect migratory bird nests when they are considered to have a high conservation value for migratory birds (i.e., generally during the nesting period). Removal of vegetation to accommodate the construction of the project could directly harm nesting birds.

9.4.2.2 Mitigation Measures

To prevent harm to nesting birds, removal of vegetation (including trees and shrubs) shall be completed outside of the typical bird nesting period in this area (late March to late August).

For activities (including vegetation removal) that must occur during bird nesting season, surveys to identify nesting activity should be completed by an experienced Avian Biologist within 24 hours of scheduled work activities. Nest surveys should only be completed in simple habitats such as singular trees where all elements of the vegetation can be thoroughly observed. Complex habitats, such as vegetation communities with layers and dense foliage, reduce the certainty of capturing all potential breeding and can not be reliably cleared for removal. The Avian Biologist conducting the nest sweeps must be able to identify birds by species and be knowledgeable of nesting seasons and activities for appropriate species. Due to the uncertainty that lies with nest sweeps during construction, especially during leaf-on conditions, it is, as noted, recommended that all vegetation clearing activities occur outside the above noted bird nesting window. In the event that bird nests protected under the *Migratory Birds Convention Act*, *Fish and Wildlife Coordination Act*, or *Endangered Species Act* are encountered during construction, work must stop in the vicinity of the sighting until further direction is provided. These species and their nests must not be disturbed, tormented, injured in any way, destroyed, and/or separated from young. A protective buffer area should be established around the nest and should be determined in consultation with a qualified avian biologist, as well as the Ministry of Natural Resources and Forestry, Ministry of the Environment, Conservation and Parks and/or Canadian Wildlife Service, as necessary.

Ultimately, the objective from a compliance perspective is to not circumvent the *Migratory Birds Convention Act* and its regulations. Due diligence measures should be implemented and documented for any nest searching efforts, including record control, to ensure compliance with the *Migratory Birds Convention Act*.

Additionally, the nests of the Pileated Woodpecker, Great Blue Heron, and Green Heron have year-round protection from destruction unless they have been shown to be abandoned. If the nest of these species has not been occupied by a migratory bird for the entirety of the waiting time indicated, it is considered to be abandoned and no longer has high conservation value for migratory birds. The waiting time for Pileated Woodpecker is 36 months, and the waiting time for Great Blue Heron and Green Heron is 24 months.

To avoid contravention of the *Migratory Birds Convention Act* and updated regulations, it is recommended that breeding bird surveys continue for three successional years before vegetation removal and included search effort for Pileated Woodpecker, Great Blue Heron, and Green Heron nests (i.e., wildlife sweeps). If a nest of one of these species is encountered and there is a need to damage, disturb, destroy, or remove the nest, it must be documented that the nest has remained unoccupied by a migratory bird for the waiting period (24 to 36 months depending on the species) and a notice must be submitted on the Abandoned Nest Registry (<https://www.canada.ca/en/environment-climatechange/services/migratory-bird-permits/notice-abandoned-nest-registry.html>).

9.4.2.3 Potential Effects on Wildlife

During site preparation and construction, wildlife may cross the site and be at risk for mortality. The probability that wildlife is found in the Study Area and does not leave on its own accord is medium to high.

In addition, construction activities may cause localized, short-term increases in noise, vibrations, and dust, which could disturb wildlife and deter animals from the area. Wildlife could also be disturbed by artificial lighting if construction occurs outside of daylight hours, and dust from work activities may settle on vegetation.

9.4.2.4 Mitigation Measures

To mitigate the risk of mortality, wildlife sweeps prior to vegetation removal must be completed. When wildlife cannot leave the area, permits under the *Fish and Wildlife Coordination Act* may be required. *Fish and Wildlife Coordination Act* permits are contractor specific, whereby the individual undertaking the work to rescue and relocate or collect wildlife and/or fish will be the responsible party required to obtain the necessary permits and approvals. Similar to *Migratory Birds Regulations*, the *Fish and Wildlife Coordination Act* also protects the nest or eggs of a bird that belongs to a species that is wild by nature from destruction. If a den or habitual dwelling of a forbearing mammal (other than a fox or skunk) is documented in wildlife sweeps, the habitat is protected from damage or destruction unless it is removed by a licensed trapper or authorized by the Minister.

The brush piles and other moveable habitat features in the area should be relocated before construction. As feasible, the work area shall be surrounded by a silt (exclusion) fence within 48 hours of the commencement of construction activities to keep wildlife out of the site. The exclusion fencing shall be examined daily and repaired as needed to ensure it functions as intended.

Potential impacts on wildlife associated with artificial lighting can be mitigated by completing work in daylight hours only. In order to prevent impacts on wildlife as a result of noise and vibrations, equipment idling should be kept to a minimum during construction. Minimizing equipment idling will also reduce carbon emissions and reduce the overall carbon footprint of construction. A dust management plan should consider wind erosion of exposed stockpiles and faces by reducing the height of stockpiles (i.e., maximum of 5 meter in height), suspend excavation and dump truck loading if wind speed exceeds 60 kilometres per hour. Loaded materials shall not exceed the dump truck tray wall. Best management land use practices and best management stormwater practices are required for pollution prevention and source control.

9.4.2.5 Other Short-term Potential Effects

The impacts below could lead to long-term impacts if left unchecked and unmitigated. If the below impacts occur, immediate action could rectify the impact and result in only a short-term influence. These impacts can largely be mitigated with an appropriate Erosion and Sediment Control Plan, including dewatering and a construction staging and project phasing plan.

Surface water effects such as:

- Sedimentation and turbidity of adjacent water bodies (e.g., after site grading and during construction);
- Ponding effects on adjacent properties due to natural drainage disruption;
- Streambank erosion (drainage outlets) from diversion, construction, or channelization of watercourses; and
- Contamination of surface waters through runoff, spills, leaks, and disinfection activities.

Groundwater effects such as:

- Interference of shallow aquifers and springs;
- Depletion or lowering of shallow aquifers and springs by groundwater utilization/reduced groundwater quantity through construction dewatering;
- Spills or leaks resulting in contamination of groundwater supply;
- Drainage of wetland areas resulting in a reduced groundwater contribution to surface waterbodies;
- Reduced surface water recharge to groundwater, particularly in soils (as a result of impervious area); and
- Interference with groundwater movement.

Vegetation loss or damage to facilitate construction activities, such as:

- Soil compaction from equipment, access routes, or laydown areas;
- Changes in vegetative composition as a result of loss of topsoil and subsoil or mixing;
- Introduction of invasive plant material from previous construction sites, disturbance activities, and erosion control restoration;

- Lowering of water table resulting in a reduced contribution to streams and stress of riparian vegetation;
- Drainage of wetland areas causing mortality or stress to animals and possible changes in species composition;
- Siltation to surface watercourses resulting in “smothered” plants and animals due to the deposition of silt and increased turbidity of surface watercourses; and
- Contamination of vegetation, natural features, and groundwater due to unplanned release or discharge of deleterious substances to the environment, including fuels, lubricants (engine oil, etc.) and coolants.

9.4.2.6 Mitigation Measures

To reduce the surface water, groundwater and wildlife and vegetation loss/damage an appropriate Erosion and Sediment Control Plan, including dewatering, construction staging, and a project phasing plan is required. In general:

- Staging and access areas will be minimized as feasible to avoid disturbing the natural environment beyond the proposed disturbance limit.
- Proper dewatering techniques and ensuring appropriate controls measures to collect sediment before entering the drainage channel, trench drainage should be discharged to settling areas before being permitted to enter surface waterbodies, such as sediment traps, seasonal constraints on construction, install check dams on drainage swales, buffers and setbacks.
- Ensure the appropriate use of culverts, porous backfill, tile drains, and apply natural channel design principles and bio-engineering techniques.
- Complete hydrogeologic investigations to identify shallow aquifers and springs in advance to develop alternatives to avoid impacts.
- Maintain the existing groundwater regime through engineering design, restrict the extent of impervious surfaces (e.g., staging) in zones of high infiltration, utilize appropriate backfill material.
- Prohibit access to the extent possible to any natural areas outside of the project footprint to ensure the protection of these areas; this includes temporary access. A sediment control fence should be installed around the perimeter of the work area to provide a visual barrier and isolate wildlife from the work area.
- Operate and store materials and equipment in such a manner that prevents any deleterious substance from entering the natural environment (e.g., construction refuelling precautions and sediment fencing at the base of stockpiles). Ensure a Spill Management Plan (including spill kit materials, instructions regarding their use, staff education, and emergency contact numbers) is present on-site at all times for implementation in the event of an accidental spill. Ensure fast, accurate reporting of spills and all spills are to be reported to the Spills Action Centre (SAC) at 1 800-268-6060. Have a contingency plan for clean-up.

- Ensure that machinery arrives on site in a clean condition and is maintained free of fluid leaks, invasive species and noxious weeds. Implement disinfection techniques in concert with fisheries requirements.
- Changes in vegetative composition as a result of loss of topsoil and subsoil or mixing can be mitigated by stripping and stockpiling of topsoil separate from the subsoil and replacing soils in preconstruction horizons.
- When seeding/restoring for Erosion and Sediment Control Plan purposes, use annuals which later die out and ensure only locally native species are used.
- Identify local regulatory authorities and have contact information available on-site. Local regulatory authorities are to include the MECP, Ministry of Natural Resources and Forestry, NPCA, the Niagara Region, local area municipalities, and local emergency service providers.

9.4.3 Terrestrial Resources – Long-term Effects

Specific long-term impacts are described below and summarized with mitigation measures where applicable. Avoidance is often the prescribed mitigation measure where activities will result in a contravention of legislation or a negative impact. However, avoidance is not possible if development proceeds through an approved Environmental Assessment and therefore, mitigation measures to reduce negative impacts are provided; however, they may not eliminate or sufficiently reduce long-term negative impacts.

9.4.3.1 Potential Effects on Species at Risk

Any species at risk ranked as Threatened or Endangered that may be impacted by any project work requires consideration to avoid contravention of the *Endangered Species Act*. If impacts on species at risk or their habitat cannot be fully avoided, a permit or registration will be required under the *Endangered Species Act*. Based on fieldwork and secondary sources, three species at risk listed as Threatened or Endangered are confirmed in the Study Area: Eastern Flowering Dogwood, White Wood Aster, and Round-leaved Greenbrier. It is also noted that species at risk bats are considered present. Two other Endangered species at risk were screened as High probability of occurrence, American Chestnut and Butternut.

9.4.3.2 Mitigation Measures

Species-specific mitigation measures for these Endangered and Threatened species are as follows:

- **American Chestnut (Endangered; High probability of occurrence)** – Suitable habitat could occur in the Study Area and MECP noted in Information Gathering Form responses that the corner of Merritt Road and Rice Road has records for this species. It is thought that individuals occur along the western edge of the Study Area in the Kunda Park Forest Regional Area of Natural and Scientific Interest. The Natural Areas Inventory (2006–2009) Volume 1 also documents this species from Brady et al., 1980 with no locations and American Chestnut is also noted in the woodlot between Highway 406 and Grisdale Road based on secondary sources. A thorough tree inventory of the project footprint and 5-10 meter beyond (as applicable) is required to confirm presence. Detailed Design to avoid damage and destruction of individuals found and the General Habitat (i.e., ELC polygon) to

avoid contravention of the *Endangered Species Act*. If avoidance is not feasible, permitting and consultation with MECP will be required.

- **Butternut (Endangered; High probability of occurrence)** – Suitable habitat could occur in the Study Area and MECP noted in Information Gathering Form responses that the corner of Merritt Road and Rice Road has records for this species. It is thought that individuals occur along the western edge of the Study Area in the Kunda Park Forest Regional Area of Natural and Scientific Interest. The Natural Areas Inventory (2006–2009) Volume 1 also documents this species from Brady et al., 1980. Butternut was found in Area C of the Port Robinson Subwatershed Study. A thorough tree inventory of the footprint and 5-10 meter beyond (as applicable) is required to confirm presence. If Butternut is found during tree inventories, the first step is to have a Butternut Health Expert categorize tree health during the leaf-on period (May-August for this species). All Butternut must be assessed to inform permitting/registration/exemption requirements depending on an individual's health. Butternut trees are divided into three categories:
 - Category 1: the tree is in the advanced stages of disease as a result of Butternut Canker
 - Category 2: the tree does not have Butternut Canker, or the disease is not in advanced stages
 - Category 3: the tree could be useful in determining how to prevent or resist Butternut Canker
- A permit is not required, if the activity can be registered and the proponent follows the conditions of the conditional exemption.
- **Eastern Flowering Dogwood (Endangered; Confirmed)** – An individual was found along Merritt Road at the edge of the woodlot to the west of the Merritt Meadows subdivision. Additionally, Natural Heritage Information Centre records in several grid squares occur and the MECP noted in Information Gathering Form responses that the corner of Merritt and Rice Road has records for this species. The Natural Areas Inventory (2006–2009) Volume 1 also documents this species from Brady et al., 1980. The Eastern Flowering Dogwood was found in the woodlot between Highway 406 and Grisdale Road based on secondary sources. A thorough tree inventory of the footprint and 5-10 meter beyond (as applicable) is required to confirm presence. Detailed Design to avoid damage and destruction of the known individual and the Regulated Habitat to avoid contravention of the *Endangered Species Act*. If avoidance is not feasible, permitting and consultation with the MECP are required. Regulated Habitat is defined in O. Reg. 832/21 as the area within 20 meter of the stem and the vegetation type (i.e., ELC vegetation type).
- **White Wood Aster (Threatened; Confirmed)** – Individuals and colonies have been found along the length of the project. Additionally, NHIC records in several grid squares occur and the MECP notes in Information Gathering Form responses that the corner of Merritt and Rice Road has records for this species. The Natural Areas Inventory (2006–2009) Volume 1 also documents this species from Brady et al., 1980. The Eastern Flowering Dogwood was found in the woodlot between Highway 406 and Grisdale Road based on secondary sources. Detailed Design to avoid damage and destruction of the known individuals/colonies and the General Habitat to avoid contravention of the *Endangered*

Species Act. If avoidance is not feasible, permitting and consultation with the MECP are required. For the purposes of this document, General Habitat is considered as the extent of biophysical attributes up to 80 meter (radial distance) around existing mapped observations of the White Wood Aster. In addition, in cases where the suitable habitat extends for less than 50 meter around a White Wood Aster, a critical function zone capturing an area within a radial distance of 50 meter is also included as habitat.

- **Round-leaved Greenbrier (Threatened; Confirmed)** – A colony was found north of Section 3. Detailed Design to avoid damage and destruction of the known individuals/colonies and the General Habitat to avoid contravention of the *Endangered Species Act*. If avoidance is not feasible, permitting and consultation with the MECP are required. For the purposes of this document, General Habitat is considered as wooded area occupied by Round-leaved Greenbrier, including all contiguous wooded habitat around Round-leaved Greenbrier plants.
- **Little Brown Myotis, Northern Myotis, Tricolored Bat (Endangered; High/Confirmed)** – In the absence of surveys, this species is considered to be present/utilizing wooded habitat as summer roosting in all wooded ecosites in the Study Area. Additionally, within 50 kilometre at least one hibernaculum and/or swarming site occurs (Humphrey & Fotherby, 2019). Detailed Design to avoid damage and destruction of individuals (i.e., no vegetation removal from April 1 to September 30) and the General Habitat to avoid contravention of the *Endangered Species Act*. If avoidance is not feasible, permitting and consultation with the MECP are required. For the purposes of this document, hibernacula, swarming sites, and maternity sites are considered General Habitat. In addition, the habitat for hibernacula and swarming sites include areas of associated foraging and roosting resources, and the maternity habitat for each species includes the maternity roost site and areas of associated foraging resources.

9.4.3.3 Potential Effects on Significant Wildlife Habitat

Development in Significant Wildlife Habitat is prohibited unless it can be demonstrated that development will have no negative impact on features and functions. Impacts on Significant Wildlife Habitat as a result of the proposed road extension and widening will be the removal of areas of vegetation communities and habitats which contribute to confirmed Significant Wildlife Habitat. One confirmed Significant Wildlife Habitat type, *Deer Winter Congregation Areas – Confirmed*, must be addressed in consultation with the Ministry of Natural Resources and Forestry and is not discussed here. Impacts and removal to all of the forest and swamp complexes on site will result in impacts to three types of Confirmed Significant Wildlife Habitat; *Amphibian Breeding Habitat: Woodland*, *Amphibian Breeding Habitat: Wetland*, and *Amphibian Movement Corridors*.

As most amphibians require a source of water to reproduce the impacts on *Amphibian Breeding Habitat: Woodland* and *Wetland Significant Wildlife Habitat* are similar. For an aquatic environment to function as a breeding pond it requires unpolluted water (permanent or temporary), emergent and submergent vegetation, shoreline structures (e.g., woody debris), and surrounding habitat to provide a closed canopy and moist understory (terrestrial habitat). Therefore, a development which results in the draining or filling of small woodland ponds will destroy the function of the pond and the surrounding land for amphibians. The loss of the breeding pond will affect the population dynamics of essentially all amphibian populations in

the vicinity of the development (Ministry of Natural Resources and Forestry, 2014).

Development on adjacent land can significantly impact breeding pond functions if it alters ground or surface water quality or quantity, and adjacent development can have a very high impact if it separates the breeding habitat from the summer or winter habitat (Ministry of Natural Resources and Forestry, 2014).

In addition to direct habitat destruction, if a road is routed through amphibian breeding habitat, roads introduce salt, sediments, gasoline and oil, etc. in road surface runoff that may affect nearby breeding ponds owing to the sensitivity that amphibians show to aquatic toxicants. Likewise, sedimentation may reduce water levels of wetland areas, and may also change the composition of pond substrates. Moreover, as adults move to and from breeding ponds or juveniles disperse from ponds, large numbers are often killed by vehicles. Traffic noise from major roads may interfere with amphibian breeding choruses.

9.4.3.4 Mitigation Measures

The best mitigation option is to avoid developing in the habitat. Other alternatives include minimizing the amount of habitat affected or locating the road where wetlands are not on both sides. As these options are not possible based on the TMP and traffic assessment, it will be necessary to install passages and fencing to direct amphibian movement underneath roads. Passages must be designed to allow the maximum number of amphibians to use them. Light and moisture are important criteria for amphibian use of passages. The diameter of a culvert must increase with increasing length, or open grates passages are required. Open grate culverts also allow for increased moisture; however, the contaminant load must be considered. There should be enough moisture in the culvert during wet weather to result in a flow of water through the culvert, but without excessive ponding, flooding, or high water velocities (unless 'dry ledges' are provided). There should be no drainage patterns perpendicular to either mouth of the culvert that might direct amphibians away from the culvert. It is important that there is substrate in the culvert, and 15 cm of native soil should be placed in it to facilitate amphibian passage, or the culvert should be open-bottomed. The best designs incorporate a perpendicular wall or funnel fence at each end of the culvert that runs parallel to the road, or out from it on an angle. This needs to be designed such that it prevents amphibians from accessing the road surface and directs them into the culvert (Ministry of Natural Resources and Forestry, 2014). Sufficient culverts should be installed to allow for the normal passage of water to the wetlands but examples of passages could be a culvert >0.5 meter in diameter lined with soil or gravel, or oversize box culverts installed in shallower areas that support emergent vegetation, or a raised road may be preferable. All culverts/passages must be paired with suitable funnel fencing (e.g., 0.6-0.9 meter high funnel fencing with additional buried section and top-lip).

Additionally, runoff from the road should not be allowed to run directly into the wetlands. Stormwater detention areas should be installed to intercept water and allow it to settle prior to discharge to the wetland. For roads within or immediately adjacent to the wetland, thought should be given to installing splash guards along the edge of the road. These are barriers that attach to the railings and help reduce salt spray and the introduction of other contaminants. If these types of barriers are planned, there should be adequate room under the road to allow wildlife movement from one side of the wetland to the other.

The detailed design phase of the Project must consider the passages of amphibians to maintain the form and function of *Amphibian Breeding Habitat: Woodland*, *Amphibian Breeding Habitat: Wetland*, and *Amphibian Movement Corridor Significant Wildlife Habitat*. If road design can incorporate appropriate passages and fencing to mitigate the loss of habitat and direct mortality of individuals, the overall negative impact may be reduced or avoided.

It was also found that Eastern Wood-Pewee is a probable breeder in the Study Area, and Wood Thrush is a possible breeder and is considered under Special Concern and Rare Wildlife Species Significant Wildlife Habitat. Eastern Wood-Pewee breeding occurs in mature to intermediate-aged forests with an open understory, often associated with clearings and edges (COSEWIC, 2012). Wood Thrush breeds in mature or second-growth deciduous and mixed wood forests (COSSARO, 2013). Therefore, the forest complexes are considered under Special Concern and Rare Wildlife Species Significant Wildlife Habitat. The footprint of the road, along with associated shoulders, banks, and ditches, will result in habitat loss. Indirect loss of habitat may occur through changes in hydrology, the introduction of non-native plant species, the introduction of sediments and other contaminants, and salt spray and runoff. As sediments and changes in hydrology are potential problems, surface water runoff from the road should be directed to stormwater management ponds prior to being discharged to the adjacent forested areas. Additionally, natural flow to the significant habitat should be maintained with sufficient culverts so that the road does not form a barrier to groundwater or surface water flow. All areas must be revegetated and kept free of invasive species until native regeneration occurs. Lastly, the loss of habitat due to the road footprint must be compensated along other forest edges.

The detailed design phase of the Project must include a restoration and compensation plan to offset the negative impact of Special Concern and Rare Wildlife Species Significant Wildlife Habitat loss.

9.4.3.5 Effects on Woodlots (Fragmentation)

Fragmentation is a severe threat to the survival of many wildlife species, particularly area-sensitive species and/or those with large home ranges (OMNR 2010). Fragmentation leads to habitat degradation and modification, edge effects, overcrowding, and invasion by non-native species. Increased isolation of species, compounded with other stresses, puts them at greater risk of disappearing from a region (OMNR 2010). There is a negative impact to consider when creating a road through a natural feature when a road does not currently exist, as is the proposal for Segment 1. Additionally, the widening of roadways in other Segments will further increase the distance and barrier between retained natural areas and features.

The creation and widening of Merritt Road will directly result in woodland cutting and vegetation removal and indirectly result in the reduction of interior forest habitat due to the loss of forest edge, the potential for increased access because of road creation, human disturbance, the introduction of predators such as cats, invasion by non-native species, and the effects of noise on wildlife. Additionally, the Project is located in an area identified in the Regional Official Plan as a linkage which represents ecological connectivity between natural features and areas.

9.4.3.6 Mitigation Measures

The leading mitigation measure is to reduce the footprint of Segment 1, through the unopened road allowance, to the extent possible. Mitigation of fragmenting wildlife habitat also includes maintaining connectivity and managing adjacent areas to improve habitat availability (e.g., invasive species management, plantings, and restoration programs). It is recommended that once a grading plan and detailed design are understood, an analysis of the current interior forest (i.e., the size of the interior forest as a 200 meter buffer from the current woodland edge) and the proposed interior forest occur.

9.4.3.7 Potential Effects on Wildlife Movement

Wildlife movement through the area is unknown. It is feasible that wildlife choose to move through across the roadways.

9.4.3.8 Mitigation Measures

Mitigation includes baseline studies to identify wildlife use in the area (all four Segments). If it is found that wildlife moves through the area, to maintain wildlife connectivity, the implementation of wildlife passages would be required. As the proposed location of the road through Segment 1 will not avoid intersecting the most likely wildlife migration routes, mitigation will include funnelling wildlife through passages. As passages will likely align with drainage structures, the structures should be built with roadside wings, and be sized accordingly. Additionally, to accommodate wildlife passage, the diameters of passages should extend beyond watercourse 'shorelines' to provide dry 'shelves'. Lastly, appropriate funnel/barrier fencing or vertical walls to direct wildlife under the road that extends beyond suitable habitat is required. A long-term maintenance plan for passages and fencing is also required to maintain efficacy.

9.4.3.9 Effects on Trees and Vegetation (Removal)

The removal of trees and vegetation could result in the following negative impacts:

- loss of shade, possibly resulting in increased water temperatures;
- drying up of refugia due to increased evaporation;
- reduced bank stability and ability to trap sediment from upland areas; increased erosion, sedimentation;
- turbidity, decrease cover and diversity of vegetation leading to a decrease in biodiversity and loss of natural linkages and animal movement corridors;
- direct loss of habitat (e.g., winter cover, vernal pools, nesting trees, important food sources);
- reduction in habitat (e.g., woodland habitat for area-sensitive birds) below a critical level;
- habitat fragmentation; and
- loss of rare plant species and SAR.

9.4.3.10 Mitigation Measures

Mitigation for the loss of trees and vegetation removed to accommodate the extension and widening includes:

- identify sensitive species before beginning the work with a tree inventory; design grading to avoid disturbing sensitive species;
- develop a tree conservation plan to encourage the retention of trees where possible;
- maintain as much riparian vegetation as possible and restore vegetative buffers;
- reduce slopes to prevent erosion issues;
- plant appropriate native species (of local stock if possible and suited to the local hydrology and soils of the area they are planted) and replace trees and shrubs at a compensation ratio determined by regulators; and
- 2014 Regional OP Policy 7.C.1.3 states that the Region shall practice good stewardship by:
 - Managing Regionally owned lands within or adjacent to the Core Natural Heritage System to maintain, restore or enhance the System's natural features and ecological functions; and
 - Maintaining a program of tree planting and naturalization on Regional properties and roads. Where trees must be removed at least two trees shall be planted for every tree removed, normally using native species from seed sources climatically similar to Niagara.
- develop and implement an erosion and sediment control plan before removing vegetation;
- identify and avoid or protect critical components of wildlife habitat (e.g., winter cover, vernal pools, grasslands that support indicator species, hibernation sites, migration staging areas, nesting trees); and
- leave a buffer around significant features and habitats of significant species.

9.4.3.11 Effects on Wetland Form and Function

The hydrology work to inform the Wetland Water Balance Risk Evaluation refined the location of wetland pockets that form the forest/swamp mosaic and their storage areas. Some of these storage areas are on-line, with watercourses explored in the fish habitat assessment. The realignment of channels may not only cause negative impacts on the aquatic communities (e.g., barriers to fish movements, sediment deposition, separation of streams from floodplains) they may also change the composition of wetland communities. The increase in impervious surfaces will increase surface runoff and stream peak flows and reduce infiltration and change baseflows and upwelling.

Drainage of wetland areas can cause mortality or stress to animals and possible changes in species composition. During Environmental Impact Study's Terms of Reference approval, NPCA required consideration of ecohydrology to inform existing conditions that should be maintained during construction activities and post-development. NPCA noted that post-construction monitoring may be an expectation of the Authority staff to demonstrate no negative effects on the hydrology and ecohydrology of the area potentially impacted by the

proposed works. The results of the Wetland Water Balance Risk Evaluation prescribed monitoring, an emphasis on understanding groundwater interaction, and a mitigation plan to maintain water balance with an interim mitigation plan.

9.4.3.12 Mitigation Measures

Mitigation for the loss of wetland form and function to accommodate the extension and widening includes (may not apply to all road Segments):

- schedule grading to avoid times of high runoff volumes (spring and fall);
- minimize changes in land contours and natural drainage; maintain streams (permanent and intermittent) and timing and quantity of flows;
- ensure grades are matched at the limit of the natural feature or area or the limit of any buffer area;
- maintain existing stream channel if possible, or realign using natural channel design (accompanied by replanting plan using native vegetation);
- use structures (i.e., culverts) to span watercourses;
- minimize the width of the ROW;
- develop and implement an erosion and sediment control plan;
- revegetate as soon as possible;
- install adequate culverts and gravel base to maintain the flow of surface water and shallow groundwater;
- use vegetated swales to capture pollutants;
- minimize area of paved surfaces;
- design roads without curbs, gutters and sidewalks to promote infiltration;
- promote infiltration galleries and other infiltration devices;
- maintain or provide vegetative buffers; and
- control quantity and quality of stormwater using best management practices.

Additionally, the removal of wetland areas should be compensated for, with the objective of a net gain in habitat function with the local watershed. Compensation lands and requirements should be the responsibility of the Region to obtain and enforce. Feature compensation considerations include but are not limited to:

- Topography and drainage of the existing and proposed feature;
- Community type (based on ELC);
- Wildlife habitat types and structures to be replicated or added as enhancements;
- Soil types, structure, and quality of the existing and proposed feature composition and processes;
- Surface water contributions and hydroperiod; and

- Groundwater processes and interactions.

The area for wetland compensation should be close to the current project as possible but also protected from future development. Wetland compensation may also take the form of an Enhancement Plan of existing wetlands in the Study Area. The new Niagara Regional Official Plan considers supporting features and enhancement areas which are intended to consist of natural self-sustaining vegetation that increase the ecological resilience and function of individual key natural heritage features, key hydrological features and/or natural features and areas. It is recommended that these areas be considered for compensation and restoration plantings. Enhancement areas are identified where; the area is comprised of natural vegetation communities (as determined according to Ecological Land Classification); or the area is currently under agricultural production; or the area does not contain a permanent form of development (i.e., house, road, or related infrastructure). Enhancement areas inside of settlement areas are to be identified as follows; in 'bays and inlets' along the edge of features - < 60 meter wide; interior gaps in features - < 0.5 ha; gaps between features - < 60 m.

9.5 Stormwater Management, Flooding and Wetland Impacts

A Stormwater Management and Hydraulic Assessment Report was conducted as part of the Class EA Study. A copy of the Stormwater Management and Hydraulic Assessment Report can be found in Appendix F.

Based on the proceeding assessment, the following conclusions can be made.

9.5.1 Stormwater Management

- The Study Area of Merritt Road and Rice Road is located within three local municipalities (Thorold, Pelham, Welland) and contributes to two subwatershed systems, namely Singers Drain and Towpath Drain, which both outlet to the Welland Canal. The existing roadway segments are primarily rurally serviced through roadside ditches and cross-culverts.
- The proposed roadway design of Merritt Road and Rice Road includes roadway widening, extension and active transportation facilities. These improvements will result in a total increase in impervious area of approximately 2.1 (ha) (+/-), equating approximately a 2% (+/-) increase within the study area subwatershed systems. Segment 1, 2 and 4 are proposed to be hybrid cross-sections (rural / urban) with ditches, and Segment 3 is proposed to be urban with storm sewers.
- A hydrologic model was developed for the study area under both existing and proposed conditions. The hydrologic assessment was completed using PCSWMM, which is an integrated hydrologic / hydraulic model, allowing for a characterization of both hydrologic changes associated with increased impervious coverage and potential drainage area boundary changes, as well as impacts of the local conveyance system.
- Due to the increased impervious area associated with the proposed design, stormwater management controls are required to mitigate the impacts to the downstream receivers. These measures are discussed in Section 8.11 above.

9.5.2 Flooding Hazard

- A hydraulic impact assessment was completed for the Segment 1 ROW. As part of this assessment, a new HEC-RAS model was developed based upon provincial LiDAR data and local survey data to assess the potential flood risks associated with the development of the unopened road allowance within Segment 1. The results of this analysis found the following:
 - The existing floodplain within the Segment 1 Study Area is very shallow and very wide, due to the flat nature of the local topography. Majority of the existing hydraulic structures within the area are found to overtop during frequent events, indicating that the ditches are undersized with respect to current design standards. Replacement of existing culverts and installation of new culverts was proposed. Preliminary culvert sizing is discussed in Section 8.11 above.

9.5.3 Wetland Impact Assessment

9.5.3.1 Wetland Hydrologic Impacts

- A wetland impact assessment was completed in consultation with the EIS/ecology Study Team to characterize the potential impacts to the Provincially Significant Wetland located within the Segment 1 ROW, which consists of several wetland pockets forming the greater system. The wetland impact assessment followed the Toronto Region Conservation Authority's Wetland Water Balance Risk Assessment, and has found the following:
 - The Provincially Significant Wetland system located within Segment 1 is made up of several localized wetland pockets, which includes features acting as on-line features, as well as off-line / isolated features. The existing subcatchments contributing to each wetland and the associated storage and footprints of the wetland pockets have been determined through a terrain analysis using the provincial Digital Elevation Model (DEM).
- The results of the wetland impact assessment identified five local wetland groups with either a Medium or High-risk score associated with changes in each total drainage area or contributing imperviousness. These findings coupled with the ecological assessment (which identified all as High Risk), resulted in these groups being a High Risk. The total Provincially Significant Wetland system resulted in Low Risk from a hydrologic perspective, with only a 2% increase in impervious area associated with the proposed roadway design.
- Due to the localized High-risk assessment, a continuous simulation was completed utilizing the PCSWMM modelling developed for informing stormwater management control requirements. The models were simulated for a 24-year period of record, using climate data sourced from the Niagara Region / NPCA's long-term monitoring network.
- The results of the results of the continuous simulation demonstrated that there are a range of potential hydrologic impacts to the wetland groups and the Provincially Significant Wetland system as a result of the proposed roadway design, if left uncontrolled, including:
 - Additional runoff volume to certain wetland units receiving roadway drainage / act as on-line wetland storage features.

- Wetland footprint reductions due to the development of the Segment 1 ROW (notwithstanding potential additional grading / construction impacts beyond the ROW).
- Impacts to both operational volume and depth within the wetland units for both on-line and off-line wetland groups.

9.5.3.2 Mitigation Options

The majority of these impacts are focused on the portions of the wetlands which receive direct drainage from both the Rice Road and Merritt Road ROW. However due to the flat topography of the Segment 1 area, impacts would occur for other wetland pockets of the Provincially Significant Wetland through backwater impacts and hydrologic surface connections between the various units.

The primary option to mitigate the hydrologic impacts of the proposed design include maintaining the runoff volume to the wetland features, which for the purpose of this study would be controlling the runoff volume at the limits of the road ROW. As summarized in Section 8.11, there are a variety of stormwater management controls that are being proposed as solutions to meet the necessary stormwater management control criteria for the proposed roadway design. These include the combination of stormwater detention within the roadside ditches for quantity control purposes, as well as the recommendation for infiltrating the runoff volume control target for the 90th percentile rainfall event as identified by the MECP through infiltration trenches beneath the roadside ditches.

The implementation of infiltration trenches designed to capture and retain the increased runoff associated with the increased impervious area under frequent events not only helps to satisfy the Niagara Region's erosion control criteria, but also promotes water quality improvements and helps to maintain the local hydrologic cycle. By implementing these or other infiltrative LID BMPs, this would allow the retention and infiltration of 90% of average annual rainfall, which for the Niagara Region would equate storms under 28-29 mm. On a long-term basis, the implementation of these LID BMPs would help to mitigate the impacts to the receiving wetland features associated with higher runoff volumes occurring from the road ROW, which will in turn help to reduce the impacts on the operational depth and volume of the Provincially Significant Wetland system.

For the portions of the wetland units which are directly physically impacted by the Segment 1 ROW, the loss of footprints and associated operational volume / storage should be mitigated. As indicated in the EIS (Appendix E), from an ecological perspective the detailed design must include a restoration and compensation plan to offset the negative impacts of the habitat loss. This is also true from a hydrologic / hydraulic perspective, to ensure that the storage available within this Provincially Significant Wetland is maintained to ensure no impacts further downstream, as the Provincially Significant Wetland provides storage / attenuation prior to discharging at Cataract Road. This should be assessed further as part of the detailed design efforts to ensure that the functionality of the wetland is maintained both upstream and downstream of the proposed roadway, and that the key hydrologic connections are maintained through culvert crossings.

In order to inform the future detailed design phase, additional long-term monitoring is recommended within the Study Area. This includes additional surface water monitoring gauges both upstream, downstream as well as within the Provincially Significant Wetland system. The

additional monitoring will allow for a better understanding of the local functions of the wetland system. The details of surface water monitoring will need to be confirmed with NPCA, following completion of the Class EA Study / during detailed design phase. This understanding of wetland functions can help to refine the modelling developed as part of the current study, and help to refine the impact assessment based upon the detailed design of the roadway and further develop mitigation opportunities. Additional monitoring requirements from an ecological / ecohydrology perspective are outlined in the EIS (Appendix E).

9.6 Groundwater

A water taking permit, either registration on the Environmental Activity and Sector Registry (EASR) or a Permit to Take Water (PTTW) will be required if water taking for construction dewatering purposes is greater than 50,000 litres per day (EASR) or greater than 400,000 litres per day (PTTW). A dewatering assessment shall be completed during detailed design to confirm the need and extent of dewatering and associated permitting requirements. This assessment shall also include an assessment of potential impacts to local groundwater users (e.g., private water supply), the surrounding natural environment and adjacent waterbody feature(s) (e.g., wetlands, watercourses), the potential for contaminated groundwater migration and settlement as a result of dewatering. The dewatering assessment must also provide details regarding the proposed discharge plan and discuss how the dewatering effluent/surface water (i.e., rain) will be managed and treated to meet water quality criteria based on the final discharge location (i.e., ditches).

9.7 Drinking Water Source Protection

9.7.1 Potential Effects

As noted in Section 4.8, the subject road segments are not located in any of the Intake Protection Zones (IPZs) within the Niagara Peninsula Source Protection Area. However, for Segments 1 and 2, residential properties are serviced by wells for potable water. Potential effects of the project on groundwater and surface water sources during construction may be associated with accidental spills and/or leakage of fluids from construction machinery.

9.7.2 Mitigation Measures

Best management practices shall be implemented during construction to prevent any fuel lubricants and fluid spills resulting from construction activities and manage any unanticipated occurrences that could result in impacts to groundwater. All spills that could potentially cause damage to the environment will be reported to the Spills Action Centre of the Ministry of the Environment, Conservation, and Parks (800-268-6060).

9.8 Climate Change Considerations

In 2017, the MECP issued a guide entitled "Considering Climate Change in the Environmental Assessment Process". This guide sets out Ministry's expectations and supports the province's Climate Change Action Plan by outlining climate change considerations for environmental assessment studies (Ministry of the Environment, Conservation and Parks, 2017).

The guide notes 'climate consideration' within a project means that consideration has been given to methods to reduce greenhouse gas emissions and developing a design that is more resilient to future changes in climate and helps maintain the ecological integrity of the local environment in the face of a changing climate. Specifically, proponents are encouraged to consider mitigation (how the project might mitigate climate change) and adaptation (measures to adapt to climate change or make the project more resilient to the effects of climate change). Considering how a project may contribute to climate change, through its greenhouse gas emissions or its effects on the natural landscape, is important to the planning process as it allows proponents to consider climate mitigation measures to avoid, minimize, or offset such effects.

The following subsections discuss climate changes within the Niagara Region and policies of the Official Plan to address such impacts, and how the Class EA Study considered effects of the project on climate change and climate change effects on the project.

9.8.1.1 Climate Changes within the Niagara Region

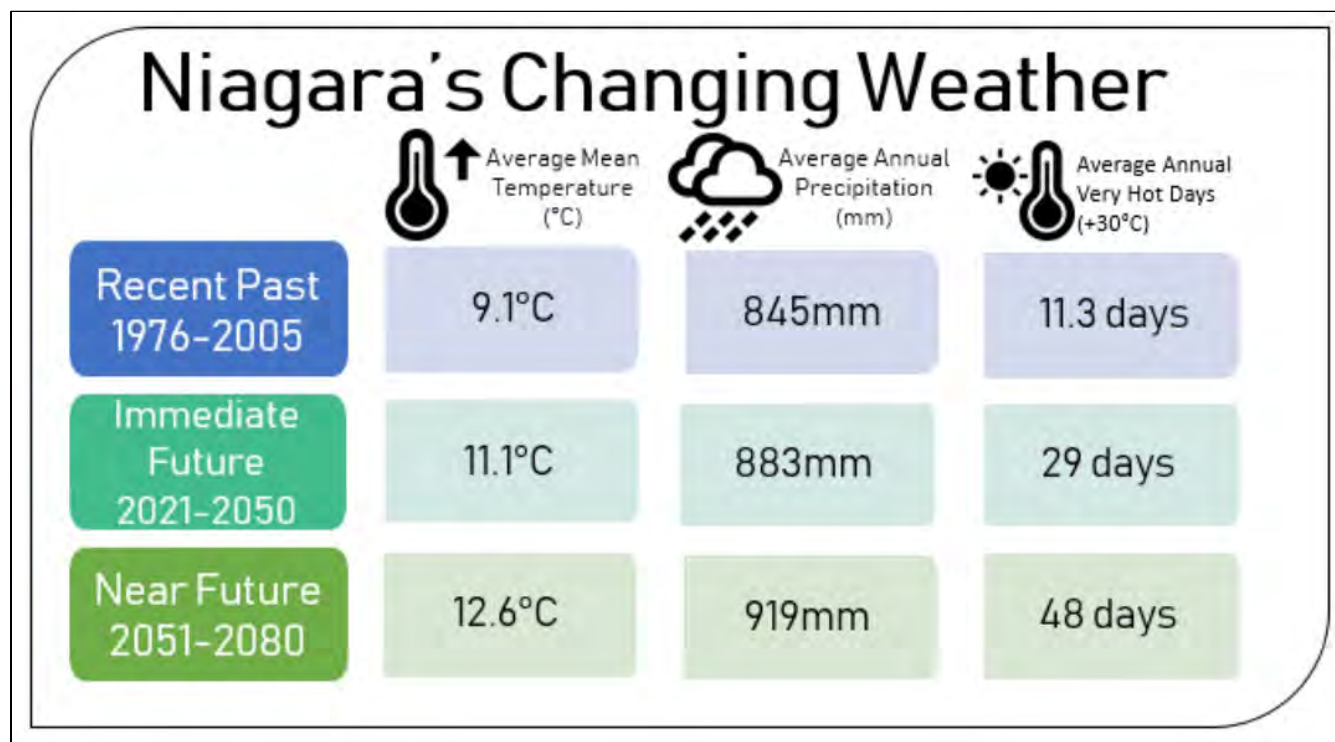
In 2019, Niagara Region developed a Climate Change Discussion Paper in support of the New Niagara Region Official Plan. This discussion paper noted that the following climate changes have already been observed within Niagara (Niagara Region, 2019):

- An increase in annual average temperature of 1.3°C in the last 40 years;
- Increase of +30°C days;
- More heat waves of 3 or more consecutive hot days;
Longer growing season, with May and September significantly warmer;
- Increase in average number of frost-free days;
- More rain and less snow in winter;
- More summer droughts and dry spells;
- Increased numbers of freeze-thaw cycles (when daily temperatures fluctuate above and below freezing); and
- Increase in heavy rain events.

Future projections indicate these changes will increase, with more unpredictability. Projections from both (Penney, 2012) and The Climate Atlas of Canada (2018) for Niagara indicate the following climate change:

- An increase in average annual temperature by 2°C-3.5°C by 2050-2080;
- An increase in annual precipitation by 38 mm to 74 mm by 2050-2080;
- An increase in the number of very hot days (+30°C) by 18-37 days by 2050-2080; and
- Increase in freeze-free days by 30 to 50 days by 2050-2080.

Figure 9-1: Projections of Niagara's weather from the Climate Atlas of Canada, 2018⁶



Some of the hazards that may experience changes in frequency and severity due to climate change in Niagara are (Niagara Region, 2019):

- Floods;
- Freezing Rain/Ice Storms;
- Severe Storms;
- Extreme Temperatures;
- Droughts; and
- Vectorborne Diseases

9.8.1.2 Niagara Region's Approach to Considering Climate Change

Niagara Region's approach to considering climate change is guided by provincial policies, and embedded in several of the policies as discussed in Section 3 of this report including:

- Provincial Policy Statement (2020);
- A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2020); and
- Niagara Region Official Plan (2022).

⁶ For more information visit see Climate Atlas of Canada (www.climateatlas.ca).

The New Niagara Region Official Plan (2022) provides policies for planning and implementing a sustainable transportation system that accommodates forecasted population and employment growth to year 2051. Specifically, Policy 5.1.1.2 notes that suitable transportation infrastructure will be provided to support the forecasted growth listed in Table 2-1 and to help mitigate and adapt to the impacts of climate change.

The project-specific recommendations outlined in Section 8 of this report support many of these policies and involve measures that will aid the Niagara Region in adapting to and mitigating impacts of climate change. For example, the key objective of this Class EA study is to provide capacity improvements and provide a direct connection of Merritt Road, which would provide multi-modal choices for all road users (i.e., pedestrians, cyclists, and auto), and goods movement, and reduce overall congestion in the Study Area. Tree plantings are proposed within the boulevards to provide carbon storage and ditches are being proposed to improve storm water collection and reduce potential flooding impacts on area lands. These are discussed further below.

9.8.1.3 Effects of the Project on Climate Change

During the construction of the project, there will be a temporary increase in greenhouse gas emissions as a result of operation of construction machinery and equipment. In order to minimize emission of greenhouse gases during project construction, idling of construction vehicles and equipment shall be minimized. In addition, construction vehicles and equipment shall be in good working order. This will help reduce inefficiencies in the operation of the construction vehicles and equipment.

From a long-term effects point of view, the project was designed to minimize loss of natural landscape to the extent possible. Mitigation measures to reduce further impacts to natural environment are discussed in Section 9.4 of this report. The proposed road design includes boulevard space along all road segments to accommodate tree replacement to provide shade and carbon sequestration. All street trees specifications and species shall be selected in accordance with the Niagara Region's Master Street Tree Planting list.

In addition, the proposed road design includes sidewalks and cycle tracks. These proposed active transportation facilities are anticipated to encourage walking and cycling and may assist in decreasing the use of motor vehicles, which may reduce green house gas emissions.

9.8.1.4 Effects on the Project from Climate Change

Well-planned and managed infrastructure is fundamental to attaining the Region's vision for thriving and resilient communities, and key to achieving the growth forecasts of this Plan. Policy 5.2.1.11 of the Niagara Region Official Plan notes that the Region will promote the use of green infrastructure and low impact development by considering green infrastructure in public works. As discussed in Section 8, the proposed design makes use of an existing transportation route and proposes to accommodate all road users (pedestrians, cyclists and vehicles). A Stormwater Management Strategy is proposed that includes ditches, culverts and Low Impact Development to improve storm water collection, reduce potential flooding impacts and address stormwater quality.

9.9 Soil

A geotechnical investigation shall be completed during detailed design to understand the sub-surface conditions, recommend pavement design for road reconstruction, foundation design for culverts, slope stability analysis for embankments (if/where required), roadway cut and fill operations, dewatering requirements, and chemical analyses and disposal requirements of excess materials.

Management of excess soil (including excavation, transportation, temporary storage, and disposal) shall be completed in accordance with O. Reg. 406/19 and Ministry of the Environment, Conservation and Parks' current guidance document titled "Rules for Soil Management and Excess Soil Quality Standards" (2022). The amount of excavated soil and/or imported soil shall be determined during detailed design phase through the development of a Soil Management and Fille Management Plan. Furthermore, the placement of fill within the Regulated Areas of the NPCA will require a work permit from the Authority under Ontario Regulation 155/06.

As part of review of the draft Environmental Study Report, the MTO commented that the Ministry will not permit any excavated soil generated as a result of the project within the Ministry's ROW or lands. Any excavated soil generated as a result of this project must be managed off site as per the regulation. The Ministry also advised that it uses its lands on the northwest of Highway 406 and Merritt Road interchange to stockpile soil from Ministry's construction projects. If during Detail Design, it is identified that the Niagara Region must impact this area to facilitate project construction, approval will be required from MTO Environmental and Maintenance staff.

9.10 Technical Environment

9.10.1 Municipal Services and Utilities

9.10.1.1 Potential Effects

Local Area Municipalities (Town of Pelham; City of Thorold and City of Welland) and utility providers were consulted during the Class EA Study. Existing services and utilities along the subject road segments may require relocation during construction.

The hydro corridor along the north side of segments 1 and 2, and segment 3 between Niagara Street and Andrew Lane is intended to remain in place.

9.10.1.2 Mitigation Measures

Impacts to municipal services and utilities shall be confirmed during detailed design. The concerned municipality and/or utility providers should be consulted, and utility relocation should be coordinated. If there are no/minor grading related effects on utilities, the utility providers should be contacted to inform them of these effects.

10 Commitments for Future Work

10.1 Commitments for Technical Work

The following table summarizes the commitments for additional work that will need to be addressed during detailed design phase.

Table 10-1: Commitments for Additional Work

Category	Commitment
Transportation	A Construction Staging Plan and a Traffic Management Plan shall be developed to be included in the Tender Documents. These plans shall identify how construction will be staged, and how vehicular, pedestrian and cycling traffic will be managed during construction, recognizing the need for maintaining traffic flow to minimize traffic delays, and associated effects on the school bus travel time and emergency response time. Efforts should be made to maintain driveway accesses and reduce the length of time during which the driveway accesses will be impacted.
	The road users (including, area residents, businesses, local schools, emergency service providers and other key parties) shall be notified of proposed construction well in advance. Attempts shall be made to inform residents and businesses in a larger area, not just in the immediate vicinity of the subject road segments. Construction notifications could be issued via means to be determined by the Niagara Region and may include mailout of direct letters to the area residents and businesses, installation of signages, newspaper ads, and/or notification posting on the Niagara Region’s website, and social media platforms (e.g., Facebook and Twitter).
	The Project Team should review, refine (if required) and incorporate mitigation measures from Section 9.1 of this report into project design and contract documents.
	Detailed intersection design shall be developed during detailed design phase. Intersections shall be designed and constructed to fulfill <i>Accessibility for Ontarians with Disabilities Act</i> (AODA) requirements.
	Illumination requirements shall be determined during detailed design in accordance with Niagara Region Roadway Lighting Design Standards (2020).
Maintenance Agreement	Maintenance agreement(s) shall be executed between the Niagara Region and the three local area municipalities during detailed design in regards to the maintenance (snow removal) of the proposed active transportation facilities.
Coordination with Other Projects	As part of review of the draft Environmental Study Report, the City of Welland commented that the Northwest Secondary Area Plan will be incorporating storm sewers in lieu of ditches on Quaker Road as the area develops. The storm sewer will extend north on Rice Road to the water crossing. A culvert replacement will also be required across Rice Road at the current crossing location north of Quaker Road, as well as new sanitary servicing and an upsized watermain on Rice Road. Future coordination will be required between this project and other planned projects by the three local area municipalities, as required.
Transportation – Ministry of Transportation Future Consultation	Provision of a raised MUP over Highway 406 Overpass will require adjustment to the existing parapet wall and replacement of the railing system to accommodate the raised MUP. Detailed dimensions and design checks of the parapet wall and combination height railing will need to be determined during detailed design phase. In addition, a structural evaluation of the exterior girder will be required during detailed design phase to determine whether it can take the additional dead load from the raised MUP.
	As part of review of draft Environmental Study Report, the MTO identified that a Transportation Environmental Study Report (TESR) was completed in 2009 for Highway 406 from 0.2 km north of Port Robinson Road to East Main Street. The 2009 TESR Preferred Plan at Merritt Road includes entrance ramps with a future study to be carried out, when required. Since the entrance ramps will be subject to a future study, the Niagara Region is committed to work with the MTO during detailed design phase to review the 2009 TESR and adjust the road design for Merritt Road, if required, to ensure that the proposed road design does not preclude entrance ramps to Highway 406. The 2009 TESR Preferred Plan is provided in Appendix L.
Social and Economic Environment	The details of property requirements (e.g., required area) shall be confirmed and refined. Further consultation with the impacted property owners shall be undertaken to confirm property requirements and discuss the process for property acquisitions. Where property is required, the Niagara Region shall provide compensation to the property owners based on appraisals completed by the Niagara Region’s Real Estate Staff. Grading limits of the proposed road improvements shall be confirmed to identify any temporary property impacts. The location and size of temporary laydown areas shall be confirmed. Where possible, road right-of-way should be used for temporary laydown areas. If temporary laydown areas required on private properties, the impacted private property owners shall be consulted to obtain permission to access their properties.
Cultural Environment – Built Heritage Resources and Cultural Heritage Landscape	Should direct impacts to the potential heritage property CHR 8 (1100 Niagara Street) be required and no other technically feasible options are available, then a Heritage Impact Assessment should be prepared for this property at the outset of the detailed design phase of the project.
	The project shall be planned in a manner that minimizes encroachment on potential heritage properties CHR 1 (402 Rice Road (Regional Road 54)), CHR 3 (436 Quaker Road) and CHR 5 (1173 Merrittville Highway). In addition, post-construction landscaping shall be completed to return the landscape to pre-construction conditions. If feasible, post-construction landscaping shall use plant species that are native to Ontario.
	The locations of identified CHRs shall be identified on construction mapping so that project personnel are aware of the presence of potential heritage properties within, and

Category	Commitment
	adjacent to, the proposed work.
Cultural Environment – Archaeological Resources	Stage 2 Archaeological Assessment for Segment 1 was completed as part of this Class EA Study. Stage 2 Archaeological Assessment for Segments 2, 3, and 4 will be completed as part of detailed design phase. Additional stages of archaeological assessment may be required, based on the findings and recommendations of the Stage 2. Archaeological concerns are not considered addressed until all recommended archaeological assessment has been completed, and the reports have been entered onto the Ontario Public Registry of Archaeological Reports. It is important to note that a Stage 2 Archaeological Assessment was completed during the Class EA Study along majority of Segment 1 (Merritt Road unopened road allowance, from Rice Road to Cataract Road). The following Indigenous Communities shall be invited to participate in the monitoring of the Stage 2 Archaeological Assessment fieldwork (and any additional archaeological assessment, if required) and report review: – Mississaugas of the Credit First Nation – Six Nations of the Grand River – Haudenosaunee Development Institute, on behalf of Haudenosaunee Confederacy During detailed design, the Project Team shall review, refine (if required) and incorporate mitigation measures from Section 9.3 (Cultural Environment) of this report into project planning and contract documents to avoid/minimize impacts on the cultural environment.
Natural Environment – Terrestrial Ecology	This report and the EIS (Appendix E) identify project's impacts on natural environment and propose mitigation measures. The Project Team responsible for the detailed design and implementation of the proposed works, shall review, refine (if required) and incorporate mitigation measures proposed in this report and the EIS (Appendix E). Mitigation/avoidance measures shall be incorporated into project design, and contract documents for implementation by the construction contractor. The development of schedules for detailed design, construction, and any ground disturbance activities shall be informed by mitigation/avoidance measures/timing windows presented in this report and the EIS (e.g., migratory and breeding bird window, bat maternity roosting window, timeline for SAR permitting, etc.). Proposed mitigation measures shall be addressed in the next steps of the project. As part of the review of the draft Environmental Study Report, the MECP advised that an authorization under <i>Endangered Species Act</i> will likely be required. An Information Gathering Form (the first stage in SAR permitting) was submitted to the MECP as part of the Class EA process, and comments have been received from the MECP. Additional confirmatory studies may be required in consultation with the MECP (e.g., installation of bat recorders) during detailed design phase. The EIS was shared with NPCA for review. NPCA's comments on the EIS and Study Team's responses are provided in Appendix H of the EIS. NPCA's comments identified need for additional work, which will need to be completed during detailed design phase. Lastly, ongoing consultation with NPCA may result in further fieldwork to inform permitting requirements. An Erosion and Sediment Control Plan shall be developed for implementation during construction. Tree inventory shall be completed, and a Tree Protection and Replacement Plan shall be prepared to identify trees that will require removal and to protect the remaining trees. Mitigation for the loss of trees shall occur in the form of replacement trees and shrubs. Replacement vegetation must be native species and suited to the local hydrology and soils of the area they are planted. For more information, refer to EIS (Appendix E). Monitoring Plan(s) identified in EIS (Appendix E) shall be developed with input from appropriate regulatory agencies (e.g., MECP, NPCA, etc.) and implemented during and after construction, as required.
Natural Environment – Species at Risk	As part of review of the draft Environmental Study Report, the MECP made the following recommendations, which shall be addressed during detailed design phase: – A thorough inventory shall be completed within the area up to 25 m from the project footprint for American Chestnut, Butternut and Eastern Flowering Dogwood and their regulated habitat and root harm prevention zones. – Inventories shall be completed for Red-headed Woodpecker, and if suitable habitat is present, the species is surveyed for using the Wisconsin Survey Protocol. Impacts to Eastern Small-Footed Myotis and its habitat and Blanding's Turtle shall be considered, and mitigation measures shall be developed, as required. Requirements for detailed species at risk surveys shall be confirmed with the MECP during detailed design phase.
Natural Environment – Groundwater	A dewatering assessment shall be completed during detailed design to confirm the need and extent of dewatering and associated permitting requirements. This assessment shall also include an assessment of potential impacts to local groundwater users (e.g., private water supply), the surrounding natural environment and adjacent waterbody feature(s) (e.g., wetlands, watercourses), the potential for contaminated groundwater migration and settlement as a result of dewatering. The dewatering assessment must also provide details regarding the proposed discharge plan and discuss how the dewatering effluent/surface water (i.e., rain) will be managed and treated to meet water quality criteria based on the final discharge location (i.e., ditches).
Soil	A geotechnical investigation shall be completed during detailed design to understand the sub-surface conditions, recommend pavement design for road reconstruction, foundation design for culverts, slope stability analysis for embankments (if/where required), roadway cut and fill operations, dewatering requirements, and chemical analyses and disposal requirements of excess materials.

Category	Commitment
	Management of excess soil (including excavation, transportation, temporary storage, and disposal) shall be completed in accordance with O. Reg. 406/19 and Ministry of the Environment, Conservation and Parks' current guidance document titled "Rules for Soil Management and Excess Soil Quality Standards" (2022). The amount of excavated soil and/or imported soil shall be determined during detailed design phase through the development of a Soil Management and Fille Management Plan. Furthermore, the placement of fill within the Regulated Areas of the NPCA will require a work permit from the Authority under Ontario Regulation 155/06. As part of review of the draft Environmental Study Report, the MTO commented that the Ministry will not permit any excavated soil generated as a result of the project within the Ministry's ROW or lands. Any excavated soil generated as a result of this project must be managed off site as per the regulation. The Ministry also advised that it uses its lands on the northwest of Highway 406 and Merritt Road interchange to stockpile soil from Ministry's construction projects. If during Detail Design, it is identified that the Niagara Region must impact this area to facilitate project construction, approval will be required from MTO Environmental and Maintenance staff.
Technical Environment	Impacts to municipal services and utilities shall be confirmed during detailed design. The concerned municipality and/or utility providers shall be consulted, and utility relocation shall be coordinated. If there are no/minor grading related effects on utilities, the utility providers shall be contacted to inform them of these effects.
Stormwater Management, Hydrology, and Hydraulics	Topographic / bathymetric survey is to be completed within the Segment 1 ROW and adjacent wetland systems to validate the LiDAR data available for the area.
	Additional long-term surface water monitoring should be undertaken upstream, downstream and within the wetland systems located within the Segment 1 ROW to better characterize and understand the performance and functionality of the wetland units. The details of the monitoring program will need to be determined in consultation with NPCA.
	Hydrologic and hydraulic modelling should be updated based upon the results of additional background data (external drainage areas) as well as new monitoring / data collection to support a detailed calibration and the final roadway designs. The final roadway designs should aim to maintain contributing drainage areas to existing drainage outlets to the best extent possible through localized ditch grading to minimize potential impacts.
	A 2D hydraulic modelling exercise is recommended for the floodplain area within Segment 1, due to the flat terrain and highly interconnected stream / wetland systems in this area. 1D computations are not capable of accurately represent the flooding conditions.
	Hydraulic structure sizing is to be updated based upon the results of the updated hydrologic (steady flow input) and 2D hydraulic modelling. The updated hydraulic model should incorporate the revised road profile and any associated ROW grading, and should verify the structures adhere to the necessary MTO design criteria and mitigate any additional water surface elevation increases to the 100-year floodplain within Segment 1. The cross culverts within the ROW will need to be reviewed for capacity and minimum cover requirements as part of the updated roadway design.
	Preliminary SWM strategies should be verified as part of the detailed design of the ROW. This includes confirming the erosion sensitivity of downstream receivers through local geomorphological assessment, confirming there is sufficient space for LID BMPs in the roadway cross-sections and that the subsurface soil conditions and bedrock and seasonally high groundwater elevations are conducive to infiltration. Geotechnical investigation / infiltration testing is to be completed throughout each segment once the preferred locations for the LID BMPs are identified during detailed design.
	Highway 406 Overpass The final design footprint for Merritt Road across Highway 406 Overpass (between Grisdale Road and Kottmeier Road) will be determined during detailed design phase. The need for SWM controls will need to be determined at that time. Other elements to be confirmed through detailed design include the drainage / conveyance system. It's understood that under existing conditions, this area is rurally serviced through roadside ditches and cross-culverts. Therefore, the drainage infrastructure will be required to be confirmed during detailed design to be of adequate capacity and condition to support the changes proposed within the interchange area. As a part of the detailed design of Segment 3, external minor and major systems peak flows resulting from the MTO's ROW and associated external drainage areas, should be assessed under both the existing and proposed roadway and drainage conditions to confirm that there is no impact on drainage conveyance from the MTO's ROW based on the proposed Merritt Road drainage system (incl. catch basins and storm sewer system). During the detailed design stage, the roadway's flow spread for Segment 3 should be assessed to confirm that it meets the MTO's Highway Drainage Standards (2008). At the detail design stage, the MTO shall review design and assessment of recommended stormwater management measures and drainage systems to confirm that proposed road improvements do not impact the MTO's drainage system. As unconventional underground storm storage systems such as chambers and infiltration systems are not permitted by the MTO, unconventional storm storage systems will not be considered by the MTO in the determination of controlled post development peak flows and ponding limits. As such, calculations and assessment of peak flows and ponding limits without the unconventional storm storage systems will be required in the detailed design by the MTO to confirm that the proposed development will not impact the MTO's drainage system. (Ref. Appendix G). During detailed design, the MTO will require all culverts located within the MTO's right-of-way to meet MTO's standards as per the Highway Drainage Standards (2008).
	The wetland impact assessment should be refined as further details become available at the detailed design stage, these include updated continuous simulation and assessment of the potential impacts associated with local grading refinements, construction impacts, etc. Any updates to the wetland impact assessment and associated mitigation measures should be completed in consultation with the ecologists assigned to the detailed design, in adherence to the recommendations of the EIS (under separate cover).

10.2 Commitments for Permits and Approvals

The following table outlines the permits and approvals that will be required to facilitate construction of the proposed works.

Table 10-2: Permits and Approvals

Permit Authority	Permit / Approval
Fisheries and Oceans Canada	A request for review form should be submitted to Fisheries and Oceans Canada to receive advice on mitigation measures and to confirm that an authorization under <i>Fisheries Act</i> is not required.
Ministry of Citizenship and Multiculturalism	A Stage 2 Archaeological Assessment (and further stages of assessment, if recommended) shall be completed and submitted by the licensed archaeologist for Ministry of Citizenship and Multiculturalism’s review during the detailed design phase. A letter issued by the Ministry indicating that archaeological concerns have been addressed and the report(s) have been entered into the Ontario Public Register of Archaeological Reports shall be obtained prior to any ground disturbing activities. It is important to note that a Stage 2 Archaeological Assessment was completed during the Class EA Study along majority of Segment 1 (Merritt Road unopened road allowance, from Rice Road to Cataract Road).
Ministry of Natural Resources and Forestry	Fish relocations may be required for the in-water works prior to construction activities. An application for License to Collect Fish for Scientific Purposes, under the <i>Fish and Wildlife Conservation Act</i> , should be submitted to the Ministry of Natural Resources and Forestry and authorization should be obtained in order to relocate any species within the in-water works area. Obtaining this authorization will be the responsibility of the contractor prior to the start of construction.
	Wildlife Scientific Collectors Authorization should be obtained for intentional or anticipated incidental capture, handling and/or relocation of herpetofauna (e.g., snakes, frogs). Obtaining this authorization will be the responsibility of the contractor prior to the start of construction.
Ministry of the Environment, Conservation and Parks	A water taking permit, either registration on the Environmental Activity and Sector Registry (EASR) or a Permit to Take Water (PTTW) will be required if water taking for construction dewatering purposes is greater than 50,000 litres per day (EASR) or greater than 400,000 litres per day (PTTW).
	As part of the review of the draft Environmental Study Report, the MECP advised that an authorization under <i>Endangered Species Act</i> will likely be required. An Information Gathering Form was submitted to the MECP during the Class EA Study to obtain advice on the permitting process (e.g., Overall Benefit Permit) related to impacts on Species at Risk and their habitat. Consultation with the Ministry should be re-initiated during detailed design to confirm permitting requirements, and necessary permitting requirements should be addressed, and permit(s) obtained during detailed design phase in accordance with <i>Endangered Species Act</i> .
Ministry of Transportation	An Encroachment Permit will be required from the MTO for works within the right-of-way of Highway 406.
Niagara Peninsula Conservation Authority	A work permit under Ontario Regulation 155/06 should be obtained from the NPCA for works within regulated areas and floodplain areas.

10.3 Monitoring Plan

The Environmental Impact Study (Appendix E) includes discussion about the monitoring measures. These monitoring measures shall be developed and implemented in the next phases of the project with input from the regulatory agencies. In addition, any monitoring measures identified in future permits and approvals, shall be implemented, as appropriate.

11 Closure

This report has documented the planning, decision making and consultation process for improvements to Merritt Road and Rice Road in accordance with the Municipal Class Environmental Assessment process for a Schedule 'C' project. This report is available for review by the public, Indigenous Communities, government agencies, impacted property owners, and key stakeholders at the location and timing outlined in the Notice of Study Completion. Interested persons may provide written comments to the following contact in accordance with the timeline identified in the Notice of Study Completion:

Maged Elmadhoon, M.Eng., P.Eng.
Manager, Transportation Planning
Niagara Region

1815 Sir Isaac Brock Way, Thorold, ON L2V 4Y6

Maged.Elmadhoon@niagararegion.ca

11.1 Section 16 (6) Order Request Process (Former Part II Order Process)

The Minister of the Environment, Conservation and Parks (MECP) has the authority and discretion to make an Order under Section 16 of the Environmental Assessment Act. A request may be made to the MECP for an order requiring a higher level of study (i.e., requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g., require further studies), only on the grounds that the requested order may prevent, mitigate, or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other grounds will not be considered.

Prior to requesting a Section 16(6) Order, the proponent should first try to resolve any concerns directly through the Class EA process. The minister must consider the factors set out in section 16(5) of the Environmental Assessment Act. If a Section 16 Order request is made, the project proponent cannot proceed with the project until the minister makes a decision on the request. If the minister makes a Section 16 Order, the proponent may only proceed with the project if they follow the conditions in the Order.

Timing for an Order Request: At the conclusion of a project, the proponent must post a Notice of Study Completion, allowing for a minimum of 30-day public comment period for the project. During the comment period the proponent cannot proceed with the project until at least 30 days after the end of the public comment period. During the public comment period, anyone can: review the documentation, submit any comments or concerns to the proponent and request a Section 16(6) Order.

How to make a request: To submit a Section 16(6) Order request, the following information must be provided to ensure that the ministry is able to efficiently begin reviewing the request:

- Name, address and email address;
- Project name;
- Proponent name;

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- What kind of Order is being requested i.e., a request for additional conditions or a request for an individual environmental assessment;
- Details about the concerns about potential adverse impacts on constitutionally protected Aboriginal or treaty rights and how the proposed Order may prevent, mitigate potential adverse impacts on Aboriginal and treaty rights, and any information in support of the statements in the request;
- Whether the concerned party belongs to, represents or has spoken with an Indigenous community whose constitutionally protected Aboriginal or treaty rights may be adversely impacted by the proposed project;
- Whether the concerned party has raised their concerns with the proponent, the proponent's response (if any) and why the concerns could not be resolved with the proponent; and
- Any other information to support the request.

Section 16 Order requests are made to the Minister of the Environment, Conservation and Parks and the Director of Environmental Assessment Branch. The request may be submitted by mail, email, fax or hand delivered to the Minister:

Minister of the Environment, Conservation and Parks
Ministry of Environment, Conservation and Parks

777 Bay Street, 5th Floor

Toronto ON M7A 2J3

Email: minister.mecp@ontario.ca

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks

135 St. Clair Ave. W, 1st Floor

Toronto ON, M4V 1P5

Email: EABDirector@ontario.ca

Requests should also be copied to the proponent of the project (in this case, Niagara Region). There is no appeal of the minister's decision with respect to a Section 16 Order. If the request for a Section 16(6) Order is denied by the minister, the proponent can proceed with the project. If the minister makes an Order, the proponent may only proceed with the project if they follow the conditions in the Order.

For more information and specific instruction and details on the process, please visit:

<https://www.ontario.ca/page/class-environmental-assessments-section-16-order>

All personal information included in the request – such as name, address, telephone number and property location – is collected, under the authority of section 30 of the Environmental Assessment Act and is collected and maintained for the purpose of creating a record that is available to the general public. As this information is collected for the purpose of a public record, the protection of personal information provided in the Freedom of Information and Protection of Privacy Act (FIPPA) does not apply (s.37). Personal information you submit will become part of a public record that is available to the general public unless you request that your personal information remain confidential.

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