

**Reconstruction of Regional Road
45 (Creek Road) between
Regional Road 27 (River Road)
and Regional Road 63
(Canborough Road) in the
Township of Wainfleet
Municipal Class Environmental
Assessment, Schedule 'C'
FINAL**

Environmental Study Report

Submitted to:
Regional Municipality of Niagara

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List of Revisions:

VERSION	DATE	DESCRIPTION
A	August 27, 2021	Draft for Submission
B	November 9, 2021	Final

1.0 Introduction and Background

The Regional Municipality of Niagara retained Parsons Inc. to conduct a Class Environmental Assessment Study to identify improvements along the Regional Road 45 (referred to here within as Creek Road) corridor between Regional Road 27 (River Road) and Regional Road 63 (Canborough Road) in the Township of Wainfleet. This study was conducted in accordance with planning and design process for Schedule 'C' Municipal Class Environmental Assessment (Class EA) (October 2000, as amended in 2007, 2011 & 2015), which is an approved process under the Ontario *Environmental Assessment Act* (EAA).

1.1 STUDY AREA

Creek Road, between River Road and Canborough Road is a two-lane east-west arterial road in the Township of Wainfleet. There are two bridges within the road corridor: Oswego Creek Bridge and Creek Road Bridge. The surrounding area is predominantly rural. Creek Road provides access to residential and commercial properties, agricultural land, and industrial and institutional uses. Adjacent land use also includes significant natural heritage features, such as the Chippawa Creek Conservation Area, the Welland River and Oswego Creek. A map of the study area is shown in **Figure 1**.

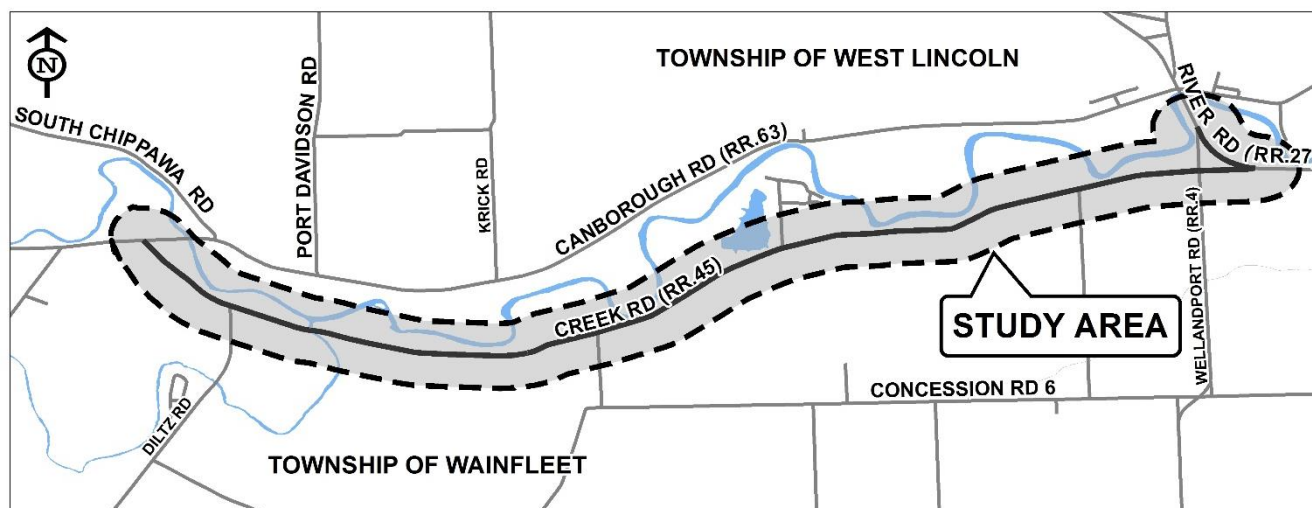


Figure 1: Study Area

1.2 STUDY OBJECTIVE

This study was undertaken to investigate the need for improvements along Creek Road, including addressing existing road conditions, intersection safety and bridge rehabilitation or replacement along Creek Road. This study also considering improvements for active transportation (i.e., walking and cycling) and roadway drainage.

1.3 MUNICIPAL CLASS ENVIRONMENTAL ASSESSMENT PROCESS

The Ontario *Environmental Assessment Act* (EAA; 1990) forms the basis and foundation for environmental assessments (EA) undertaken within the province. The EAA identifies two planning and approval processes: Individual EAs and Class EAs.

Class EAs, once approved by the Ministry of Environment, Conservation and Parks (MECP), provide for specific classes of undertakings to follow an alternative planning and decision-making process that is different and less burdensome than that of an individual EA (which is laid out in Part II of the EAA). Providing that the approved process is followed, undertakings conducted under Class EAs have obtained approval under the EAA and can proceed with implementation, given that all other approvals have been obtained. Class EAs provide a more streamline process since the effects on the environment of the undertakings within that class are generally common or well understood.

Under the Municipal Class EA process, municipal road projects are categorized according to their environmental significance and potential effects they may impose on the environment. These categories, described by specific Class EA “schedules”, prescribe planning methodologies for each category. At present, there are four schedule classification types including Schedule A, A+, B and C. The main difference between each of the schedule types is the degree to which each project may adversely affect the existing environment. The various Schedules are described below:

- | | |
|--------------------|--|
| Schedule A | <ul style="list-style-type: none">• limited in scale and have minimal adverse environmental impacts;• includes a number of municipal maintenance and operational activities;• are pre-approved and as such, no public notification or documentation is required. |
| Schedule A+ | <ul style="list-style-type: none">• limited in scale and have minimal adverse environmental impacts;• are pre-approved and as such, no documentation is required;• the public is to be advised of the project prior to implementation. |
| Schedule B | <ul style="list-style-type: none">• have the potential for some adverse environmental impacts;• the proponent is required to undertake a screening process, involving mandatory contact with the directly affected public and relevant review agencies;• a project file is required to be prepared and made available for public review. |
| Schedule C | <ul style="list-style-type: none">• have the potential for significant environmental impacts;• must proceed under the full planning and documentation procedures of the Municipal Class EA process;• an Environmental Study Report is required to be prepared and filed on the public record for review by the public and review agencies. |

The Creek Road Class EA study has been identified as a Schedule ‘C’ project undertaking which applies to larger, more complex projects with the potential for significant environmental impacts (natural, social, cultural and economic) and requires multiple opportunities for public input.

An Environmental Study Report is required for Schedule 'C' projects and documents the EA process carried out. In order to complete the Schedule 'C' process, a Notice of Completion will be submitted to review agencies, stakeholders and the public for a period of at least 30 days for comment and input. The Notice will include notification for provision to request a Part II Order. If no appeals are brought forth by the expiry of the review period, the project is considered to have met the requirements of the Class EA process and the Region may prepare contract drawings, proceed to tender and construct the project.

The Municipal Class EA process includes five phases. The combination of the five phases that are required to be completed will depend on the Schedule of the project. Schedule 'C' projects require that all 5 phases are conducted. The first four phases will be completed as a part of this study; the fifth phase will be initiated following completion of the study. The 5 phases are summarized as follows, and illustrated in **Figure 2**:

Phase 1: Problem or Opportunity	• Identification and description of the problem or opportunity.
Phase 2: Alternative Solutions	• Identification of alternative solutions to the problem; • Preparation of a physical description of the study area as well as a general inventory of the natural, social and economic environments; • Evaluation of all reasonable alternatives, including the “do nothing” scenario; • Consultation with the public and review agencies; • Selection of the preferred solution.
Phase 3: Alternative Design Concepts for the Preferred Solution	• Identification of alternative designs for the preferred solution; • Preparation of a detailed inventory of the natural, social and economic environments; • Identification of the potential impacts of the alternative designs; • Evaluation of all alternative designs, including the “do nothing” scenario; • Consultation with the public and review agencies; • Selection of the preferred design; • Preliminary finalization of preferred design.
Phase 4: Environmental Study Report	• Completion of the Environmental Study Report (ESR); • Filing of the ESR on the public record for 30 days to allow for review by the public and review agencies; • Respond to part II order requests during 30-day review period, if received.
Phase 5: Implementation	• Implementation of preferred design.

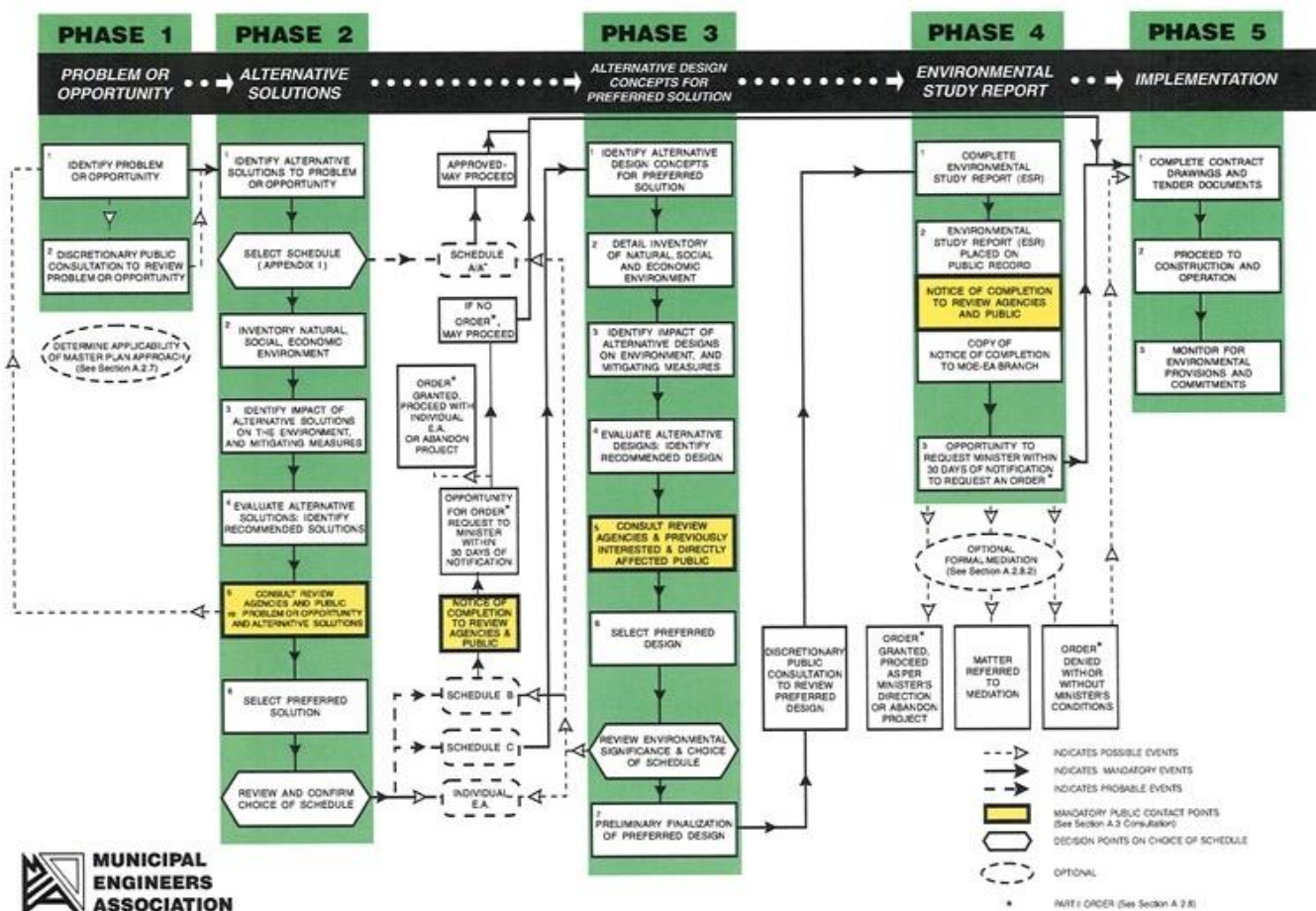


Figure 2. Municipal Class EA Planning and Design Process

1.3.1 PART II ORDERS

A request may be made to the Ministry of the Environment, Conservation and Parks (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. Requests should include the requester contact information and full name for the ministry.

Requests should specify what kind of order is being requested (request for additional conditions or a request for an individual/comprehensive environmental assessment), how an order may prevent, mitigate or remedy those potential adverse impacts, and any information in support of the statements in the request. This will ensure that the ministry is able to efficiently begin reviewing the request.

Requests should be sent in writing or by email to:

Minister of the
Environment, Conservation
and Parks
777 Bay Street, 5th Floor
Toronto, ON M7A 2J3
Email:
Minister.mecp@ontario.ca

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Assessment Branch
MECP
135 St. Clair Avenue West, 1st
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1.4 PROBLEM/OPPORTUNITY STATEMENT

As required by Phase 1 of the Municipal Class Environmental Assessment process for a Schedule ‘C’ project, a “Problem/Opportunity Statement” was prepared for the Creek Road Municipal Class EA to identify in detail the various problems and opportunities to be addressed throughout the study:

The Niagara Region is undertaking a Municipal Class EA study for improvements to the Creek Road corridor between River Road and Canborough Road, in the Township of Wainfleet. Improvements along Creek Road are being considered to address pavement condition and traffic capacity needs, structural deficiencies, as well as to provide active transportation facilities for pedestrians and cyclists along the corridor.

1.4.1 NEED AND JUSTIFICATION

Creek Road, within the study limits, is a two-lane east-west arterial road. This study is being undertaken to address:

- Roadway and pavement deterioration;
- Intersection and corridor safety issues (roadway geometrics, poor sightlines, narrow lanes and shoulders);
- Technical requirements (right-of-way standards, drainage & stormwater management); and,
- Structural deficiencies at the Oswego Bridge and Creek Road Bridge.

These improvements are required to maintain a **safe and functional road** that is **suitable for all road users**. Opportunities also exist to:

- Improve pedestrian and cycling experience; and,
- Incorporate other recommendations from the Region’s Transportation Master Plan.

2.0 Related Policies and Legislation

2.1 NIAGARA REGION OFFICIAL PLAN

Niagara Region's Official Plan (2014) provides a long-range policy and planning document to help shape and manage growth in the Region, including consideration for the natural environment, the economy, resources and agriculture, infrastructure. From a transportation perspective, the Official Plan supports multimodal transportation systems and promoting modes of transport besides single-occupant vehicle trips, including active transportation, transit and complete streets, as well as accommodating agricultural vehicles where appropriate.

The Official Plan also identifies the structure / land uses throughout the Region. The study area is designated as a "Good General Agriculture Area", with environmental protection and conservation areas located in and adjacent to the study corridor. The Chippawa Conservation Area and the Welland River are both classified as potential natural heritage corridors.

2.2 NIAGARA REGION TRANSPORTATION MASTER PLAN

Niagara Region's Transportation Master Plan (TMP), also known as *How We Go*, is a strategic planning document that lays out the programs, plans, and improvements required to address transportation needs in the Region from today through to 2041. The TMP looks at a variety of transportation needs including roads and highways for the movement of people and goods, pedestrians and cycling facilities, and transit. The most recent iteration of the TMP was completed in 2017.

The Region's TMP identifies the section of Creek Road within the study area as a Regional Capital Road Project that requires road rehabilitation and bridge replacement in the short term (2017-2021). No cycling or transit improvements are proposed as part of the TMP, but see Section 2.3 for more details on the Region's Bikeway Master Plan.

2.3 REGIONAL NIAGARA BIKEWAYS MASTER PLAN

The Regional Niagara Bikeways Master Plan (2003) establishes a long-term plan to support cycling (recreational, tourism, utilitarian) in the Region. This includes a Region-wide network of on and off-road cycling facilities to connect communities and key tourism destinations. Creek Road is identified in the Bikeways Master Plan as an existing on-road cycling facility.

2.4 TOWNSHIP OF WAINFLEET OFFICIAL PLAN

The study area is located in the lower-tier municipality of the Township of Wainfleet, who also has its own Official Plan (2016) to guide development and growth. Generally, the Official Plan also supports a transportation system for all modes of transportation, including walking and cycling, and a convenient and connected system.

The Official Plan also identifies the municipal structure / land uses in the township. The study area is identified as agricultural area as well as environmental conservation / protection areas due to the presence of the Welland River and the Chippawa Conservation Area. Lands adjacent to the Welland River are identified as hazard lands due to flooding potential. The Wellandport Hamlet is located on the east end of the study area.

2.5 CLEAN WATER ACT

As part of the EA process, impacts to Drinking Water Source Protection in the context of the *Clean Water Act*, 2006 must be considered. The applicable plan is the *Source Protection Plan for the Niagara Peninsula Source Protection Area* (2014). This plan contains policies to reduce existing and future threats to drinking water by addressing activities that have the potential to impact municipal drinking water systems. See Section 3.6 for more information on source water protection.

2.6 PROVINCIAL POLICY STATEMENT

The *Provincial Policy Statement* (PPS; 2020) provides direction on land use planning within the province to promote strong communities, a strong economy and a clean and healthy environment. All decisions related to land use planning matters are required to be consistent with the PPS. Policies that are relevant to the study are provided in Part V of the PPS:

- Part V, Section 1.5, Policy 1.5.1 states that “Healthy, active communities should be promoted by:
 - Planning public streets, spaces and facilities to be safe, meet the needs of pedestrians, foster social interaction and facilitate active transportation and community connectivity...”.
- 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 further provides, “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”.

The Creek Road Class EA addresses the PPS as the road (and bridges), in its current condition, does not meet current safety requirements, and so does not meet the transportation needs of the community. Improvements are needed to improve safety, maintain network connectivity (via auto and active transportation), and increase the service life of the road and bridges.

3.0 Inventory of Existing Conditions

3.1 LAND USE

Land use within the study area is composed of primarily agricultural and farmland properties with some natural, residential and institutional uses. The Wellandport Area Hamlet is located at the east end of the study area and generally includes institutional, commercial and village residential uses.

As described above in Section 2, Niagara Region and the Township of Wainfleet's Official Plan designates the surrounding land as agricultural area and as environmental conservation/protection areas adjacent to the Welland River and the Chippawa Conservation Area.

3.2 MUNICIPAL INFRASTRUCTURE

3.2.1 EXISTING ROADWAY

Creek Road, between River Road and Canborough Road, is a two-lane, east-west, Regional arterial roadway with a rural cross-section (one lane in each direction, with shoulders and ditches). The existing right-of-way width of Creek Road is 15m and the pavement is in poor condition, possibly indicating poor road drainage. Lane and shoulder widths are currently substandard based on Regional design standards and there are safety concerns related to obstacles and hazardous areas within the clear zone outside of the paved area (e.g. vegetation in the clear zone, steep slopes requiring guiderail) and due to sightline issues related to the existing horizontal and vertical alignments.

Within the study area, there are two bridge structures known as the Oswego Creek Bridge (single lane only) and Creek Road Bridge (single lane only). There are a number of local/regional intersecting roads within the study area listed in **Table 1**. There are also many private access roads (driveways, laneways) that connect directly to Creek Road as well.

Table 1: Intersections within the Study Area

Intersecting Road	Jurisdiction	Intersection Control	Description
Canborough Road (Regional Road 63)	Niagara Region	Stop Sign on Creek Road only	An east-west two-lane arterial road on the west end of the study area, crosses Creek Road forming a skewed, three-leg intersection.
Diltz Road	Town of Wainfleet	Stop Sign on Diltz Road only	A north-south two-lane local road, crosses Creek Road at a T-intersection.
Marshagan Road (Regional Road 7)	Niagara Region	Stop Sign on Marshagan Road only	A north-south two-lane arterial road, crosses Creek Road to the west of the Chippawa Creek Conservation Area. Only the portion south of Creek Road belongs to the Region; the roadway to the north is a local road.

Intersecting Road	Jurisdiction	Intersection Control	Description
Side Road 42	Town of Wainfleet	Stop Sign on Side Road 42 only	A north-south two-lane local gravel road, crosses Creek Road at a T-intersection.
Wellandport Road (Regional Road 4)	Niagara Region	Two-Way Stop System for Creek Road and traffic operating freely on Wellandport Road	A north-south two-lane arterial road, is located on the east end of the study area. A four-leg intersection is formed where Creek Road and Wellandport Road cross.
River Road (Regional Road 27)	Niagara Region	Stop Sign on Creek Road only	A two-lane curved arterial road, forms the east end of the study area and marks the end of Creek Road. This forms a three-leg skewed intersection, where Creek Road merges onto River Road. The intersections of River Road and Wellandport Road also results in a skewed three-leg intersection, which is part of our study area. The intersection of these three roads forms a triangle with skewed intersections at the east end of the study area and is part of the Wellandport Area Hamlet.

3.2.2 EXISTING STRUCTURES

3.2.2.1 Oswego Creek Bridge

Originally constructed in 1930, Oswego Creek Bridge conveys Creek Road over Oswego Creek. This structure is a single span, steel Warren pony truss, with the superstructure supported on two concrete abutments with piles driven into the bedrock (see **Figure 3**). The structure has a total deck length of 22.7 m and deck width of 6.1 m. The roadway narrows from two lanes to a single lane over the structure with a paved width of 5.64 m. The deck width does not meet current Niagara Region standard road width requirements for two lanes of vehicular traffic. There is a steel beam guide rail at all four corners of the structure with extruders at all four corners. The guide rail structure connections do not meet current roadside safety standards.

The posted speed limit over the bridge is 60 km/hr. The bridge has a vehicle load limit posting.

Flooding of the structure occurs occasionally, along with the approach roadways, as both are below the 100-year flood water elevation.



Figure 3 Oswego Creek Bridge

3.2.2.2 Creek Road Bridge

Originally constructed in 1950, Creek Road Bridge conveys Creek Road over an unnamed tributary of the Welland River. This structure is a single span concrete rigid frame structure (see **Figure 4**). The structure carries Creek Road over an Unnamed Creek which is a tributary of the Welland River. The structure has a total span length of 4.6 m and deck width of 7.8 m. The roadway narrows from two lanes to a single lane over the structure with a paved width of 5.0 m. The deck width does not meet current Niagara Region standard road width requirements for two lanes of vehicular traffic. There is steel beam guide rail over the structure with extruders at all four corners.

The posted speed limit over the bridge is 60 km/hr.

The 100 year flood water elevation overtops the existing bridge and overtopping extends over the approach roadways approximately 100m in each direction.



Figure 4: Creek Road Bridge

3.2.3 ACTIVE TRANSPORTATION

There are no existing active transportation facilities in the study area. Road shoulders are very narrow or non-existent and cannot be used safely for pedestrians or cyclists.

3.2.4 EXISTING MUNICIPAL SERVICING

There is no municipal servicing (watermains or sanitary sewers) in the Creek Road corridor.

3.2.5 EXISTING STORMWATER MANAGEMENT AND DRAINAGE

Stormwater and drainage of the roadway is accommodated through roadside ditches and centreline culverts.

3.2.6 EXISTING UTILITIES

Hydro One has a primary overhead utility line that runs along the entire Creek Road corridor from approximately 400m east of Canborough Road easterly to Regional Road 27 and along Regional Road 4 from Regional Road 27 southerly to Creek Road. The hydro line is located both inside and outside of the existing road allowance and varies in location from the south side to the north side. Service connections to the various buildings are both overhead or underground. Hydro One overhead utility plant is also located along the east side of the road allowance of Regional Road 4 from Regional Road 27 to Regional Road 45.

Bell Canada has buried utility plant throughout the Creek Road corridor along the north side of the ROW. In addition, a second buried Bell utility line crosses Regional Road 45 to the south side of the road allowance approximately 1.75km west of Regional Road 4 and extends easterly to Regional Road 4. Bell buried utility plant exists along the west side of Regional Road 4 from Regional Road 45 to the north cemetery limits at which point the Bell utility becomes an aerial installation to the intersection with Regional Road 27.

Union Gas indicated that no plant exists within the overall corridor. This should be reconfirmed during further phases of the project as there is some evidence of buried gas utilities at the east and west ends of Regional Road 45.

Cogeco has indicated that there is no plant for their communications cables within the project limits.

In 2016, the Niagara Region Wind Farm development installed wind tower infrastructure on Regional Road 45 as part of the overall development of 77 wind towers in the Niagara Region. A buried electricity transmission line enters the Regional Road 45 road allowance from the south at Sideroad 42 and continues westerly for approximately 660m. At that point, the buried infrastructure proceeds northwesterly onto private lands and exits the Regional Road 45 road allowance. At a location approximately 400m west of Sideroad 42, an underground junction box was installed under the road pavement which connects transmission cables from a wind tower immediately south of this location to the transmission line. In January 2017, Boralex acquired a 50% stake in the Niagara Region Wind Farm and currently operates the site.

3.3 TRAFFIC

The following sections discuss the findings of the Transportation and Traffic Analysis. For the full report, refer to **Appendix A**.

3.3.1 EXISTING (2016) TRAFFIC CONDITIONS

3.3.1.1 Traffic Speed

The section of Creek Road from Canborough Road to Marshagan Road has a posted speed limit of 70 km/hr. From Marshagan Road to Side Road 42 the posted speed is 80 km/hr and from Side Road 42 to River Road the posted speed is 50 km/hr.

3.3.1.2 Existing (2016) Lane Capacity Analysis

Existing traffic volumes collected in 2016 for the study area were compared against standard lane capacity, which determined that all of the major sections of Creek Road are operating below capacity in both the eastbound and westbound directions. Based on these results, there are no additional capacity requirements required for the corridor.

3.3.1.3 Existing (2016) Intersection Operations

Traffic volumes were also used to assess the operations for the unsignalized intersections during the AM and PM peak hours. All of the unsignalized intersections analyzed are operating well under existing traffic conditions with either LOS 'A' or 'B'.

3.3.2 FUTURE (2026 AND 2036) TRAFFIC VOLUMES

Future (2026 and 2036) traffic volumes were established by applying a 2% per annum growth rate to the existing (2016) traffic volumes. The same lane capacity analysis and intersection operations analysis was completed.

Under future (2026 and 2036) traffic conditions, all the major sections of Creek Road operate below capacity in both the eastbound and westbound directions and no additional capacity is required on the corridor. For both future traffic conditions, all unsignalized intersections were forecasted to operate well with no critical movements.

A left turn lane warrant analysis was also conducted to determine the need for dedicated left turn lanes. The analysis indicated that exclusive left turn lanes are not required at any of the unsignalized intersections under both future (2026 and 2036) traffic conditions.

3.3.3 COLLISION ASSESSMENT

A Safety Performance Assessment was completed to review intersection and midblock collision data. The purpose of the review is to determine if there are any discernable collision trends which require implementation of mitigation measures or roadway improvements.

Based on data from 2009 to 2016, the intersection of Creek Road and Wellandport Road contained the highest percentage of collisions (five collisions, representing 83% of collisions). Four of these collisions were classified as angle collisions. One other collision occurred at the Creek Road and Diltz Road intersection. Overall, there are no significant patterns at any intersections within the study area which would indicate the need for operational or roadway safety improvements.

Using the same data, a total of 17 midblock collisions occurred. Most of the collisions were single motor vehicle collisions. Overall, there are no discernable collision trends in the midblock sections within the study area which would indicate the need for operational or roadway safety improvements.

3.4 GEOTECHNICAL AND HYDROGEOLOGICAL CONDITIONS

A geotechnical investigation was undertaken to review the existing pavement and underlying soil conditions along Creek Road. The following section is a summary of geotechnical and hydrogeological conditions within the study area. See **Appendix B** for the full report.

3.4.1 GEOTECHNICAL

Forty-six boreholes were drilled and sampled for the study area as well as Oswego Creek Bridge. The asphalt pavement on Creek Road is in poor condition with longitudinal and alligator cracking, potholes and evidence of raveling. There are areas of patch repair and crack sealing on the roadway.

3.4.2 HYDROGEOLOGICAL

Groundwater depths are approximately 5 to 6 m below existing grades, just above the level of the Welland River.

3.5 NATURAL HERITAGE

An Environmental Impact Study (EIS) was completed and the following section summarizes the Natural Heritage features within the study. For the full EIS report, refer to **Appendix C**.

3.5.1 PHYSIOGRAPHY AND SOIL

The study area is found in the Haldimand Clay Plain Physiographic Region and is most often characterized by stratified clay soils and moraine till ridges. The dominant natural physiographic features in the study area are the Welland River and Oswego Creek.

3.5.2 DESIGNATED NATURAL AREAS

The following designated natural areas and features are found in the study area:

- As identified in the Niagara Region Official Plan, much of the study area is designated as environmental protection areas or environmental conservation areas, including the Chippawa Creek Conservation Area (CA), Chippawa Creek Slough Forest PSW Complex, Welland River West PSW Complex, and riparian areas along the Welland River and Oswego Creek.

- 21 NPCA Regulated Areas associated with the Welland River, Oswego Creek, and their tributaries, PSW complexes, and Chippawa Creek Conservation Area.
- Three separate PSWs:
 - Welland River West PSW Complex
 - Oswego Creek PSW Complex
 - Chippawa Creek Slough Forest PSW Complex

3.5.3 AQUATIC/FISHERIES

The primary water features of interest within the study area are the Welland River, Oswego Creek, and an unnamed tributary to Welland River located approximately 600 m west of Marshagan Road. At the time of investigations, three watercourse crossings along Creek Road were found to provide seasonal or permanent fish habitat and are discussed in the following sections. The remaining watercourse crossings do not directly support fish populations; however, given their connectivity to the Welland River, these features provide contributions indirectly to fish habitat along the river shoreline where they outlet.

3.5.3.1 Unnamed Tributary to Welland River

The watercourse is a Corrugated Steel Pipe (CSP) culvert that conveys an unnamed tributary of the Welland River across Creek Road approximately 500 m northwest of Diltz Road. It was observed to have shallow pools at the culvert inlet and outlet within an otherwise dry channel, and very little water was observed to be entering the pools from the CSP culvert during field investigations. The water quality is likely to limit the fish community to warm water species tolerant of low dissolved oxygen.

The watercourse was comprised of a dry overland swale in the agricultural field upstream of the culvert. Downstream, the channel was lined with rip-rap through manicured lawn for approximately 25 m before leading to a deeper, naturalized section, approximately 0.5 m deep that may offer potential nursery/rearing habitat near the river confluence. Some erosion was observed downstream of the rip-rap channel, consisting of minor undercut banks.

Based on conditions observed, this watercourse may provide seasonal fish habitat up to and including the ROW; however, due to the absence of sufficient flow, refuge habitat, and a low flow channel on both sides of Creek Road, prolonged usage by fish is unlikely in the study area.

3.5.3.2 Oswego Creek

The Oswego Creek Bridge conveys Oswego Creek across Creek Road approximately 750 m southeast of Diltz Road. At the bridge, submerged and/or floating vegetation was present along both banks of Oswego Creek. The Oswego Creek corridor is identified as a PSW.

Upstream (southside) of Creek Road, the creek is part of the Oswego Creek PSW Complex and downstream (northside), the creek is part of the Welland River West PSW Complex. Oswego Creek is exposed to multiple potential stressors, such as agricultural and roadway runoff, which are expected to be the source of increased phosphorus resulting in potential nuisance algae and abundant

duckweed during summer months. Migration of fish through Oswego Creek from the larger permanent Welland River is likely when conditions permit. The overhanging trees found throughout the watercourse banks shade the watercourse, provide cover for fish, and contribute to coarse woody in-stream cover found along the creek margins. Water depths at this section of the river are estimated to be 4 m - 6 m at the centre of the creek with muddy/silty substrate.

Based on field investigations, aquatic habitat in Oswego Creek is abundant along the shorelines and suitable for sustaining a diverse fishery and supporting important spawning, feeding, and nursery functions. Available in-stream habitat consists of floating, submergent, and emergent aquatic macrophytes, overhanging bank vegetation, limited coarse woody debris, and rock protection around the existing bridge wingwalls.

3.5.3.3 Creek Road Bridge

The Creek Road Bridge conveys another unnamed tributary of Welland River across Creek Road approximately 600 m southwest of Regional Road 7 (Marshagan Road) and is a main intersect drainage point from the agricultural fields upstream to the Welland River.

Upstream of the culvert, the channel was completely overgrown in places with emergent wetland vegetation. Downstream of the culvert, large riparian trees are located along the banks of the creek offering submerged root systems that provide complex structure for fish habitat. Tall grasses and other semi-aquatic vegetation found throughout the watercourse likely provide spawning habitat for many fish species, including Northern Pike (*Esox lucius*) and potentially Grass Pickerel (*Esox americanus vermiculatus*). The portion of this watercourse found north of Creek Road is identified as part of the Welland River West PSW complex and provides important habitat for small or young fish. .

3.5.3.4 Aquatic Community Inventory

The Welland River, Oswego Creek, and associated tributaries were mapped as suitable habitat to support diverse fish and mussel communities; however due to flow conditions observed, only Welland River and Oswego Creek, and the unnamed tributary at Creek Road Bridge provide suitable habitat for freshwater mussels. The Lilliput mussel (*Toxoplasma parvum*) is potentially present at both watercourses and identified as an Endangered species under the SARA and Threatened under the ESA with known critical habitat at the Oswego Creek bridge. The Mapleleaf mussel (*Quadrula quadrula*) is identified as a Special Concern species under the SARA and ESA and was highlighted on DFO online SAR Mapping (2019) as potentially inhabiting Oswego Creek and the unnamed tributary to Welland River at Creek Road Bridge given their permanent flow conditions and presence of suitable habitat. Multiple Mapleleaf shells were found along the shoreline of the Welland River near Oswego Creek confirming the presence of the SAR species. In addition, Grass Pickerel is a species of Special Concern under the SARA and ESA and may also be present at both watercourses as well.

For a full list of potential fish species, refer to the EIS report.

3.5.4 VEGETATION

The largest areas of natural vegetation in the study area are in the Chippawa Creek CA and in the extension of the PSW that abuts Creek Road east of the CA. Patches of natural and naturalized vegetation are also present along watercourses, along the abandoned railway corridor which crosses the road corridor, and in hedgerows at the edges of fields. Natural and naturalized vegetation in the study area includes deciduous forests, swamp, marsh, cultural thickets, and cultural meadows.

Vegetation in the study area was divided into overall vegetation units and further refined into vegetation communities using the Ecological Land Classification (ELC). A map of the ELC areas is provided in the EIS report however, **Table 2** below outlines the vegetation communities within the study area.

Plant Species of Conservation Concern (SoCC) were also documented including one provincially rare species, Walter's Barnyard-grass (*Echinochloa walteri*) found in riparian marsh habitat along Oswego Creek, and seven regionally rare species.

Table 2: Summary of Vegetation Communities in the Study Area

ELC Code	Community Type	Description/Comments
CUM1	Mineral Cultural Meadow	Cultural meadow typically includes old fields and open areas in the early stages of succession. It is characterized as well-drained, open habitat dominated by grass and forbs with few or no trees and shrubs. Cultural meadow is widespread in the study area and represents the largest contiguous vegetation communities.
CUP1	Deciduous Plantation	Planted areas of deciduous trees, including Black Walnut (<i>Juglans nigra</i>), Black Locust (<i>Robinia pseudoacacia</i>), and Hickories (<i>Carya</i> spp.), are located in Chippawa Creek CA.
CUS1-1	Hawthorn Cultural Savannah	Cultural savannah typically represents old fields and pastures with scattered trees and groundcover dominated by grasses and forbs. Several patches of cultural savannah are present in the study area, mainly between Creek Road and the Welland River.
CUP3	Coniferous Plantation	Plantations of coniferous trees, namely Pine (<i>Pinus</i> spp.) and Spruce (<i>Picea</i> spp.), represent most vegetation in Chippawa Creek CA.
CUW1	Mineral Cultural Woodland	Typically a vegetation community of human origin but in a more advanced stage of succession than cultural savannah or cultural meadow. Cultural woodlands are present at various locations throughout the study area.
HAc	Common Apple Hedgerow	Narrow hedgerow containing predominantly Common Apple (<i>Malus pumila</i>).
HAg	Green Ash Hedgerow	Narrow hedgerow containing predominantly Green Ash (<i>Fraxinus pennsylvanica</i>).
HOsw	Swamp White Oak Hedgerow	Hedgerow consisting of planted (or possibly remnant) Swamp White Oaks (<i>Quercus bicolor</i>).

ELC Code	Community Type	Description/Comments
FOD6-5	Fresh-Moist Sugar Maple-Hardwood Deciduous Forest	Deciduous forest community with a canopy dominated by Sugar Maple (<i>Acer saccharum</i>) and other hardwood trees. This is a common and widespread community typical of southern Ontario forests.
FOD7-2	Fresh-Moist Ash Lowland Deciduous Forest	Deciduous forest community with a canopy dominated by Ash (<i>Fraxinus</i> spp.) and other hardwood trees. This community is located adjacent to most of the watercourses in the study area.
FOD9	Fresh-Moist Oak-Maple-Hickory Deciduous Forest	Deciduous forest community with a canopy dominated by Oaks (<i>Quercus</i> spp.), Maples (<i>Acer</i> spp.) and Hickories. There is only one small area of this community in the study area, in Chippawa Creek CA.
FOM	Mixed Forest	Forest community consisting of a mix of deciduous and coniferous trees. Much of Chippawa Creek CA can be classified as mixed forest.
FOM2-2	Dry-Fresh White Pine-Sugar Maple Mixed Forest	Forest community with a canopy dominated by Eastern White Pine (<i>Pinus strobus</i>) and Sugar Maple (<i>Acer saccharum</i>). There are two small areas of this vegetation community located in the eastern section of the study area.
MAM2-2	Reed Canary Grass Mineral Meadow Marsh	Seasonally flooded marsh community dominated by Reed Canary Grass (<i>Phalaris arundinacea</i>). This is a common and widespread vegetation community in Ontario.
MAS2	Mineral Shallow Marsh	Typically permanently flooded marsh community with mineral substrate.
MAS2-9	Forb Mineral Shallow Marsh	Typically permanently flooded marsh community with mineral substrate. Forb mineral shallow marshes in the study area are dominated by Arrowhead (<i>Sagittaria</i> spp.).
SAF1-1	Water Lily Floating-leaved Shallow Aquatic	Found along the banks of Oswego Creek.
SWD2-2	Green Ash Mineral Deciduous Swamp	Swamp community with a canopy dominated by Green Ash. This is the predominant component of PSWs in and around the study area. Inclusions of meadow marsh and other wetland communities occur within mineral deciduous swamp communities in the study area.
SWT2-9	Grey Dogwood Mineral Thicket Swamp	Swamp community dominated by Grey Dogwood (<i>Cornus racemosa</i>), or in some cases Silky Dogwood (<i>Cornus amomum</i>).

3.5.5 WILDLIFE AND WILDLIFE HABITAT

3.5.5.1 Wildlife

Birds

A total of 42 bird species were identified in the study area and 32 additional species were documented via eBird and iNaturalist. Noteworthy species include Barn Swallow (*Hirundo rustica*) and Eastern Wood-Pewee (*Contopus virens*), which are Species at Risk (SAR). A nest was observed on Creek Road Bridge, which are consistent with nest characteristics of Barn Swallow, but the large amount of material built onto the nest suggests another species took over the nest site. Regardless, this structure has the potential for future nesting of Barn Swallow as well as other species.

The underside of the Oswego Creek bridge has numerous ledges and cavities created by the exposed support beams, and therefore has a high potential to support nesting birds. Although visibility beneath the bridge was limited by steep banks and deep water, bird activity around the bridge was high and Barn Swallows were observed on multiple occasions flying above the water around the bridge. The bridge is therefore considered potential nesting habitat for Barn Swallow.

Amphibians

Breeding amphibian surveys completed by Parsons identified six species of frog within the study area: American Bullfrog (*Lithobates catesbianus*), American Toad (*Anaxyrus americanus*), Gray Tree Frog (*Hyla versicolor*), Green Frog (*Lithobates clamitans*), Spring Peeper (*Pseudacris crucifer*), and Western Chorus Frog (*Pseudacris triseriata*).

Other

Mammals were observed within the study area, with many of the observations made in the vicinity of the Chippawa Creek CA, and some were observed dead on the road surface. The only reptile observations in the study area were two Eastern Garter Snakes (*Thamnophis sirtalis sirtalis*) and one Midland Painted Turtle (*Chrysemys picta marginata*), all of which were found dead on the road shoulder. Of other reptile species with the possibility of occurring, Snapping Turtle (*Chelydra serpentina*) and Northern Water Snake (*Nerodia sipedon sipedon*) are likely to occur in the study area in association with suitable habitat in the large watercourses crossed by Creek Road. Seven species of butterfly were also observed within the study area, in open fields and along roadsides. This includes the provincially and federally listed Special Concern species Monarch (*Danaus plexippus*).

3.5.5.2 Significant Wildlife Habitat (SWH)

Seasonal Concentration Areas

Waterfowl Stopover and Staging Areas: This type of habitat includes water-sheeted fields in spring as well as ponds and other watercourses which provide waterfowl with the opportunity to rest and feed during migration. Within the study area, the large aquatic features (e.g., the Welland River, Oswego Creek, and Dils Lake) likely provide some stopover habitat during migration, although large numbers of waterfowl have not been reported in the area via eBird records, nor were any observed during

Parsons' own site investigations. As such, candidate Waterfowl Stopover and Staging Areas are considered present within the study area.

Shorebird Migratory Stopover Areas: Habitat characteristic of Shorebird Migratory Stopover Areas are not present within the study area, this SWH type will not be considered further.

Landbird Migratory Stopover Areas: Significant landbird stopover areas are woodlots greater than 5 ha in size located within 5 km of Lake Erie or Lake Ontario. The study area does not contain any sites within that location boundary; therefore, this SWH type is considered absent from the study area.

Raptor Wintering Areas: Open fields that support small mammal populations, in conjunction with woodlands providing roosting sites, are important to the winter survival of many raptors. The open spaces adjacent to Creek Road within the study area could be appealing to raptors and are found near wooded areas which could provide the associated roosting sites. However, as field investigations were not conducted during winter, the presence of this SWH type could not be confirmed. Thus, candidate Raptor Wintering Areas are considered present in the study area.

Colonially-nesting Bird Breeding Habitat: Bird nesting colonies can occur on cliffs and structures, in natural vegetation, and on open ground. Evidence of nesting colonies of any type within the study area were not observed. Therefore, Colonially-nesting Bird Breeding Habitat is considered absent from the study area.

Bat Hibernacula and Maternity Colonies: Maternity colonies typically occur in forests with large-diameter dead or dying trees (called "snags") and/or with several oak trees, preferably with dead or dying branch tips. Numerous suitable roost trees with potential to provide bat maternity habitat were observed within the study area, often near the existing road. Complete surveys of snag trees throughout the study area were not conducted; however, snag surveys and acoustic monitoring would be required to rule out the possibility of bat maternity colonies in the study area. Therefore, candidate bat maternity habitat is considered present in the study area.

Turtle Wintering Areas: Turtle overwintering habitat requires permanent water bodies deep enough to prevent the full water column from freezing through, typically with soft mud substrates. This type of habitat could be present in the Welland River, Oswego Creek, and Dils Lake. Therefore, candidate Turtle Wintering Areas are considered present within the study area.

Snake Hibernacula: Communal snake hibernation sites frequently include old animal burrows, rock crevices, or building foundations where animals can get below the frost line and where there is sufficient moisture to prevent them from desiccating. While such features were not documented near the existing road, hibernacula can be very difficult to find so a lack of incidental observations cannot be taken as definitive proof that hibernacula are absent. Therefore, candidate snake hibernacula habitat is considered present in the study area.

Migratory Butterfly Stopover Areas: In the fall, migrant butterflies typically target old field habitats dominated by abundant nectar sources such as goldenrods and asters. Although the open areas and roadsides within the study area contained a high number and variety of butterflies in the late summer and fall, the study area does not meet the requirement for provincially significant stopover

sites to be within 5 km of Lake Ontario or Lake Erie. As such, Migratory Butterfly Stopover Areas are considered absent from the study area.

Deer Wintering Congregation Areas: The importance of sheltered winter deer habitat is greatest in areas with deep snow accumulation since deer do not move well in deep snow. Although deer are present and were observed both directly and by tracks on multiple occasions, deer management is a NDMNRF responsibility and therefore significant congregation areas are mapped by NDMNRF. Winter deer yards were not identified by NDMNRF in the study area; therefore, Deer Winter Congregation Areas are considered absent from the study area.

Rare Vegetation Communities

None of the vegetation communities identified along the road corridor are considered rare in Ontario.

Specialized Habitat for Wildlife

Specialize Habitat for Wildlife identified in the study area include:

- Waterfowl Nesting Areas, due to the presence of wetland habitat adjacent to Creek Road along Oswego Creek and the tributary of the Welland River
- Bald Eagle and Osprey Nesting, Foraging and Perching Habitat, due to the presence of the woodlands in the Chippawa Creek CA adjacent to Dils Lake and the Welland River
- Woodland Raptor Nesting Habitat, as the woodland-nesting Cooper's Hawk (*Accipiter cooperii*) was reported via eBird in the study area
- Turtle Nesting Areas, as the banks of Oswego Creek, the Welland River, and the unnamed tributary of the Welland River provide suitable habitat for turtle nesting
- Amphibian Breeding Habitat (Woodland), confirmed through the amphibian survey which documented a large number of amphibians calls mostly from the south and some from the north side of Creek Road
- Amphibian Breeding Habitat (Wetland), as the amphibian survey confirmed American Bullfrogs calling from multiple locations along the Welland River, Oswego Creek, and the lower portion of the tributary to the Welland River
- Seeps and Springs, as such areas are likely to occur in the woodland/wetland associated with the Chippawa Creek CA

Habitat for Species of Conservation Concern

Marsh Bird Breeding Habitat: Wetlands and shallow open water habitats supporting breeding pairs of indicator species. Suitable habitat is present in the study area; therefore, candidate Marsh Bird Breeding SWH is considered present in the study area.

Open Country Bird Breeding Habitat: Indicator bird species were not observed in sufficient density to qualify their habitats as SWH.

Shrub/Early Successional Bird Breeding Habitat: Significant successional bird habitat is defined by the presence of certain indicator species. Of the listed species, only Willow Flycatcher (*Empidonax traillii*) was observed during breeding bird surveys. This species was observed in a ~4 ha patch of

shrubby, successional habitat on the Chippawa Creek CA lands; this patch, of itself, is not large enough to be considered candidate SWH without further observation of the indicator species

Terrestrial Crayfish: Crayfish burrows were not observed in the study area; however, suitable habitat is present. Candidate terrestrial crayfish SWH is considered present in the study area.

Species of Conservation Concern: 17 Species of Conservation Concern (SoCC) are confirmed or have the potential to occur in the study area. They are listed in **Table 3** below.

Table 3: SoCC Associated with the Study Area

Species	Status	Discussion
<i>Fish and Mussels</i>		
Mapleleaf <i>Quadrula quadrula</i>	SARA - SC ESA - SC COSEWIC – SC SRANK – S2	Dead valves belonging to this species were found during field investigations at the confluence of Oswego Creek and the Welland River. Mapleleaf is very likely present at both bridge locations and is also mapped as present by DFO (2019).
Grass Pickerel <i>Esox americanus vermiculatus</i>	SARA – SC ESA – SC COSEWIC – SC SRANK – S3	Wetland and stream habitat in the study area is suitable for Grass Pickerel, though it was not observed during field investigations.
<i>Reptiles</i>		
Eastern Milksnake <i>Lampropeltis triangulum</i>	SARA - SC ESA - NAR COSEWIC – SC SRANK – S4	This is a relatively widespread species in the region and could easily occur in the area, especially given the number of abandoned structures and other potential hibernacula. Milksnakes are often secretive and hard to detect even by dedicated snake surveys.
Eastern Ribbonsnake <i>Thamnophis sauritus</i>	SARA - SC ESA - SC COSEWIC – SC SRANK – S4	Although it was not observed during field investigations, suitable potential habitat is present along the study area watercourses and in adjacent open, grassy areas.
Northern Map Turtle <i>Graptemys geographica</i>	SARA - SC ESA - SC COSEWIC – SC SRANK – S3	Both the Welland River and Oswego Creek are deep, permanent watercourses and provide potential habitat.
Snapping Turtle <i>Chelydra serpentina</i>	SARA - SC ESA - SC COSEWIC – SC SRANK – S4	Very likely to occur in study area watercourses. Could also be found entering the road corridor to bask on warm asphalt surfaces and/or seek out gravelly nesting areas.
<i>Birds</i>		
Eastern Wood-pewee <i>Contopus virens</i>	SARA – SC ESA – SC COSEWIC – SC SRANK – S4B	This species was heard singing from wooded lands associated with the Chippawa Creek CA and is probably breeding in this location.
Bald Eagle <i>Haliaeetus leucocephalus</i>	SARA - no status ESA – SC COSEWIC - NAR SRANK - S2N, S4B	Local eBird (2021) records exist for this species in association with the Chippawa Creek CA.
<i>Plants</i>		

Species	Status	Discussion
Finely-nerved Sedge <i>Carex leptoneura</i>	RRANK – R	Found growing at the edge of woodland habitat to the west of Anderson Sideroad (in Chippawa Creek CA).
Buttonbush Dodder <i>Cuscuta cephalanthi</i>	SRANK - S2	Could be present on emergent aquatic plants in Oswego Creek and other deep watercourses.
Swamp Loosestrife <i>Decodon verticillatus</i>	RRANK – R	Grows extensively in shallow water along Oswego Creek. Occurs in proximity to the Oswego Creek bridge and could be impacted by construction.
Walter's Barnyard-grass <i>Echinochloa walteri</i>	SRANK – S3 RRANK – R	Found during field investigations growing in riparian marsh habitat on the east side of Oswego Creek about 50 m north of Oswego Creek Bridge.
Honey-locust <i>Gleditsia triacanthos</i>	SRANK – S2 RRANK – R	A thicket of Honey-locust, including several large trees, is located to the south of the intersection of Creek Road and Wellandport Road. This is a frequently planted ornamental species. It is not possible to determine whether the individuals at this location are planted or naturally occurring. Notably, these individuals are not cultivars (as would be expected of planted trees).
Pickerelweed <i>Pontederia cordata</i>	RRANK - R	Pickerelweed grows extensively in Oswego Creek in proximity to the bridge and could be impacted by construction.
American Plum <i>Prunus americana</i>	RRANK – R	American Plum was found growing at the edge of the forest to the north of Creek Road within Chippawa Creek CA.
Branching Bur-reed <i>Sparganium angustifolium</i>	SRANK - SH	Could be present in Oswego Creek and other watercourses.
Insects		
Monarch <i>Danaus plexippus</i>	SARA – SC ESA – SC COSEWIC – END SRANK – S2N, S4B	Observed in multiple locations within the study area. Requires milkweed (<i>Asclepias</i> sp.) plants for larval food source and fall wildflowers as nectar source prior to migration – both of which are present in the study area.

Wildlife Movement Corridors

Several potential natural heritage corridors are in the study area as indicated in Schedule C of the Niagara Region Official Plan. Two of these corridors run north-south through the study area and intersect with Creek Road. The first includes terrestrial habitats and riparian areas associated with Oswego Creek and the second includes natural areas within and connected to Chippawa Creek CA. The Welland River and associated terrestrial habitats also constitute a natural heritage corridor as indicated in the Official Plan.

Other potential connections and corridors include the former rail bed, which likely provides passage for terrestrial wildlife through the study area. Mature hedgerows throughout the study area also provide potential movement corridors for wildlife.

Parsons observed multiple mammal, amphibian, and reptile carcasses on Creek Road during field investigations, indicating that the road acts as a barrier to wildlife movement. Frog movement and mortality on the road was observed during early spring night surveys adjacent to the CA lands, which supports the idea that frogs are utilizing breeding habitat on both sides of the road and attempting to

migrate between these areas, especially on rainy spring nights. The vicinity of the CA lands is also where the reptile roadkill observations were made.

Currently, terrestrial habitat connectivity along major watercourses via the bridge/culverts is minimal. Bridge and culvert structures extend right to the water's edge with no space for terrestrial species to move along the banks beneath the roadway.

3.5.6 SPECIES AT RISK

A list of potential Species at Risk (SAR) in the study area was populated based on NDMNRF publicly available SAR occurrence records, a list of known SAR in Maitland township provided by NDMNRF correspondence, DFO aquatic mapping, and site observations. The full list of SAR were evaluated based on the availability of suitable habitat for the SAR in question and eleven species are confirmed to be present or considered to have high potential to occur in the study area (Table 4).

Table 4: Species at Risk associated with the Study Area

Species	Status	Discussion
<i>Fish and Mussels</i>		
Lilliput <i>Toxolasma parvum</i>	ESA - THR SARA - END COSEWIC - END SRANK - S2	Although it was not observed during field investigations, suitable habitat is present in the study area at Oswego Creek and Creek Road Bridges and is also mapped as present by DFO (2019). Oswego Creek is known critical habitat for Lilliput.
<i>Birds</i>		
Barn Swallow <i>Hirundo rustica</i>	SARA - THR ESA - THR COSEWIC - THR SRANK - S5B	Numerous Barn Swallows were observed throughout the study area during field investigations. There are barns, sheds, and other structures in and around the study area which likely provide nesting habitat for the species. One nest was also observed in tributary culvert, and Barn Swallows were observed flying around the underside of the Oswego Creek bridge.
Bank Swallow <i>Riparia riparia</i>	SARA - THR ESA - THR COSEWIC - THR SRANK - S4B	Not observed during breeding bird surveys but reported in the study area via eBird along the river corridor near the eastern project limits. Suitable breeding habitat could potentially occur along the Welland River banks.
Wood Thrush <i>Hylocichla mustelina</i>	SARA - THR ESA - SC COSEWIC - THR SRANK - S4B	Not observed during breeding bird surveys but reported via eBird in the Chippawa Creek CA. Suitable breeding habitat is present in forested areas adjacent to the road.
Common Nighthawk <i>Chordeiles minor</i>	SARA - THR ESA - SC COSEWIC - SC SRANK - S4B	Local eBird records exist for this species in association with the Chippawa Creek CA.
Eastern Whip-poor-will <i>Antrostomus vociferus</i>	SARA - THR ESA - THR COSEWIC - THR SRANK - S4B	The habitats that abut Creek Road in the CA and further east could potentially provide habitat for this species, as these areas consist of forests with many clearings and open patches. However, it was not observed by Parsons and was not reported in the area by eBird.
<i>Mammals</i>		
Eastern Small-footed Myotis	SARA - no status ESA - END	Roosts in rock outcrops, hollow trees, cavities, beneath loose bark, and in similar features. As previously noted, large diameter snags that could

Species	Status	Discussion
<i>Myotis leibii</i>	COSEWIC – no status SRANK – S2S3	provide bat maternity and/or roosting habitat were observed close to the existing road.
Little Brown Myotis <i>Myotis lucifugus</i>	SARA – END ESA – END COSEWIC – END SRANK – S3	Roosts in crevices and cavities in dead or dying trees, or sometimes beneath naturally loose bark on species like Shagbark Hickory (<i>Carya glabra</i>). These features are present in the study area, in some cases directly adjacent to the existing road.
Northern Myotis <i>Myotis septentrionalis</i>	SARA – END ESA – END COSEWIC – END SRANK – S3	Roosts in crevices and cavities in dead or dying trees, or sometimes beneath naturally loose bark on species like Shagbark Hickory. These features are present in the study area, in some cases directly adjacent to the existing road.
Tri-coloured Bat <i>Perimyotis subflavus</i>	SARA – END ESA – END COSEWIC – END SRANK – S3?	Roosts in foliage within or below the canopy, preferably in oak species but also sometimes in maples. Clusters of dead or dying leaves on live branches are preferred. The study area included many large oaks with such features.
Plants		
Butternut <i>Juglans cinerea</i>	SARA – END ESA – END COSEWIC – END SRANK – S2?	Although not identified during field investigations, the study area does provide suitable growing habitat. Areas that will be subject to vegetation removal prior to construction should be intensively surveyed for this species to confirm its presence or absence.

3.6 DRINKING WATER SOURCE PROTECTION

Based on mapping from MECP, there are some Significant Groundwater Recharge Areas and Highly Vulnerable Aquifers adjacent to Creek Road as shown in **Figure 5** below. There are no Wellhead Protection Areas or Intake Protection Zones.

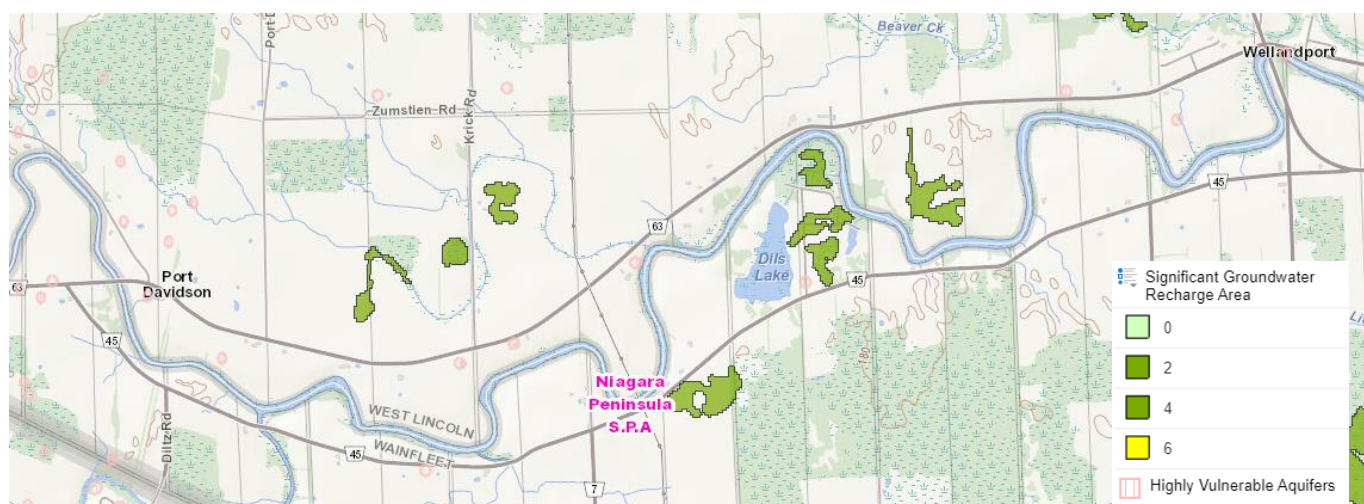


Figure 5: Source Water Protection Features within the Study Area

3.7 CULTURAL HERITAGE

A Cultural Heritage Resource Assessment (CHRA) was completed to identify cultural heritage resources within the study area. Based on this background research and field review, seventeen

potential cultural heritage resources were identified within or adjacent to the study area, including sixteen potential cultural heritage landscapes (CHL) and one potential built heritage resource (BHR). **Table 5** provides a summary of these findings.

A Cultural Heritage Evaluation Report and Heritage Impact Assessment (CHER/HIA) was completed for Oswego Creek Bridge (BHR 1), which determined the structure retains cultural heritage value. As the Oswego Creek Bridge met at least one of the criteria contained in Regulation 9/06, this structure is considered to be a cultural heritage resource and is eligible for designation under the *Ontario Heritage Act*. Character-defining elements associated with the bridge includes contributing to the rural agricultural and riverine setting of the area, longstanding association of a bridging point for Creek Road over Oswego Creek, rarity of comparable warren pony truss bridges in the area, and association with the Township of Wainfleet.

Both the CHRA and CHER/HIA can be found in **Appendix D and E**, respectively.

Table 5: Summary of Cultural Heritage Resources within the Study Area

Feature	Location	Heritage Status and Recognition	Type/Description
BHR 1	Oswego Creek Bridge	Potential BHR as identified in the CHRA, but the CHER/HIA determined the bridge retains cultural heritage value and is eligible for designation.	20 th century Warren Pony Truss Bridge constructed in 1930 and associated with the historical development of the Township of Wainfleet.
CHL 1	Chippawa Creek Conservation Area, 74646 Creek Road	Potential CHL – identified during desktop data review	Conservation Area organized in the mid-20 th century is an important local recreational area and natural heritage area.
CHL 2	84014 Creek Road	Potential CHL – identified during desktop data review	Wellandport/Riverside Cemetery associated with church depicted in 1862 mapping.
CHL 3	74366 Creek Road	Potential CHL – identified during field review	Farmscape present in similar location in 1878 based on historical mapping. Structures and landscape features present in same location as 1934 aerial photograph.
CHL 4	75389 Creek Road	Potential CHL – identified during field review	Farmscape structures and landscape present in same location as 1934 aerial photograph.
CHL 5	75229 Creek Road	Potential CHL – identified during field review	Farmscape structures and landscape present in same location as 1934 aerial photograph.

Feature	Location	Heritage Status and Recognition	Type/Description
CHL 6	75173 Creek Road	Potential CHL – identified during field review	Farmscape present in similar location in 1878 based on historical mapping. Structures and landscape features present in same location as 1934 aerial photograph.
CHL 7	85014 Creek Road	Potential CHL – identified during field review	Farmscape present in similar location in 1878 based on historical mapping. Structures and landscape features present in same location as 1934 aerial photograph.
CHL 8	74978 Creek Road	Potential CHL – identified during field review	Farmscape structures and landscape present in same location as 1934 aerial photograph. Constructed ~1903 according to occupant.
CHL 9	74830 Creek Road	Potential CHL – identified during field review	Farmscape present in similar location in 1878 based on historical mapping. Structures and landscape features present in same location as 1934 aerial photograph.
CHL 10	74241 Creek Road	Potential CHL – identified during field review	Farmscape structures and landscape present in same location as 1934 aerial photograph.
CHL 11	74221 Creek Road	Potential CHL – identified during field review	Farmscape present in similar location in 1878 based on historical mapping. Structures and landscape features present in same location as 1934 aerial photograph.
CHL 12	74178 Creek Road	Potential CHL – identified during field review	Farmscape structures and landscape present in same location as 1934 aerial photograph.
CHL 13	74154 Creek Road	Potential CHL – identified during field review	Farmscape present in similar location in 1878 based on historical mapping. Structures and landscape features present in same location as 1934 aerial photograph.
CHL 14	74033 Creek Road	Potential CHL – identified during field review	Farmscape structures and landscape present in same location as 1934 aerial photograph.
CHL 15	75422 Creek Road	Potential CHL – identified during field review	Farmscape structures and landscape present in same location as 1934 aerial photograph.

Feature	Location	Heritage Status and Recognition	Type/Description
CHL 16	75546 Creek Road	Potential CHL – identified during field review	Farmscape present in similar location in 1878 based on historical mapping. Structures and landscape features present in same location as 1934 aerial photograph.

3.8 ARCHAEOLOGY

A Stage 1 Archaeological Assessment (AA) was completed for the study area and can be found in **Appendix F**. The findings determined that the majority of the study area retains archaeological potential beyond the existing right-of-way (i.e. north and south of Creek Road) which will require further Stage 2 AA. In addition to these areas that will require further archaeological investigation, other archaeological sites were identified.

The Riverside/Wellandport Cemetery on the east end of the study area should be avoided if possible. If work is required on lands within a 10m buffer adjacent to the cemetery, further Stage 3 investigation is required for the presence of burial shafts / unmarked graves. The cemetery investigation entails Stage 3 mechanical removal of topsoil in a 10m buffer north and south of the cemetery, under the supervision of a licensed archaeologist. In the event that unmarked grave shafts or cultural features are uncovered during the Stage 3, then mechanical topsoil removal should continue 10m beyond such features.

The NRWC-49 site (AfGu-62) is identified as a Pre-Contact Indigenous site located on the north side of Creek Road near recent wind power infrastructure development. The site requires further Stage 3 assessment to determine the nature and extent of cultural deposits.

4.0 Alternative Solutions

Under Phase 2 of the Municipal Class EA process, Alternative Solutions, which are high level methods to address the Problem / Opportunity Statement, are developed. The Alternative Solutions are put through an evaluation process that will determine the most recommended solutions. The recommended Alternative Solution(s) is then presented to the public, stakeholders and agencies to solicit input into the evaluation and selection process.

4.1 EVALUATION METHOD AND CRITERIA

The “Reasoned Arguments” methodology was used to evaluate the alternatives for this Class EA. The “Reasoned Arguments” methodology is intended to provide an objective, traceable response to each criterion for each alternative. This involved identifying the advantages and disadvantages of each alternative against a set of evaluation criteria representing natural, cultural, social and economic environments, and capital costs. The evaluation criteria used is shown in **Table 6**.

Table 6. Assessment and Evaluation Methodology and Criteria

Criteria	Description
Transportation & Technical	
Roadway Safety	• Does the alternative provide for the safety of all road users?
Road Condition	• Does the alternative address the existing road surface conditions?
Supports Active Transportation	• Is the alternative able to provide facilities that encourage active transportation?
Drainage and Stormwater	• Does the alternative consider drainage and stormwater needs and impacts?
Utility Impacts	• What impacts does the alternative have on existing utilities and are there any potential relocations required?
Cultural Environment	
Archaeological Resources	• Will the alternative impact existing archaeological resources?
Cultural Heritage/Cultural Landscape	• Will the alternative impact existing cultural landscapes and/or built heritage resources?
Natural Environment	
Terrestrial Wildlife & Habitat	• What impact does the alternative have on the existing wildlife, their habitats, and surrounding vegetation?
Aquatic Wildlife & Habitat	• What impact does the alternative have on the existing fish community, their habitats, and watercourses?
Ground/Surface Water Quality & Supply	• What are the potential impacts to the existing ground and surface water?

Socio-Economic Environment	
Construction Impacts	• What effect will the construction of the alternative have on local residents/business and road users?
Compatibility with Adjacent Land Use	• Does the alternative make sense with the existing and future land uses?
Property Impacts	• Does the alternative require the purchase of property?
Costs	
Capital (Construction)	• What is the cost to construct the alternative?
Operation and Maintenance	• What is the cost associated to maintain and operate the alternative?

4.2 ALTERNATIVE SOLUTIONS - CREEK ROAD

The following alternative solutions were developed to address the issues identified for the Creek Road corridor identified in **Table 7** and are evaluated in **Table 8**.

Table 7. Alternative Solutions Considered for Creek Road

Alternative Solutions		Description
1	Do Nothing	As required by the Municipal Class EA process, the Do Nothing option was considered and evaluated against the other options. No improvements and no consideration for additional measures are included to address long-term project specific problems or opportunities on Creek Road. For the study area, there are no cycling facilities or sidewalks. This alternative was considered to provide a baseline upon which other alternatives were evaluated.
2	Road Reconstruction and Resurfacing	This alternative involves reconstruction and resurfacing of the asphalt on Creek Road. Reconstruction would entail installing a new subgrade asphalt base and a top pavement overlay. Resurfacing would be completed as restoration mechanism, and does not require a new base layer.
3	Road Realignment and Geometric Improvements	This alternative involves refinements to the route of the road. Road realignment would include changes to the length of the curves, and the length of straight (horizontal) lines of Creek Road connecting the curves. Geometric improvements would further modify the profile (crest and sag curves (hills and valleys), and the straight (horizontal) lines connecting them) and the cross-section (the number of travel lanes, cycling lanes) of Creek Road.
4	Intersection Improvements Only	This alternative involves consideration and improvement of access in the approach to an intersection, and within an intersection. This can be accomplished by improving geometric design to reduce traffic conflicts, improving sight distance and driver awareness when approaching an

Alternative Solutions		Description
		intersection, and intersection traffic control (e.g., signals, roundabouts and stop signs).
5	Improvements to Alternative Corridors	This alternative considered diversion of traffic currently using Creek Road to a parallel corridor (Canborough Road).
6	Improved Pedestrian and Cyclist Connectivity	This alternative would add facilities that will encourage and support active transportation modes (pedestrian and cyclist).

Table 8: Evaluation of Alternative Solutions - Creek Road

Alternatives	1	2	3	4	5	6
Criteria	Do Nothing	Road reconstruction and resurfacing	Road realignment and geometric improvements	Intersection improvements only	Improvements to alternative corridors (Canborough Road)	Improved pedestrian and cyclist connectivity
Transportation & Technical	✗ Does not address identified safety issues, road condition and active transportation requirements ✗ Roadway condition will severely deteriorate ✗ Bridge could be closed affecting the movement of people and goods • Roadway drainage improvement not included ✓ No impacts to utilities	✓ Addresses existing road surface conditions ✗ Road user safety not addressed ✗ Active transportation requirements not addressed ✓ No impacts to utilities ✓ Roadway drainage improvements included	✓ Improves safety in specific problem areas ✓ Meets roadway design standards ✓ Roadway drainage improvements included ✗ Safety concerns at intersections not addressed ✗ Active transportation requirements not addressed • Potential impacts to utilities	✓ Improves intersection safety and meets intersection design standards ✓ Roadway drainage improvements included ✗ Active transportation requirements not addressed ✗ Does not address road condition and safety issues along the rest of the corridor • Potential impacts to utilities	✓ Partially addresses road user safety by diverting traffic onto another corridor road ✓ Roadway drainage improvements included ✗ Identified safety issues, road condition and active transportation requirements along Creek Road not addressed • Potential impacts to utilities	✓ Accommodates active transportation throughout the corridor ✗ Does not address safety concerns at intersections and road condition • Potential impacts to utilities • Roadway drainage improvements not included
Cultural Environment	✗ Poor road condition will deteriorate access to the Wellandport area, impacting overall attractiveness of the hamlet	✓ Minimal impacts to cultural environment, if any	• Potential impacts to adjacent archaeological resources	• Potential impacts to adjacent archaeological resources	• Potential impacts to adjacent archaeological resources on Canborough Road	• Potential impacts to adjacent archaeological resources
Natural Environment	✓ No impacts to the natural environment	✓ Minimal impacts to the natural environment during construction	• Potential impacts to the natural environment depending on realignment location	• Potential impacts to the natural environment depending on proposed improvements	• Potential impacts to the natural environment adjacent to Canborough Road	• Potential impacts to the natural environment depending on proposed improvements
Socio-Economic Environment	✓ No property required ✓ No construction impacts ✗ Key stakeholders, such as Wainfleet residents and businesses, will be affected by poor road condition in the future	• Some impacts during construction, mitigation measures will be required ✓ No property required	✗ Potential for property to be required depending on realignment location • Some impacts during construction, mitigation measures will be required	✗ Potential for property to be required ✓ Improvements will support adjacent land uses • Some impacts during construction, mitigation measures will be required	✗ Potential for property to be required to implement along Canborough Road	✗ Potential for property to be required ✓ Improvements will support adjacent land uses, particularly local businesses and residents
Costs	✓ No construction costs ✗ Significant future operation and maintenance costs to maintain roadway	• Low construction cost ✓ Potentially lower maintenance costs due to improved road surface	• Moderate construction cost ✓ No significant change to maintenance costs	• Low construction cost ✓ No significant change to maintenance costs	✓ No construction costs ✗ Significant future operation and maintenance costs maintain roadway	• Low construction cost • Slight increase in roadway maintenance costs
Recommendation	Not recommended This alternative does not adequately address the study problem statement. Issues identified along the corridor (i.e. user safety, road surface conditions) would continue to deteriorate.	Recommended in conjunction with other alternatives This alternative only partially addresses the study problem statement (i.e. improves existing road surface conditions).	Recommended in conjunction with other alternatives This alternative only partially addresses the study problem statement (i.e. improves roadway safety and brings the roadway to current design standards).	Recommended in conjunction with other alternatives This alternative only partially addresses the study problem statement (i.e. improves intersection safety and brings the intersection to current design standards).	Not recommended Improvements to Canborough Road (R.R.63) are being undertaken as part of the R.R. improvement program. Improvements to Canborough Road does not avoid the need to rehabilitate Creek Road.	Recommended in conjunction with other alternatives This alternative only partially addresses the study problem statement (i.e. improves pedestrian and cyclist connectivity).

The recommended alternative solution for the Creek Road corridor is a combination of Alternative Solutions 2, 3, 4 and 6. This combination addresses the problem/opportunity statement by:

- Improving existing road surface conditions;
- Bringing Creek Road to current Niagara Region design standards and improving roadway safety;
- Improving intersection safety by bring the intersection to current Niagara Region design standards; and
- Improving infrastructure for pedestrian and cyclist connectivity.

Alternative Solution 1 was not recommended as it does not address the Problem/Opportunity Statement. Alternative Solution 3 was not recommended as it would not address transportation choices on Creek Road or provide an opportunity to incorporate pedestrian and cycling facilities along the corridor. In addition, there is limited excess capacity available to accommodate the diverted traffic without creating additional operational and roadway deficiencies on these parallel corridors. This alternative would result in similar or significant out of the way travel and associated environmental impacts.

4.3 ALTERNATIVE SOLUTIONS - OSWEGO CREEK BRIDGE

The alternative solutions were developed to address the issues identified for the Oswego Creek Bridge are in **Table 9** and are evaluated in **Table 10**.

Table 9: Alternative Solutions Considered for Oswego Creek Bridge

Alternative Solutions		Description
1	Do Nothing	The existing structure is not changed. This alternative was considered to provide a baseline upon which other alternatives were evaluated.
2	Replace Existing Bridge with a New Bridge	Involves the demolition and removal of the existing bridge, and building a new bridge
3	Rehabilitate Existing Bridge	Sections of the bridge will be restored to improve the existing condition of the bridge.

Table 10: Evaluation of Alternative Solutions - Oswego Creek Bridge

Alternatives	1	2	3
Criteria	Do Nothing	Replace the Existing Bridge with a New Bridge (same location)	Rehabilitate the Existing Bridge
Transportation & Technical	✗ Bridge structure remains in poor condition ✗ Road geometrics (vertical curve) and poor sight lines of west approach not addressed ✗ Bridge roadway width does not meet road safety standards	✓ Addresses structural and safety requirement ✓ Addresses road geometrics (vertical curve) and poor sight lines of west approach ✓ Supports recommendation of 2011 & 2013 Bridge Appraisals to replace the bridge ✓ Supports Region's requirements to widen the road (Official Plan)	• Partially addresses structural and safety requirements ✗ Road geometrics (vertical curve) and poor sight lines of west approach not addressed ✗ Load Limit posting would still be required ✗ Does not support recommendation of 2011 & 2013 Bridge Appraisals ✗ Does not support Region's requirements to widen the road (bridge would remain single lane only)
Cultural Environment	✓ No impacts to the cultural environment	• Potential impacts to adjacent archaeological resources ✗ Least preferred from a cultural heritage perspective (comprises heritage value of the bridge). Mitigation required	✓ No impacts to the cultural environment ✓ Preferred from a cultural heritage perspective (minor impacts to heritage value of the bridge)
Natural Environment	✓ No impacts to the natural environment	• Potential impacts to Oswego Creek and surrounding natural heritage features, mitigation measures will be required	• Potential impacts to Oswego Creek and surrounding natural heritage features, mitigation measures will be required
Socio-Economic Environment	✓ No property required ✓ No construction impacts	✗ Significant construction impacts (e.g. road closure & traffic detours), work can be done in phases • Potential property impacts if alignment is shifted	✗ Significant construction impacts (e.g. road closure & traffic detours) due to need for replacement of abutments and structural components, work can be done in phases
Costs	✓ No construction costs	✗ Significant construction costs ✓ Low maintenance costs	• Moderate construction cost ✗ Ongoing maintenance costs

Alternatives	1	2	3
Criteria	Do Nothing	Replace the Existing Bridge with a New Bridge (same location)	Rehabilitate the Existing Bridge
	✖ Significant future operation and maintenance costs to maintain bridge		
Recommendation	Not recommended This alternative does not adequately address the study problem statement (i.e. bridge structural deficiencies, horizontal & vertical road geometric and sight line issues).	Recommended This alternative fully addresses the bridge's structural and safety requirements, allows for improvements to the west approach and widening of the roadway cross section to Regional standards. Impacts to the bridge's heritage significance could be offset through applicable mitigation.	Not recommended This alternative only partially addresses the bridge's structural requirements and does not allow for improvements to the vertical curve and poor sight lines of the west approach or widening of the roadway cross section to Regional standards. Would require increased future operation and maintenance costs.

Alternative Solution 2 is recommended for Oswego Creek Bridge. This alternative addresses the bridge's structural and safety requirements, allows for improvements to the west approach, addresses the loading on the bridge, addresses flooding concerns by raising the bridge, and widening of the roadway cross section to Niagara Region standards. Impacts to the bridge's heritage significance could be offset through applicable mitigation.

Alternative Solution 1 is not recommended as this approach would not address the structural deficiencies identified in the Need and Justification statement for this study. In addition, the horizontal and vertical road geometric and sightline issues would not be addressed. Alternative Solution 3 was not recommended as the bridge would remain a single lane, and not comply with Niagara Region standards. The horizontal and vertical road geometric and sightline issues would not be addressed.

4.4 ALTERNATIVE SOLUTIONS - CREEK ROAD BRIDGE

The alternative solutions in **Table 11** were developed to address the issues identified for the Creek Road Bridge and are evaluated in **Table 12**.

Table 11: Alternative Solutions Considered for Creek Road Bridge

Alternative Solutions		Description
1	Do Nothing	The existing structure is not changed. This alternative was considered to provide a baseline upon which other alternatives were evaluated.
2	Replace Existing Bridge at Existing Vertical Alignment	Involves the demolition and removal of the existing bridge, and building a new bridge at the existing vertical alignment.
3	Replace Existing Bridge at a Higher Vertical Alignment	Involves the demolition and removal of the existing bridge, and building a new bridge at a higher vertical alignment.
4	Rehabilitate Existing Bridge	Sections of the bridge will be restored to improve the existing condition of the bridge.

Table 12: Evaluation of Alternative Solutions - Creek Road Bridge

Alternatives	1	2	3	4
Criteria	Do Nothing	Replace the Existing Bridge at the Existing Vertical Alignment	Replace the Existing Bridge at a Higher Vertical Alignment	Rehabilitate the Existing Bridge
Transportation & Technical	✗ Bridge structure remains in poor condition ✗ One lane only ✗ Bridge roadway width does not meet road safety standards ✗ Bridge floods at the 100-year flood levels	✓ Addresses structural and safety requirement ✓ Allows for two lanes ✓ Supports Region's requirements to widen the road (Official Plan) ✗ Bridge floods at the 100-year flood levels	✓ Addresses structural and safety requirement ✓ Allows for two lanes ✓ Supports Region's requirements to widen the road (Official Plan) ✓ Able to address flooding at the 100-year flood levels	✗ Does not address long-term structural integrity and safety requirements ✗ Does not support Region's requirements to widen the road (single lane only) ✗ Bridge floods at the 100-year flood levels
Cultural Environment	✓ No impacts to archaeological resources or the cultural environment	• Potential impacts to adjacent archaeological resources ✓ No cultural heritage impacts	• Potential impacts to adjacent archaeological resources ✓ No cultural heritage impacts	✓ No impacts to archaeological resources or the cultural environment
Natural Environment	✓ No impacts to the natural environment	• Potential impacts to the creek and surrounding natural heritage features, mitigation measures will be required	• Potential impacts to the creek and surrounding natural heritage features, mitigation measures will be required	• Potential impacts to the creek and surrounding natural heritage features, mitigation measures will be required
Socio-Economic Environment	✓ No property required ✓ No construction impacts	✗ Significant construction impacts (e.g. closure/detours), work can be done in phases ✗ Property impacts is required for widening of the bridge	✗ Significant construction impacts (e.g. closure/detours), work can be done in phases ✗ Property impacts from bridge widening and expanding the approach fill areas	✗ Significant construction impacts (e.g. closure/detours) from need to rehabilitate structural components
Costs	✓ No construction costs ✗ Significant maintenance costs to maintain bridge	✗ Significant construction costs ✓ Low maintenance costs	✗ Significant construction costs ✓ Low maintenance costs	• Moderate construction cost ✗ Ongoing maintenance costs

Alternatives	1	2	3	4
Criteria	Do Nothing	Replace the Existing Bridge at the Existing Vertical Alignment	Replace the Existing Bridge at a Higher Vertical Alignment	Rehabilitate the Existing Bridge
Recommendation	Not recommended This alternative does not adequately address the study problem statement.	Recommended This alternative fully addresses the bridge's structural and safety requirements, allows for capacity increase, and upgrading the roadway to Regional standards.	Not recommended This alternative addresses the bridge's structural and safety requirements but has significant costs and property needs. The Oswego Creek bridge is being raised so residents have an alternative route in case of flooding.	Not recommended This alternative only partially addresses the bridge's structural requirements and does not address widening of the roadway to Regional standards. Results in increased operation and maintenance costs over time.

Alternative Solution 2 – Replace Bridge at the existing vertical alignment is recommended for Creek Road Bridge. This alternative addresses the bridge’s structural and safety requirements, allows for capacity increase and brings the roadway to Niagara Region standards.

Alternative Solution 1 was not recommended as this approach would not address the structural deficiencies identified in the Need and Justification statement for this study. In addition, the horizontal and vertical road geometric and sightline issues would not be addressed. Alternative Solution 4 was not recommended as the bridge would remain a single lane, and not comply with Niagara Region standards. Alternative Solution 3 was not recommended due to significant costs and property needs, and as the Oswego Creek Bridge is being raised, this will provide access during flooding concerns.

4.5 RECOMMENDED ALTERNATIVE SOLUTIONS AND CONFIRMATION OF CLASS EA SCHEDULE

The Recommended Alternative Solution(s) for Creek Road is for:

- Road reconstruction and resurfacing
- Road realignment and geometric improvements
- Intersection Improvements
- Improved pedestrian and cyclist connectivity

The Recommended Alternative Solution includes bridge replacement for both Oswego Creek Bridge and Creek Road Bridge.

As required by the Municipal Class EA process, following the selection of the Preferred Alternative Solution in Phase 2, the status of the project was confirmed to be a Schedule ‘C’ undertaking.

5.0 Alternative Design Concepts

Under Phase 3 of the Municipal Class EA process, a range of design concepts to implement the preferred alternative solutions from Phase 2 were identified and evaluated based on technical factors as well as impacts to the surrounding environment. The recommended design concept is then presented to the public, stakeholders and agencies to solicit input into the selection of the “preferred design”.

5.1 INTERSECTION ALTERNATIVES

Alternative design concepts were developed for three skewed intersections in the study area with the goal of improving safety while also considering other impacts such as traffic, the environment, property, etc.:

- Creek Road (RR45) / Canborough Road (RR63)
- Wellandport Road (RR4) / River Road (RR27)
- Creek Road (RR45) / River Road (RR27)

These alternatives and evaluation of the alternatives are discussed further in the follow sections.

5.1.1 CREEK ROAD / CANBOROUGH ROAD

Alternative design concepts were developed to address the issues identified at the Creek Road (RR45) and Canborough Road (RR63) intersection on the west end of the study area. Improvements are needed due to the existing skewed intersection. The design concepts are shown in **Table 13** and **Figure 6** are evaluated in **Table 14**.

Table 13: Alternative Design Concepts Considered for Creek Road/Canborough Road

Alternative Solutions		Description
1	Do Nothing	This alternative was considered to provide a baseline upon which other alternatives were evaluated.
2	Major Realignment of Creek Road / “T” intersection (major)	This concept involves curving Creek Road to the west so that Creek Road will meet Canborough Road at a “T”-intersection.
3	Roundabout Intersection	This alternative involves implementing a single-lane roundabout with 3 legs
4	Minor Realignment to the East / “T” intersection (minor)	This alternative involves realigning Creek Road slightly to the east so that Creek Road will meet Canborough Road at a “T”-intersection.

Option 1, Do Nothing (used as a baseline for evaluation)

Option 2, Major Realignment of Creek Road



Option 3, Roundabout Intersection



Option 4, Minor Realignment to the East



Figure 6: Alternative Design Concepts for Creek Road/Canborough Road

Table 14: Evaluation of Alternative Design Concepts for Creek Road/Canborough Road

Alternatives		1	2	3	4
Criteria		Do Nothing	"T" intersection (major realignment)	Roundabout	"T" intersection (minor realignment)
Transportation & Technical	Safety	✗ No changes means no improvements to the intersection	✓ A "T" intersection allows for safer turning movements	✓ A roundabout improves safety for movements through the intersection	✓ A "T" intersection allows for safer turning movements
	Active Transportation	✗ No changes means no improvements to the intersection	✓ Realigning the intersection allows for improvements for active transportation	✓ Realigning the intersection allows for improvements for active transportation	✓ Realigning the intersection allows for improvements for active transportation
	Meet Region's Design Standards	✗ Existing intersection is not to Region's design standard	✓ Reconfiguring the intersection will meet the Region's design standards	✓ Reconfiguring the intersection will meet the Region's design standards	✓ Reconfiguring the intersection will meet the Region's design standards except for the design speed of Creek Road approaching the intersection which will need to drop from the design speed used in the rest of the corridor.
Cultural Environment	Archaeology	✓ No impacts to archaeological resources	✗ Due to the large footprint of this alternative, there is the potential for more impacts to archaeological resources	✗ Due to the large footprint of this alternative, there is the potential for more impacts to archaeological resources	• Due to the footprint of this alternative, there is some potential for impacts to archaeological resources (less than alternative 2 and 3)
	Cultural Heritage	✓ No impacts to cultural heritage resources	✓ No direct impacts to cultural heritage buildings though some potential impacts to property.	✓ No direct impacts to cultural heritage buildings though some potential impacts to property.	✓ No direct impacts to cultural heritage buildings though some potential impacts to property.
Natural Environment	Terrestrial Resources	✓ No impacts to terrestrial resources	• Due to the larger footprint of this alternative, some vegetation will have to be removed	• Due to the larger footprint of this alternative, some vegetation will have to be removed	✓ There will be minor vegetation removal where Creek Road is being realigned
	Aquatic Resources	✓ No impacts to aquatic resources	✓ No impacts to aquatic resources	✓ No impacts to aquatic resources	✓ No impacts to aquatic resources
	Species at Risk	✓ No impacts to Species at Risk	✓ No impacts to Species at Risk	✓ No impacts to Species at Risk	✓ No impacts to Species at Risk
Socio-Economic Environment	Construction Impacts	✓ No construction impacts	• Moderate construction impacts as there is major realignment	• Moderate construction impacts due to the large footprint of the roundabout	✓ Some construction impacts, but will be very localized to the intersection area
	Property Impacts	✓ No property required	✗ Due to the large footprint of this alternative there will be significant property impacts	✗ Due to the large footprint of this alternative there will be significant property impacts	• Due to the footprint of this alternative, some property is required adjacent to the intersection
Costs	Capital	✓ No construction costs	• Moderate construction costs	• Moderate construction costs	✓ Minor construction costs
	Operation and Maintenance	✓ No operation and maintenance costs	• Moderate increase in operation and maintenance costs	• Moderate increase in operation and maintenance costs	✓ Minor to no change in operation and maintenance costs
Recommendation		Not recommended While this alternative has the least impacts, it does not offer safety and operational improvements required for the intersection.	Not recommended While the "T" intersection configuration meets the safety and operational needs, the major realignment of Creek Road would have significant impacts to the natural and cultural environment as well as property impacts.	Not recommended While the roundabout configuration meets the safety and operational needs, the large footprint of the roundabout would have significant impacts to the natural and cultural environment as well as property impacts	Recommended This alternative addresses the safety and operational requirements through the "T" intersection while having the least impacts on the environment, property, and costs.

The recommended alternative design concept for the Creek Road/Canborough Road intersection is to slightly realign Creek Road to the east to create a “T” intersection. This alternative has the smallest footprint and thus has the least impacts all around, including the least property, environmental and cultural impacts, while still meeting the technical transportation needs of the intersection. The reduction in design speed at this location is acceptable as the road is coming to an end and all westbound traffic must stop at the stop sign.

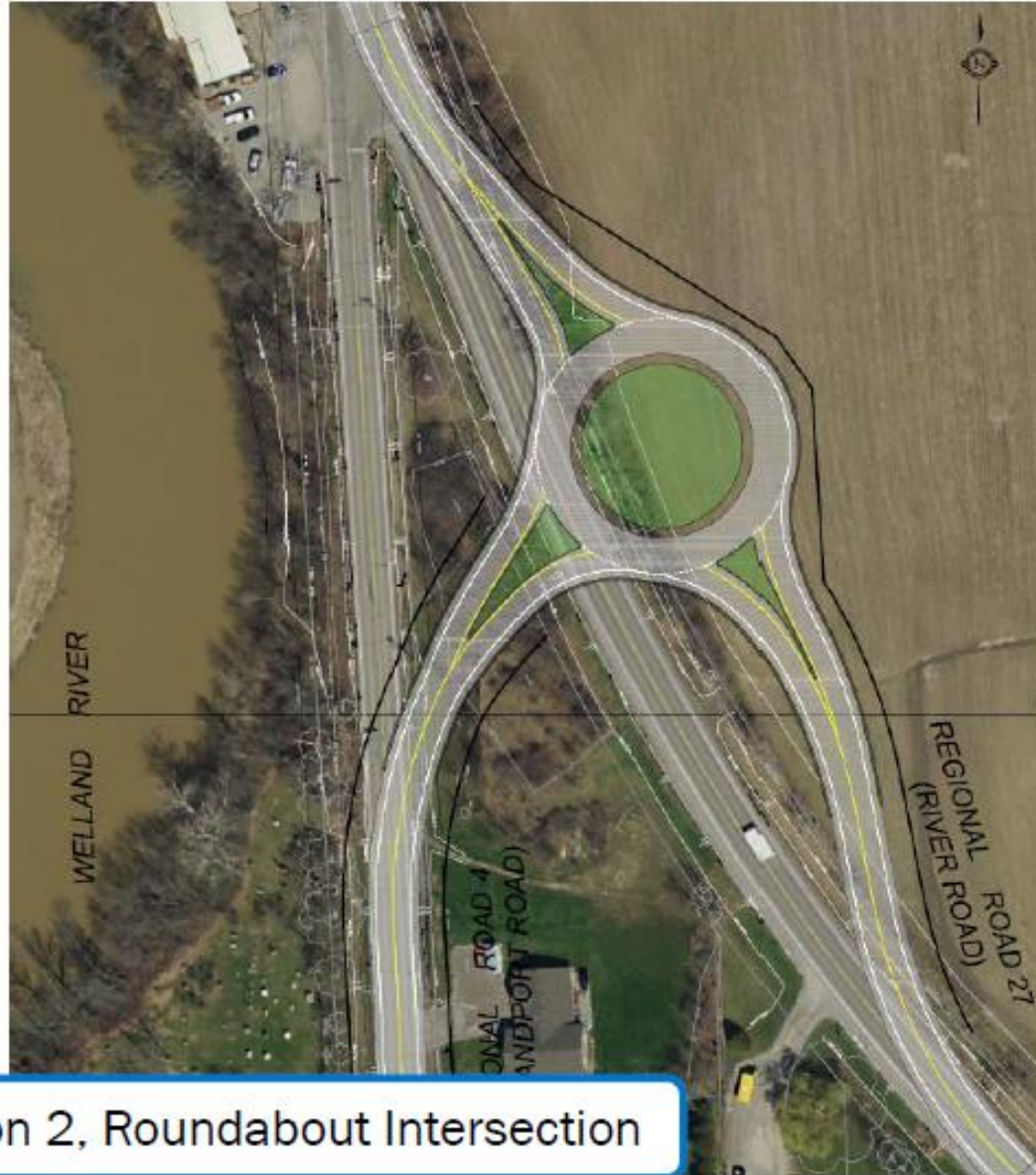
5.1.2 WELLANDPORT ROAD / RIVER ROAD

Alternative design concepts were developed to address the issues identified at the Wellandport Road (RR4) and River Road (RR27) intersection on the east end of the study area. Improvements are needed due to the existing skewed intersection. The design concepts are shown in **Table 15** and **Figure 7** and are evaluated in **Table 16**.

Table 15. Alternative Design Concepts Considered for Wellandport Road/River Road

Alternative Solutions		Description
1	Do Nothing	This alternative was considered to provide a baseline upon which other alternatives were evaluated.
2	Roundabout Intersection	This alternative involves implementing a single-lane roundabout with 3 legs to the southeast of the existing intersection.
3	Realignment to the south	This alternative involves realigning Wellandport Road to the south so that Wellandport Road will meet River Road at a “T” intersection.

Option 1, Do Nothing (used as a baseline for evaluation)



Option 2, Roundabout Intersection



Option 3, Realignment to the south

Figure 7: Alternative Design Concepts for Wellandport Road/River Road

Table 16: Evaluation of Alternative Design Concepts for Wellandport Road/River Road

Alternatives		1	2	3
Criteria		Do Nothing	Roundabout	“T” Intersection with Realignment to the south
Transportation & Technical	Safety	✗ No changes means no improvements to the intersection	✓ A roundabout improves safety for movements through the intersection	✓ A “T” intersection allows for safer turning movements
	Active Transportation	✗ No changes means no improvements to the intersection	✓ Realigning the intersection allows for improvements for active transportation	✓ Realigning the intersection allows for improvements for active transportation
	Meet Region’s Design Standards	✗ Existing intersection is not to Region’s design standard	✓ Reconfiguring the intersection will meet the Region’s design standards	✓ Reconfiguring the intersection will meet the Region’s design standards
Cultural Environment	Archaeology	✓ No impacts to archaeological resources	✗ Due to the large footprint of this alternative, there is the potential for more impacts to archaeological resources	• Due to the footprint of this alternative, there is some potential for impacts to archaeological resources (less than alternative 2)
	Cultural Heritage	✓ No impacts to cultural heritage resources	✓ No direct impacts to cultural heritage buildings though some potential impacts to property	✓ No direct impacts to cultural heritage buildings though some potential impacts to property
Natural Environment	Terrestrial Resources	✓ No impacts to terrestrial resources	• Due to the footprint of this alternative, some vegetation will have to be removed	• Due to the footprint of this alternative, some vegetation will have to be removed
	Aquatic Resources	✓ No impacts to aquatic resources	✓ No impacts to aquatic resources	✓ No impacts to aquatic resources
	Species at Risk	✓ No impacts to Species at Risk	✓ No impacts to Species at Risk	✓ No impacts to Species at Risk
Socio-Economic Environment	Construction Impacts	✓ No construction impacts	✗ Significant construction impacts as there is major realignment of all approaches	• Some construction impacts due to the realignment footprint
	Property Impacts	✓ No property required	✗ Due to the large footprint of this alternative there will be significant property impacts	• Due to the footprint of this alternative, some property is required adjacent to the intersection
Costs	Capital	✓ No construction costs	✗ Significant construction costs	• Moderate construction costs
	Operation and Maintenance	✓ No operation and maintenance costs	• Moderate increase in operation and maintenance costs	• Moderate increase in operation and maintenance costs
Recommendation		Not recommended While this alternative has the least impacts, it does not offer safety and operational improvements required for the intersection.	Not recommended While the roundabout configuration meets the safety and operational needs, the large footprint of the roundabout would have significant impacts to the natural and cultural environment as well as property impacts.	Recommended This alternative addresses the safety and operational requirements through the “T” intersection while having the least impacts on the environment, property, and costs.

The recommended alternative design concept for the Wellandport Road/River Road intersection is to realign Wellandport Road to the south to create a “T” intersection with a stop sign control on Regional Road 4. This alternative has the smallest footprint and thus has the least impacts all around, including the least property, environmental and cultural impacts, while still meeting the technical transportation needs of the intersection.

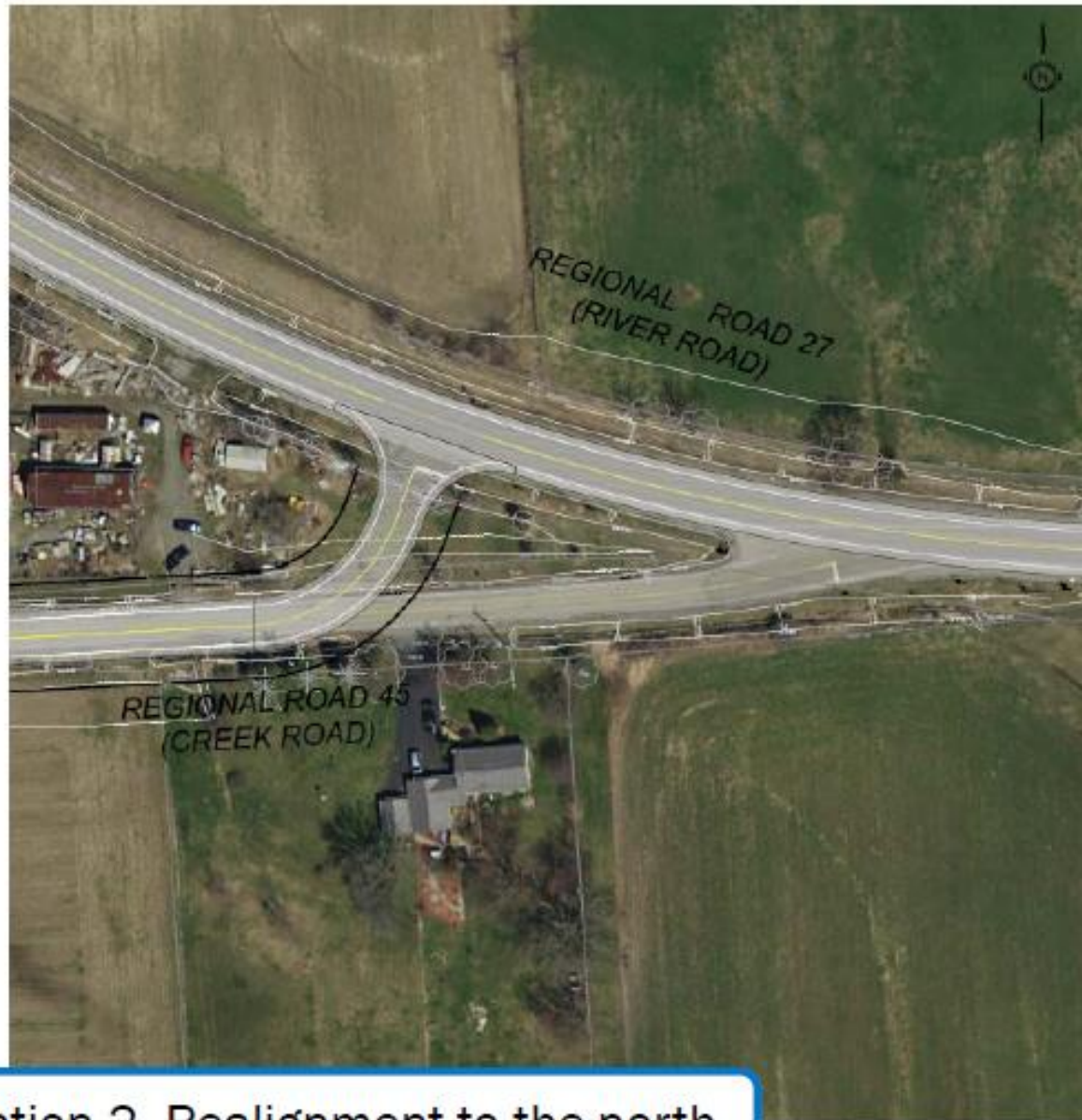
5.1.3 CREEK ROAD / RIVER ROAD

Alternative design concepts were developed to address the issues identified at the Creek Road (RR45) and River Road (RR27) intersection on the east end of the study area. Improvements are needed due to the existing skewed intersection. The design concepts are shown in **Table 17** and **Figure 8** are evaluated in **Table 18**.

Table 17. Alternative Design Concepts Considered for Creek Road / River Road

Alternative Solutions		Description
1	Do Nothing	This alternative was considered to provide a baseline upon which other alternatives were evaluated.
2	Realignment to the North	This alternative involves realigning Creek Road to the north so that Creek Road will meet River Road at a “T” intersection.
3	No intersection	This alternative involves closing the intersection and turning the end of Creek Road into a cul-de-sac.

Option 1, Do Nothing (used as a baseline for evaluation)



Option 2, Realignment to the north



Option 3, No intersection, Closure of Creek Road in a cul-de-sac

Figure 8: Alternative Design Concepts for Creek Road / River Road

Table 18: Evaluation of Alternative Design Concepts for Creek Road / River Road

Alternatives		1	2	3
Criteria		Do Nothing	Realignment to the north	No intersection, Closure of Creek Road in a cul-de-sac
Transportation & Technical	Safety	✗ No changes means no improvements to the intersection	A “T” intersection is an improvement to the existing conditions, but the new intersection would still be located on a curve with sightline issues causing operational concerns and potential for rear end collisions. The turning traffic volumes at this location are lower than at RR 4.	✓ Offers the safest solution by eliminating the intersection which is located on a curve. Traffic that would normally turn at this intersection would be diverted to the intersection of Reg Rd. 27 and Reg. Rd. 4 which is being designed to provide improved safety. Out of way travel for this traffic is approximately 900m and provides increased safety.
	Active Transportation	✗ No changes means no improvements to the intersection	✓ Realigning the intersection allows for improvements for active transportation	✓ Closing the intersection only has minimal impacts to active transportation
	Meet Region’s Design Standards	✗ Existing intersection is not to Region’s design standard	✓ Reconfiguring the intersection will meet the Region’s design standards	✓ Closing the intersection will meet the Region’s design standards
Cultural Environment	Archaeology	✓ No impacts to archaeological resources	✓ The footprint may have some archaeological impacts, though the area may be disturbed (less than Alternative 3)	Due to the footprint of this alternative, there is some potential for impacts to archaeological resources
	Cultural Heritage	✓ No impacts to cultural heritage resources	✓ No direct impacts to cultural heritage buildings though some potential impacts to property	✓ No direct impacts to cultural heritage buildings though some potential impacts to property
Natural Environment	Terrestrial Resources	✓ No impacts to terrestrial resources	Due to the footprint of this alternative, some vegetation will have to be removed	Due to the footprint of this alternative, some vegetation will have to be removed
	Aquatic Resources	✓ No impacts to aquatic resources	✓ No impacts to aquatic resources	✓ No impacts to aquatic resources
	Species at Risk	✓ No impacts to Species at Risk	✓ No impacts to Species at Risk	✓ No impacts to Species at Risk
Socio-Economic Environment	Construction Impacts	✓ No construction impacts	Some construction impacts due to the realignment footprint	Some construction impacts due to the new cul-de-sac footprint
	Property Impacts	✓ No property required	Due to the footprint of this alternative, some property is required adjacent to the intersection	✗ Due to the footprint of this alternative, some property is required adjacent to the cul-de-sac, and some access changes to adjacent properties
Costs	Capital	✓ No construction costs	Moderate construction costs	Moderate construction costs
	Operation and Maintenance	✓ No operation and maintenance costs	Moderate increase in operation and maintenance costs	Moderate increase in operation and maintenance costs
Recommendation		Not recommended While this alternative has the least impacts, it does not offer safety and operational improvements required for the intersection.	Not recommended This alternative somewhat addresses the safety and operational requirements through the “T” intersection, though an intersection on a curve is not preferred. There are minimal to moderate impacts on the environment, property, and costs.	Recommended This alternative best addresses the safety and operational requirements by closing the intersection and redirecting traffic to a nearby intersection. There will be changes to access for some properties, but there will be minimal traffic impacts and minimal to moderate impacts on the environment and costs.

The recommended alternative design concept for the Creek Road/River Road intersection is to close Creek Road in a cul-de-sac. This alternative best meets the safety needs of the intersection, as it is still not favorable to have a “T” intersection on a curve. There will be some impacts to property and access but will not result in significant traffic impacts with only generally 900m out of way travel.

5.2 OSWEGO CREEK BRIDGE

From Phase 2, it was recommended that Oswego Creek Bridge be replaced with a new bridge on an existing or new alignment. Thus, alternative design concepts for replacement of Oswego Creek Bridge are shown in **Table 19** and **Figure 9** and are evaluated in **Table 20**.

Table 19. Alternative Design Concepts for Oswego Creek Bridge

Alternative Solutions		Description
1	Do Nothing	This alternative was considered to provide a baseline upon which other alternatives were evaluated.
2	Replace Keeping the Same Alignment	Replace Oswego Creek Bridge along its existing alignment.
3	Replace Moving the Alignment to the North	Replace Oswego Creek Bridge moving the bridge alignment to the north of the existing bridge.
4	Replace Moving the Alignment to the South	Replace Oswego Creek Bridge moving the bridge alignment to the south of the existing bridge.

Option 1, Do Nothing (used as a baseline for evaluation)

Option 2



Option 3



Option 4



Figure 9: Alternative Design Concepts for Oswego Creek Bridge

Table 20: Evaluation of Alternative Design Concepts for Oswego Creek Bridge

Alternatives		1	2	3	4
Criteria		Do Nothing	Same Alignment	Alignment to the North	Alignment to the South
Transportation & Technical	Safety	✗ No changes means no safety improvements	✓ This alignment meets the safety needs of the bridge	✓ This alignment meets the safety needs of the bridge	✓ This alignment meets the safety needs of the bridge
	Active Transportation	✗ No changes means no improvements to active transportation	✓ This alignment is able to accommodate active transportation	✓ This alignment is able to accommodate active transportation	✓ This alignment is able to accommodate active transportation
	Meet Region's Design Standards	✗ Existing bridge is not to Region's design standard	✓ This alignment will meet the Region's Design Standards	✓ This alignment will meet the Region's Design Standards	✓ This alignment will meet the Region's Design Standards
Cultural Environment	Archaeology	✓ No impacts to archaeological resources	✓ Minimal archaeological impacts as the bridge is on its existing alignment	• Due to the footprint of the realignment, more potential for archaeological resources	• Due to the footprint of the realignment, more potential for archaeological resources
	Cultural Heritage	✓ No impacts to cultural heritage resources	• Oswego Creek Bridge is a Built Heritage Resource. Some mitigation measures are required.	• Oswego Creek Bridge is a Built Heritage Resource. Some mitigation measures are required.	• Oswego Creek Bridge is a Built Heritage Resource. Some mitigation measures are required.
Natural Environment	Terrestrial Resources	✓ No impacts to terrestrial resources	✓ Minimal impacts to terrestrial resources as the bridge is along the same alignment.	• Moderate impacts to terrestrial resources due to the realignment of the approaches.	• Moderate impacts to terrestrial resources due to the realignment of the approaches.
	Aquatic Resources	✓ No impacts to aquatic resources	• Some impacts to aquatic resources due to in-water works during construction.	✗ Significant impacts to aquatic resources as new piers and a new structure is being built in the water.	✗ Significant impacts to aquatic resources as new piers and a new structure is being built in the water.
	Species at Risk	✓ No impacts to Species at Risk	• Potential impacts to aquatic SAR	• Potential impacts to aquatic SAR	• Potential impacts to aquatic SAR
Socio-Economic Environment	Construction Impacts	✓ No construction impacts	• Moderate construction impacts, bridge will be closed	• Moderate construction impacts due to significant realignment of road/bridge	• Moderate construction impacts due to significant realignment of road/bridge
	Property Impacts	✓ No property required	✓ Some property impacts as the bridge is on its existing alignment but property required for grade raise	• Moderate property impacts due to realignment and grade raise of the bridge but impacts the property owner on the north more severely than the south side.	• Moderate property impacts due to realignment and grade raise of the bridge but impacts the property owner on the south side more severely than the north side
Costs	Capital	✓ No construction costs	• Moderate construction costs	• Moderate construction costs	• Moderate construction costs
	Operation and Maintenance	✓ No operation and maintenance costs	• Moderate increase in operation and maintenance costs	• Moderate increase in operation and maintenance costs	• Moderate increase in operation and maintenance costs
Recommendation		Not recommended While this alternative has the least impacts, it does not offer safety and operational improvements required at Oswego Creek Bridge.	Recommended Replacement of Oswego Creek Bridge along its existing alignment will meet all the technical and operational requirements of the bridge, including safety, with the least impacts to the environment and property.	Not recommended While this alternative meets the technical and operational needs, there are significant impacts to property and the aquatic environment due to construction of a new bridge with new piers.	Not recommended While this alternative meets the technical and operational needs, there are significant impacts to property and the aquatic environment due to construction of a new bridge with new piers.

The recommended alternative design concept is to replace Oswego Creek Bridge and build the new bridge on the same (existing) alignment. This alternative meets all the technical and operational requirements of the new bridge, including a safer crossing for all road users. Compared to realignment to the north or south, replacing on the existing alignment has the least impacts, particularly the aquatic environment as the bridge can be built using existing foundations rather than having to place new piers in the water. Realignment also included moderate property impacts due to the realignment of the approaches and is more equitable to both adjacent property owners.

5.3 CREEK ROAD BRIDGE

From Phase 2, it was recommended that Creek Road Bridge be replaced with a new bridge at the existing vertical alignment. Further alternative design concepts for replacement of Creek Road Bridge are in **Table 21** and are evaluated in **Table 22**.

Table 21. Alternative Design Concepts Considered for Creek Road Bridge

Alternative Solutions		Description
1	Do Nothing	This alternative was considered to provide a baseline upon which other alternatives were evaluated.
2	Replace Keeping the Same Alignment	Replace Oswego Creek Bridge along its existing alignment.
3	Replace Moving the Alignment to the North	Replace Oswego Creek Bridge moving the bridge alignment to the north of the existing bridge.
4	Replace Moving the Alignment to the South	Replace Oswego Creek Bridge moving the bridge alignment to the south of the existing bridge.

Table 22. Evaluation of Alternative Design Concepts for Creek Road Bridge

Alternatives		1	2	3	4
Criteria		Do Nothing	Same Alignment	Alignment to the North	Alignment to the South
Transportation & Technical	Safety	✗ No changes means no safety improvements	✓ This alignment meets the safety needs of the bridge	✓ This alignment meets the safety needs of the bridge	✓ This alignment meets the safety needs of the bridge
	Active Transportation	✗ No changes means no improvements to active transportation	✓ This alignment is able to accommodate active transportation	✓ This alignment is able to accommodate active transportation	✓ This alignment is able to accommodate active transportation
	Meet Region's Design Standards	✗ Existing bridge is not to Region's design standard	✓ This alignment will meet the Region's Design Standards	✓ This alignment will meet the Region's Design Standards	✓ This alignment will meet the Region's Design Standards
Cultural Environment	Archaeology	✓ No impacts to archaeological resources	✓ Minimal archaeological impacts as the bridge is on its existing alignment	• Due to the footprint of the realignment, more potential for archaeological resources	• Due to the footprint of the realignment, more potential for archaeological resources
	Cultural Heritage	✓ No impacts to cultural heritage resources	✓ No impacts to cultural heritage resources	• Potential impacts to adjacent cultural heritage landscape	• Potential impacts to adjacent cultural heritage landscape
Natural Environment	Terrestrial Resources	✓ No impacts to terrestrial resources	✓ Minimal impacts to terrestrial resources as the bridge is along the same alignment	• Moderate impacts to terrestrial resources due to the realignment of the approaches	• Moderate impacts to terrestrial resources due to the realignment of the approaches
	Aquatic Resources	✓ No impacts to aquatic resources	• Some impacts to aquatic resources due to in-water works during construction	✗ Significant impacts to aquatic resources as there is placement of a bridge in a new location	✗ Significant impacts to aquatic resources as there is placement of a bridge in a new location
	Species at Risk	✓ No impacts to Species at Risk	• Potential impacts to aquatic SAR	• Potential impacts to aquatic SAR	• Potential impacts to aquatic SAR
Socio-Economic Environment	Construction Impacts	✓ No construction impacts	• Moderate construction impacts, bridge will be closed	• Moderate construction impacts due to significant realignment of road/bridge	• Moderate construction impacts due to significant realignment of road/bridge
	Property Impacts	✓ No property required	✓ Minimal property impacts as the bridge is on its existing alignment	• Moderate property impacts due to realignment of the bridge	• Moderate property impacts due to realignment of the bridge
Costs	Capital	✓ No construction costs	• Moderate construction costs	• Moderate construction costs	• Moderate construction costs
	Operation and Maintenance	✓ No operation and maintenance costs	• Moderate increase in operation and maintenance costs	• Moderate increase in operation and maintenance costs	• Moderate increase in operation and maintenance costs
Recommendation		Not recommended While this alternative has the least impacts, it does not offer safety and operational improvements required at Creek Road Bridge.	Recommended Replacement of Creek Road Bridge along its existing alignment will meet all the technical and operational requirements of the bridge, including safety, with the least impacts to the environment and property.	Not recommended While this alternative meets the technical and operational needs, there are significant impacts to property and the aquatic environment due to placement of a new bridge in a new location.	Not recommended While this alternative meets the technical and operational needs, there are significant impacts to property and the aquatic environment due to placement of a new bridge in a new location.

The recommended alternative design concept is to replace Creek Road Bridge and build the new bridge on the same (existing) alignment. This alternative meets all the technical and operational requirements of the new bridge, including a safer crossing for all road users. Compared to realignment to the north or south, replacing on the existing alignment has the least impacts, particularly the aquatic environment as the bridge will only impacts its existing location rather than cause impacts in new areas. Realignment also included moderate property impacts due to the realignment of the approaches.

5.4 SUMMARY OF RECOMMENDED DESIGN ALTERNATIVES

In summary, the recommended alternative design concepts are:

- Minor realignment of Creek Road to the east to create a “T” intersection at Canborough Road
- Realignment of Wellandport Road to the south to create a “T” intersection at River Road
- Close Creek Road at River Road in a cul-de-sac
- Replace Oswego Creek Bridge along its existing alignment
- Replace Creek Road Bridge along its existing alignment

Section 6.0 provides an overview of the final recommended design.

6.0 Description of the Recommended Design

Based on an assessment of the needs of the corridors and the evaluation of the Alternative Solutions and Alternative Design Concepts, the recommended scope of work includes:

- Reconstruction of Creek Road to address pavement deterioration, to meet Regional roadway standards, to improve roadway safety, and to provide active transportation facilities
- Intersection reconfiguration to improve safety, particularly poor sight lines
- Bridge replacement at two locations to address structural deficiencies and substandard roadway widths on the bridges

6.1 CREEK ROAD

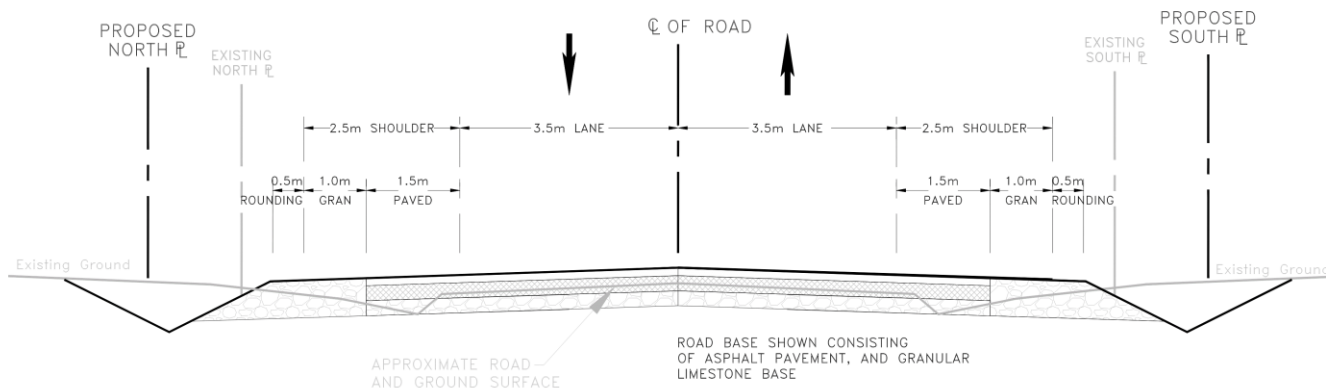
Creek Road is being reconstructed to improve the road surface, to address locations that do not meet geometric design standards, and to accommodate safer facilities for cyclists and pedestrians. In addressing these items, the road right-of-way was widened to 25.5m to accommodate the standard lane and shoulder widths as required in the Niagara Region Roadway Design Guideline and the TAC Geometric Design Guide for Ontario Roadways and to accommodate utility relocation requirements. Based on these guidelines and the assessment of alternative design concepts, the following cross sections were developed and are shown in **Figure 10** and **Figure 11**:

Rural Cross Section (majority of the study area):

- 2 x 3.5m travel lanes, one per direction
- 2 x 1.5m paved shoulder, to accommodate cyclists and pedestrians
- 2 x 1.0m granular shoulder
- 2 x 0.5m rounding

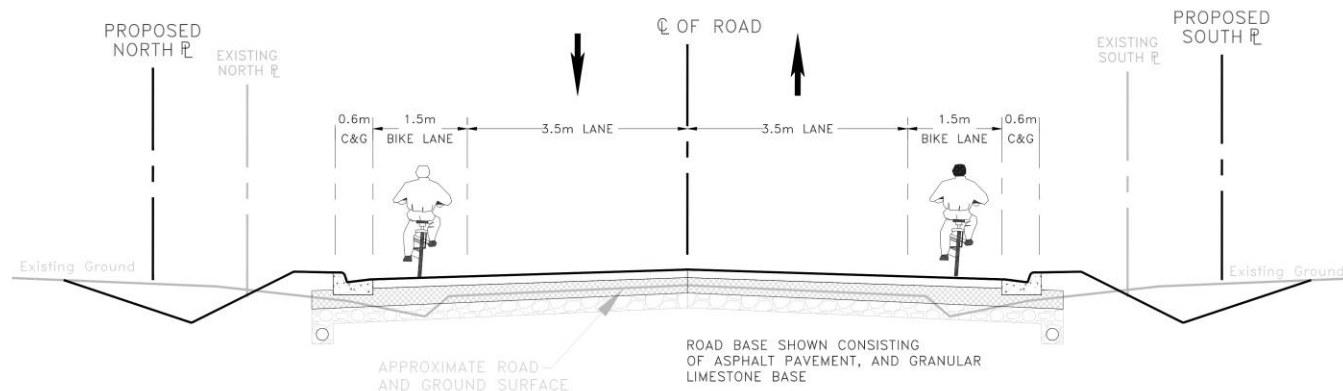
Urban Cross Section (curb and gutter) in the Wellandport Hamlet:

- 2 x 3.5m travel lanes, one per direction
- 2 x 1.5m on-road bike lanes
- 2 x 0.6m curb and gutter
- Sidewalks being considered in consultation with the Township of Wainfleet



REGIONAL ROAD 45 (CREEK ROAD) RURAL SECTION

Figure 10: Creek Road Cross-Section (Rural)



REGIONAL ROAD 45 (CREEK ROAD) URBAN SECTION

Figure 11: Creek Road Cross-Section (Urban)

6.2 HORIZONTAL AND VERTICAL ALIGNMENT

In general, the horizontal alignment along Creek Road matches the existing, except for a widened paved ROW, a 330m long section approximately 350m west of Marshagan Road, and changes at the three key intersections (See Section 6.3 for more details). Geometric improvements were designed for Creek Road to meet the Region's design standards and to minimize or avoid impacts to adjacent features, such as existing property and natural features. For the full design drawings, see **Appendix G**. During detailed design, some minor refinements to the horizontal alignment will be required.

The vertical alignment of Creek Road will match the existing elevation, with the exception of the approaches at Oswego Creek Bridge. The Oswego Creek Bridge will also be raised to address

flooding issues in order to provide a safe and usable roadway in the event of a large storm event (see **Figure 12**). Typically, both the Oswego Creek Bridge and the Creek Road Bridge flood during major storm events, which presents a safety concern for residents along Creek Road. It was determined that Oswego Creek Bridge would be raised, allowing residents located between the bridges to have a safe access route in and out of the area. The remainder of the vertical alignment along the corridor will be adjusted up to 0.7m to remove minor undulations and improve sight distance to the Niagara Region design standards.

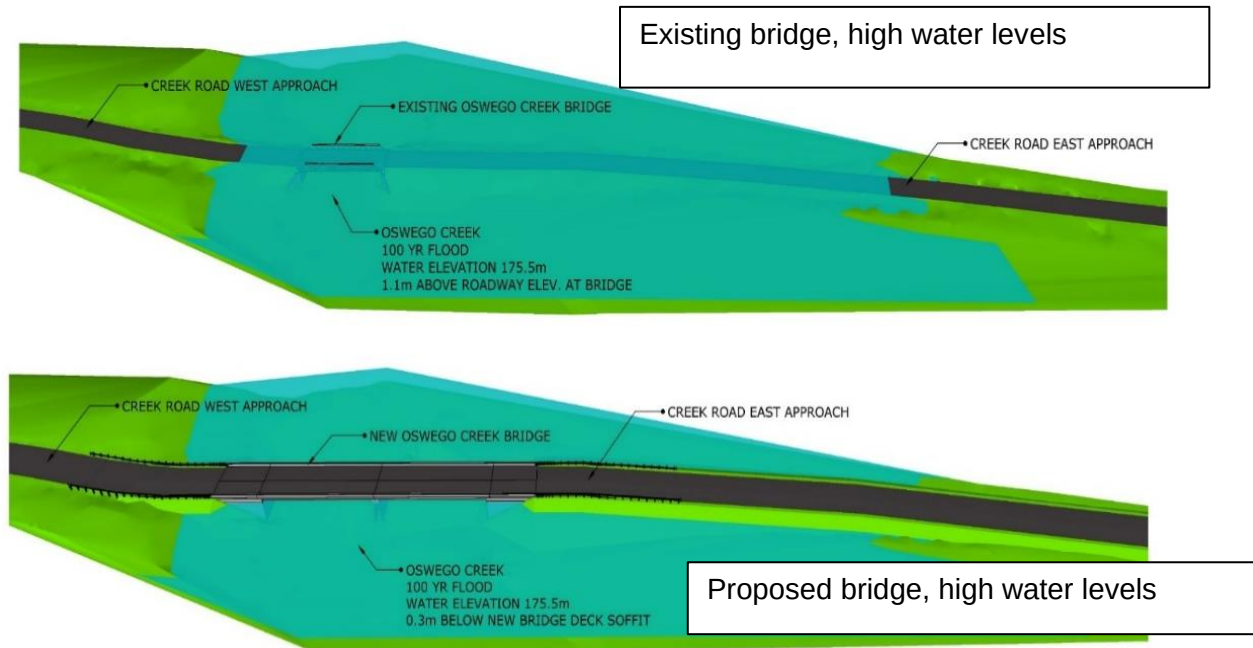


Figure 12: Grade Raise at Oswego Creek Bridge and Flooding

6.3 INTERSECTION IMPROVEMENTS

In Phase 2 of the Class EA (see Section 4.0), one of the recommended alternative solutions was to improve unsafe intersections to meet safety standards. Three intersections were identified as needing safety improvements and in Phase 3 (see Section 5.0), alternative design concepts were developed for each intersection and evaluated. The recommended improvements for each intersection are summarized below.

Creek Road (Regional Road 45) / Canborough Road (Regional Road 63)

Creek Road will be slightly realigned to the east of the existing intersection to create a “T” intersection (as shown in **Figure 13**), which will be safer for vehicles making turns compared to the existing skewed angle.



Figure 13: T-intersection at Creek Road and Canborough Road

Wellandport Road (Regional Road 4) / River Road (Regional Road 27)

The intersection will be realigned to the south of the existing intersection, with Wellandport Road being curved to create a “T” intersection (see **Figure 14**), which will be safer for vehicles making turns compared to the existing skewed angle. A left turn slip around is recommended along northbound Regional Road 27 to allow a pocket for left turning vehicles to stop safely in order to make a left turn onto Regional Road 4.



Figure 14: T-intersection at Wellandport Road and River Road

Creek Road (Regional Road 45) / River Road (Regional Road 27)

The intersection with Creek Road will be closed ending in a cul-de-sac (see **Figure 15**). There will be no direct access between River Road and Creek Road.



Figure 15: Cul-de-Sac at Creek Road and River Road

6.4 ACTIVE TRANSPORTATION

Active transportation users, such as cyclists and pedestrians, will be accommodated on Creek Road through the 1.5m paved shoulder throughout the rural section of Creek Road and through a 1.5m on-road bike lane throughout the urban section of Creek Road in the Wellandport Hamlet. A 1.8m paved shoulder will be accommodated on both Oswego Creek Bridge and Creek Road Bridge with bicycle height parapet wall/railing combinations. Sidewalks may be added on the urban section as well.

6.5 OSWEGO CREEK BRIDGE

Oswego Creek Bridge will be replaced along its existing alignment with a single span steel I-girder structure with a span length of 32m. The bridge cross-section as shown in **Figure 16** includes:

- 2 x 3.5m travel lanes, one per direction
- 2 x 1.8m paved shoulders, to accommodate cyclists and pedestrians
- 1.4m high bike rails

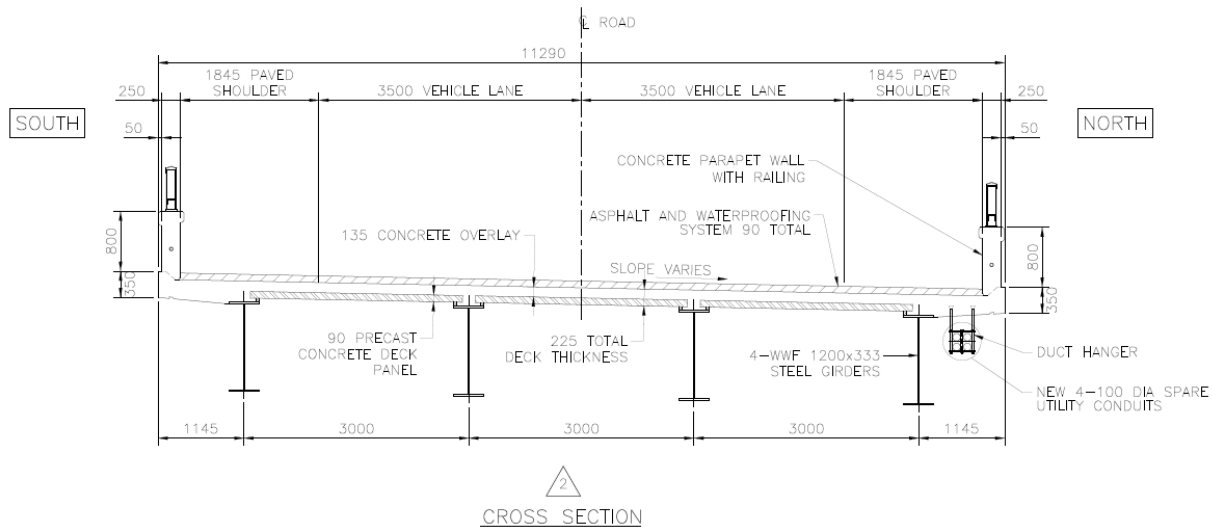


Figure 16: Oswego Creek Bridge Cross-Section

The grade of the bridge was also raised to address flooding and safety concerns for residents located between the two bridges (see Section 6.2). The roadway approaches will also be backfilled and graded to match the increase in roadway elevation. The elevation of the new bridge deck soffit will be at 175.894m, which provides adequate clearance for the 100 year flood water elevation and for recreational watercraft.

800mm high concrete parapet walls with 600mm high bicycle railings will be constructed on both sides of the structure for a total height of 1.4m. A commemorative plaque of the existing bridge will be included as part of the detailed design as per cultural heritage mitigation measures.

Some property acquisition is required at the bridge and approaches to accommodate the new width and the roadway side slopes. During construction, Creek Road will be fully closed. Construction is anticipated to take approximately 12 to 18 months. Construction of the bridges cannot occur at the same time.

To accommodate wildlife passage under the structure, a 1.5m wide level area will be constructed along the west embankment and covered with wildlife-friendly material to form a walkway.

6.6 CREEK ROAD BRIDGE

Creek Road Bridge will be replaced along its existing alignment with a single span precast concrete box culvert structure with a span length of 5.0m and inside height of 3.5m. Six precast box culvert units would be used with a structure width of 11.29m. The bridge cross-section as shown in **Figure 17** includes:

- 2 x 3.5m travel lanes, one per direction
- 2 x 1.8m paved shoulders, to accommodate cyclists and pedestrians

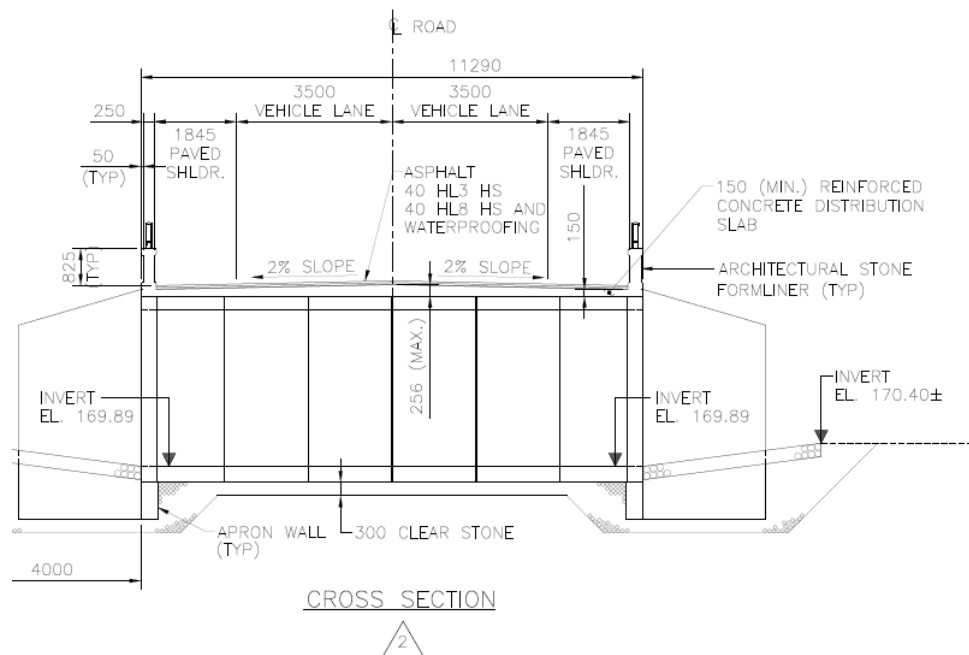


Figure 17: Creek Road Bridge Cross-Section

Creek Road will not be raised to prevent overtopping of the 100 year storm. To prevent overtopping and to meet bridge code requirements, the bridge and approach roadways would have to be raised approximately 2.1m. This alternative was determined not to be feasible due to hydraulic and cost concerns. Changing the opening could have adverse effects on the back water levels of the creek resulting in flooding or changes to the edge of the waterway. Also, this replacement alternative would require a significant amount of fill and a large bridge structure with an estimated total cost of approximately \$2.8M. It was determined that Creek Road Bridge should not be raised due to these considerations and that only Oswego Creek Bridge will be raised, which will provide at least one point of access during major flooding events. Thus, the elevation of the new bridge deck soffit will match the elevation of the existing bridge deck.

800mm high concrete parapet walls with 600mm high bicycle railings will be constructed on both sides of the structure for a total height of 1.4m.

Some property acquisition is required at the bridge and approaches to accommodate the new width and the roadway side slopes. During construction, Creek road will be fully closed. Construction is anticipated to take approximately 3 to 4 months. Construction of the bridges cannot occur at the same time.

6.7 DRAINAGE AND STORMWATER MANAGEMENT

As the roadway is being slightly widened, it is expected that there will be a slight increase in runoff, however the additional volumes can be accommodated via roadside ditches, as per existing conditions. The ditches will be relocated and reinstated in accordance with the new roadway.

Drainage culverts will need to be assessed for both condition and capacity in order to determine if they are to simply be extended to align with the widened road platform or fully replaced.

The existing pavement deterioration was indicative of poor road drainage. The reconstruction of the road will better direct runoff into the ditches rather than sitting in the roadbed leading to pavement issues and increased maintenance.

6.8 CONSTRUCTION STAGING

Creek Road will be constructed in stages. In order to allow for the full depth reconstruction of the pavement, sections of the road will need to be restricted to single lane traffic during the construction hours. Staging requirements are to be determined during detailed design in order to identify specific staging methods. Access to existing owners and other uses is to generally be maintained at all times.

Construction of the bridges likely requires the full closure of Creek Road, though the exact traffic staging strategy will be confirmed in detailed design. It is anticipated that the Oswego Creek Bridge replacement will take 12 to 18 months and the Creek Road Bridge replacement will take 3 to 4 months. As access needs to be maintained for residents located between the bridges, construction of the bridges cannot occur at the same time.

6.9 PROPERTY

Property is required along Creek Road due to widening of the road right-of-way and also due to the widening and grade raise of the bridges to accommodate two lanes of traffic and shoulders.

6.10 UTILITIES

The existing overhead Hydro One plant and the buried Bell plant will require relocation in order to reconstruct the Creek Road and Wellandport Road road cross sections. Sufficient ROW is recommended to install the overhead hydro infrastructure. A proposed location has not been determined with either Hydro One or Bell.

The existing Niagara Wind Farm infrastructure is more complex to relocate. The junction box chamber is located within the road cross section of Regional Road 45 so the updated road bed should be designed to pass over the chamber without causing a need for relocation of either the chamber or the underground transmission lines.

6.11 PAVEMENT RECOMMENDATIONS

A full depth reconstruction is recommended to achieve the longest lifespan and the least maintenance requirements. A typical pavement structure to support cars, large trucks, emergency vehicles, etc., for a rural or local semi-urban roadway consists of a minimum of:

- 40mm of HL3 asphalt surface course
- 80mm of HL8 asphalt binder course
- 150mm of base course granular

- 350mm of sub-base course granular

Pavement recommendations should be confirmed in detailed design.

6.12 PRELIMINARY COST ESTIMATE

The cost estimate for the reconstruction of Creek Road is approximately \$12.3M to \$13.0M including the road works and the bridge replacements.

The cost estimate for Oswego Creek Bridge ranges from \$3.8M to \$4.5M, including contingency and additional engineering coordination, depending on the grade raise required on the east side of Creek Road.

The cost estimate for Creek Road Bridge is approximately \$859,000.00 including contingency and additional engineering coordination.

7.0 Consultation

Public, stakeholder and agency consultation is a key feature of the Municipal Class EA process. Through an effective consultation program, the Region was able to generate meaningful dialogue between the Project Team and the agencies, stakeholders and the public, resulting in an exchange of ideas recorded in this Environmental Study Report, and the broadening of the information base leading to better decision making.

7.1 NOTICE OF STUDY COMMENCEMENT

The Notice of Study Commencement was published in the *Niagara This Week* on Thursday, August 18, and 25, 2016 (see **Appendix H**). The Notice was also posted on the Region's website. Nearby property owners within the study area were mailed a Notice via tax roll information obtained from the Region.

Technical agencies, utilities, special interest groups, stakeholders and First Nations were notified of this EA study by mail and email on August 19, 2016. The list of agencies, Emergency Services, Indigenous Communities utilities, and other stakeholders contacted are summarized in **Table 23**. The notification materials can be found in **Appendix H**.

Table 23: Summary of Stakeholders on the Contact List

Federal Agencies	
Crown-Indigenous Relations and Northern Affairs Canada	- Environment and Climate Change Canada - Fisheries and Oceans Canada
Provincial Agencies	
- Ministry of the Environment, Conservation and Parks - Ministry of Indigenous Relations and Reconciliation - Ministry of Agriculture, Food and Rural Affairs - Ministry of Heritage, Sport, Tourism, and Culture Industries	- Ministry of Northern Development, Mines, Natural Resources and Forestry - Infrastructure Ontario - Ministry of Transportation
Conservation Authority	
Niagara Peninsula Conservation Authority	
Municipal Agencies and Groups	
- Niagara Region - Township of Wainfleet - Township of West Lincoln - Town of Pelham	- Port Colborne - District School Board of Niagara - Niagara Catholic District School Board
Emergency Services	
Haldimand County Emergency Medical Services	

• Niagara, Central Ambulance Communication Centre • Niagara Emergency Medical Services • Niagara Regional Police
Indigenous Communities
• Six Nations of the Grand River First Nation • Haudenosaunee Development Institute • Mississaugas of the Credit First Nation
Utilities
• Niagara Regional Broadband Network • Enbridge Consumer Gas • Bell Canada
Other Stakeholder
• CP Rail

7.2 STAKEHOLDER ADVISORY GROUP

At the beginning of the study, a list of local stakeholders that were considered to have an interest in this study were invited to be part of a Stakeholder Advisory Group (SAG). The SAG is comprised of individuals from differing areas of interest, including adjacent residents, representatives from local businesses, active transportation groups, and organizations within the study area.

The SAG would be able to provide localized knowledge or convey local interests that the project team would not be aware of otherwise. The main role of the SAG members will be to provide input to the project team, assist in the development and evaluation of alternatives, and provide feedback to their constituent communities/interest groups.

One SAG meeting was held by the project team. The meeting was prior to PIC No. 1 on November 29, 2016. The meeting was held in-person at the Riverside Christian Reformed Church and included a presentation by the project team as well as a time for questions, feedback and discussion. General concerns expressed include safety for pedestrians, cyclists and vehicles, drainage issues, and intersection safety and operation concerns. For materials related to the SAG, please refer to **Appendix H**.

7.3 PUBLIC INFORMATION CENTRE NO. 1

The Notice of Public Information Centre (PIC) No. 1 was hand delivered, mailed or emailed to adjacent property owners, tenants, businesses, authorities, agencies, Indigenous Communities and special interest groups in advance of PIC No. 1, as well as advertised in the local newspaper *Niagara the Week* on December 8, 2016. PIC No. 1 was a drop-in, “Open House” format providing information on the project needs and project environment. This first PIC was held to present and obtain feedback the study background and existing conditions, and the alternative solutions and evaluation of the alternatives. The session was held as follows:

Date: December 13, 2016

Time: Information Display Drop In: 4:00 p.m. to 7:00 p.m. (Technical agencies were invited to attend between 4:00 p.m. and 5:00 p.m.)

Location: Riverside Christian Reformed Church
74094 Wellandport Road, Wellandport, Ontario

Attendance at PIC No. 1 included 16 individuals based on the sign in sheet. In total seven (7) comment sheets were received and one (1) letter response. A variety of issues and topics were brought forward, though there were several clear trends that emerged from the comments:

- Considerable consensus that the existing posted speed limit for Creek Road is too high. Vehicles often speed on Creek Road, resulting in dangerous conditions for other users of the road and local residents. This also poses safety concerns on the two bridges in the study area. Improving safety, especially related to speed limits, should be a priority.
- The current Creek Road cross section does not support or provide safe facilities for active transportation, particularly walking and cycling. Existing shoulders are too narrow for pedestrians and cyclists. Improvements should provide a safer environment to accommodate active transportation.
- Significant upgrades need to be undertaken at the two bridge structures in the study area. These upgrades should consider safety, widening, and accommodation of heavier vehicles.
- General improvements needed along the roadway that include addressing drainage deficiencies, road surfacing, and accommodating farming-related vehicles.

A summary of comments received is shown in **Table 24**. For the PIC Summary Report, which includes the display boards and written comments received, please refer to **Appendix H**.

Table 24: Public Information Centre No. 1 Comment Summary

Topic	Comment Summary	Project Response
Safety/Speed	• Do not increase speed limits • Cars are speeding on R.R. 45 • Speed limits are a concern because of housing density, the narrow road and curves in the road • 80 km/h is too fast • People do not observe the 50 km/h speed limit at Wellandport Road • Drivers are unaware of the stop sign when traveling north on Diltz Road • Issue with bridge signs; warning of narrowing roads should be clearer • Some intersections could be improved • Locals have witnessed accidents at the tight curve approximately 900 meters west of Side Road 42 • Vehicles do not obey the four-way stop at the Creek Road and Wellandport Road intersection	The EA and preliminary design recommends improvements to Creek Road and several intersections to improve safety along the corridor. The bridge replacements will also improve safety at these crossings. The roadway will be designed to a 90 km/h design speed in order to meet the Niagara Regional road standard of 80 km/h posted speed. The skew of the Diltz Road intersection will be normalized to 90 degrees which will assist in slowing

Topic	Comment Summary	Project Response
	Yield/caution/blinking signs should be implemented to improve safety	traffic approaching the intersection. It is recommended that traffic calming measures (i.e. curb and gutter, painted edge blocks) be considered at the curve 900m west of Sideroad 42 in order to slow traffic speeds. A regulatory speed limit of 60 km/h is recommended within this built up residential area.
Traffic	- Creek Road & Wellandport: - Traffic going east and north are heavy with trucks - Highest traffic volumes are on Sunday morning - Creek Road is a designated pick up area for high school buses	Improvements to the road right-of-way will make it safer for both trucks and school buses to use these roads.
Sight lines	- The Diltz Road and R.R. 45 intersection have sight line issues - Area around 75620 R.R. 45 has sight line issues - Sightline issues on the west end of the study area at driveways - Poor sight lines at the Oswego Creek Bridge - Visibility issues due to hedge growth at Creek Road and Marshagan Road	The design has considered sightline issues through the study area, including along Creek Road and at key intersections. The Diltz Road intersection skew angle will be normalized to 90 degrees in order to improve sightlines. The vertical profile of Creek Road at Marshagan Road will be cut by approximately 0.8m in order to improve sightlines.
Active Transportation	- Bicycling and walking lanes on R.R. 45 would be safer and more pleasurable - Shoulders are too narrow for pedestrians and cyclists - R.R. 45 is regularly used by cyclists in the summer	The proposed design includes a 1.5m paved shoulder which can be used by active transportation users, such as cyclists and pedestrians. The paved shoulders give cyclists and pedestrians more buffer room than existing conditions.
Bridges	- Speed limits should not be increased - In the past, the Oswego Creek bridge has been underwater (particularly in spring) - Oswego Creek Bridge flooded 3-4 times since 2008	The proposed design is able to safely accommodate larger vehicles due to the wider right-of-way and an improved road design standard.

Topic	Comment Summary	Project Response
	• Creek Road Bridge flooding around 3-4 times in 6 years • The two bridges should be replaced with wider bridges that are capable of safely handling modern farm equipment and trucks, both in terms of dimension and weight	Oswego Creek Bridge will be raised above the 100-year level storm so that one safe access point can be maintained for residents on Creek Road.
Drainage	• Drainage needs to be improved • Drain culvert near 75422 R.R. 45 is plugged • Ditches on R.R. 4 and R.R. 45 should be filled in and culverts put in (similar to what was done in front of the Riverside Cemetery) – this currently presents great challenges for lawn maintenance and grass cutting • Pooling occurs throughout the study area just off the shoulder due to poor drainage	The proposed design reinstates ditches and positive drainage on the side of the road. Through reconstruction, drainage will be improved as culverts are cleaned / replaced and ditches are made new and deeper.
Natural Environment	• Snapping turtles and painted turtles observed at the Creek Road bridge area	The EA study includes an Environmental Impact Study that looks at impacts to wildlife. Mitigation measures will be in place to reduce environmental impacts, such as wildlife fencing and wildlife encounter protocols.
Widening	• Road design should allow for oversize farm implements to pass along Creek Road, particularly at curbs and bridge locations both during and after construction • Road is narrow near 75422 R.R. 45 but is adequate and widening is not needed here • Extending the road by 2.5 metres will have impact on 75620 R.R. 45 property • If there is widening, impacted landowners should be treated fairly during the property acquisition process	The road right-of-way will be widened to meet Regional design standards in order to provide a safe road for all road users. Thus, widening is required and the Region will reach out to impacted landowners for the property negotiation process. Intersection designs will be developed to accommodate the larger implements by adding turning lanes.
Stakeholder Advisory Group	• Request to be added to Stakeholder Advisory Group	Stakeholders were added to the project contact list as required.
Alternative Solutions	• Road reconstruction and resurfacing and improvements to alternative corridors should be applied to R.R. 45, east of R.R. 7 • R.R. 45, west of R.R. 7, requires much more work on road and bridges	The focus of this project is on improvements to this portion of Creek Road. The road surface will be reconstructed to improve its condition.

Topic	Comment Summary	Project Response
	Road is in poor condition and needs to be resurfaced	

7.4 PUBLIC INFORMATION CENTRE NO. 2

Notices for Public Information Centre No. 2 were hand delivered, mailed or emailed to adjacent property owners, tenants, businesses, authorities, agencies, Indigenous Communities and special interest groups in advance of PIC No. 2, as well as advertised in the local newspaper, *Niagara This Week* on June 13 and 20, 2019

Similar to PIC No. 1, the second PIC No. 2 was a drop-in format providing information on the design alternatives being considered for traffic and transportation system improvements, evaluation of their potential impact on the Project environment, and identifying the preliminary preferred design alternative being considered by the Project Team. Members of the project team were available to answer questions and receive input from the public. The session was held as follows:

- Date:** June 25, 2019
- Time:** Information Display Drop In: 5:30 p.m. to 7:30 p.m.
- Location:** Wellandport Community Centre
5024 Canborough Road, Wellandport, Ontario

Attendance at PIC No. 2 included 17 individuals based on the sign in sheet. In total three (3) comment sheets and one (1) email response were received. Comments received at PIC No. 2 generally supported the need for traffic, pedestrian and cyclist improvements along Creek Road, however, concerns were expressed regarding:

- Traffic speeds along Creek Road are of concern to multiple area residents. Current drivers are speeding down the road and a new and improved roadway may also encourage speeding. Attendees would like to see the speed limit reduced for the study area.
- There is poor drainage throughout the study area resulting in flooding on residents' properties. It was brought up that area drainage could be addressed through this study.

A summary of comments received is shown in **Table 25**. For the PIC Summary Report, which includes the display boards and written comments received, please refer to **Appendix H**.

Table 25. Public Information Centre No. 2 Comment Summary

Topic	Comment Summary	Project Response
Safety/Speed	- Speed limit should be reduced throughout study area, but particularly near Chippawa Creek Conservation Area and the Hamlet area - Improved road conditions allow vehicles to drive even faster, thus speed limit	The EA and preliminary design recommends improvements to Creek Road and several intersections to improve safety along the corridor. The posted speed will be 80 km/h to meet Niagara Region road design standards. Design standards for a 90 km/h design speed will be implanted to allow for safe

Topic	Comment Summary	Project Response
	should be reduced along the entirety of the neighbourhood. • General support for the proposed intersection changes as it improves sightlines.	operations. The speed limit at the Wellandport hamlet will be reduced to 50 km/h. Additional traffic calming measures shall be considered in other areas where speed is a concern.
Active Transportation	• General support for the paved shoulders as it can accommodate active transportation users.	Noted.
Drainage	• Poor drainage and lack of ditching present in study area. • Area flooding occurs because of lack of continuous ditch along roadway. • Significant flooding at the two bridges during major storm events. • Widening of the road will impact ditches on resident's properties, though they will be reinstated as part of the drainage improvements.	The proposed design reinstates ditches on the side of the road. Through reconstruction, this may help improve drainage as culverts are cleaned / maintained and ditches are made new. Oswego Creek Bridge will be raised above the 100-year level storm so that one safe access can be maintained for residents on Creek Road.
Noise	• Proposed that a special type of pavement be used to reduce the noise produced by the increase in traffic.	Quieter asphalt surfaces may be considered during the detailed design process.
Property	• Potential impacts to septic tanks near the road right of way. • Property will be required to accommodate a wider road.	Widening is required and the Region will reach out to impacted landowners for the property negotiation process. If there are impacts to facilities, such as a septic tank, these can be discussed as part of the property discussion.
Other	• Archaeological studies will be moving forward and the Region will reach out to obtain PTEs.	N/A

7.5 AGENCIES AND UTILITIES

Consultation was undertaken with External Agencies. A summary is provided **Table 26**. The consultation record is included in **Appendix H**.

Table 26: Summary of Agency and Utilities Consultation

Agency/Utility	Comment Summary	Date Received	Project Team's Consideration of Comments
Ministry of Environment, Conservation	Letter provided additional information on the requirement to consult with Indigenous communities and	October 3, 2016	Indigenous communities were consulted throughout the study and a section on SWP was included in the ESR.

Agency/Utility	Comment Summary	Date Received	Project Team's Consideration of Comments
and Parks (MECP)	to consider Source Water Protection (SWP) through the Class EA process.		
Infrastructure Ontario (IO)	IO needs to be consulted and involved if IO lands will be impacted by the undertaking. If not, written confirmation also needs to be provided to IO.	November 25, 2016	IO owned lands will be required to accommodate the revised road allowance. Niagara Region will consult with IO regarding the acquisition of this strip of road widening.
Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNRF)	Response to a request for information on SAR and natural heritage features, including information on ANSI, wetlands, fish and Species at Risk (SAR).	September 12, 2016	Information was used to develop an inventory of the existing natural environment and for determining appropriate mitigation measures.
	Inquired if project team screened for SAR.	December 22, 2016	Confirmed that the project team screened for existing SAR through contact with NDMNRF and NHIC's online database. Summer 2016 field studies were conducted and an impact assessment was also completed.
Ministry of Heritage, Sport, Tourism, and Culture Industries (MHSTCI)	Provided a letter detailing MHSTCI's interest in cultural heritage and archaeological resources. MHSTCI also indicated they will review the Oswego Bridge CHER/HIA and requested a copy of the PIC displays.	December 16, 2016	Relevant archaeological and cultural resource assessments were completed for the EA study. A copy of the PIC displays was sent to MTCS.
	MHSTCI reviewed the CHER/HIA and has no concerns with the report, but that the recommendations of the CHER/HIA be considered through the overall EA, specifically how the 9 conservation options were considered and why each is/is not a viable option. Suggestion for a separate technical memo to document this.	February 16, 2017	This discussion was incorporated into Section 8.2.1 of this ESR. Due to structural concerns and the need to raise the grade, it is not possible to retain the existing bridge. A commemorative plaque will be installed and proper documentation prepared.

Agency/Utility	Comment Summary	Date Received	Project Team's Consideration of Comments
	MHSTCI indicated support for focusing on key areas for Stage 2 archaeological assessment during the Class EA phase and completing the full Stage 2 in Detailed Design. MHSTCI noted that the suggestion is always to complete the AAs as early in the planning process as possible so that archaeological resources can be factored into the assessment of alternatives.	April 19-21, 2017	Project team acknowledged that doing AAs in the planning process provides more information, however as the project team does not feel completing select Stage 2 AAs provide additional input for this evaluation, as there are costs associated with the work, PTEs being difficult to obtain, and with the potential for design to change during detailed design, the project team feels it would be a better decision to complete additional studies later in the project. This would also reduce the need for the Region to complete redundant work and is more cost effective.
	Teleconference with MHSTCI to discuss the Stage 2 AA strategy.	May 3, 2017	
Township of Wainfleet	The Township is interested in drainage at intersections and possible improvements to areas of concern regarding safety at curves, driveway entrances and intersections (at Wellandport Road). Tree planting of native species to replenish canopy from the devastation of Emerald Ash Borer.	August 31, 2016	The proposed design / recommended alternative design concept was provided for the Town's review.
	Requested a copy of the alternative design concepts and preferred design that will be presented at the PIC.	June 17, 2019	The PIC displays were provided.
Niagara Peninsula Conservation Authority (NPCA)	The proposed hydraulic opening is larger than existing thus a hydraulic analysis to confirm the Oswego Creek floodplain is not needed. The elevation of the Welland River 100-year floodplain is higher than that of Oswego Creek, thus NPCA does not anticipate that the Welland River backwaters will be negatively impacted.	June 22, 2017	Acknowledged by project team. Design revisions were made to the Oswego Creek bridge and was provided to NPCA for review. NPCA indicated they did not have any objections to the proposed.

Agency/Utility	Comment Summary	Date Received	Project Team's Consideration of Comments
	Phone call with NPCA. Discussed the two flood scenarios at Oswego Creek Bridge due to the proximity of the Welland River downstream of the structure. The minimum bridge span and soffit elevation were discussed. NPCA noted they are updating the study on the Welland River Watershed. This should be reviewed by the designer during detailed design.	July 11, 2017	N/A
	Project team provided updated drawings of the Oswego Creek Bridge. NPCA noted no concerns.	September 21, 2017	N/A
	NPCA noted the current Niagara Peninsula Source Protection Area Source Protection Plan does not have any policies addressing threats withing Significant Groundwater Recharge Areas and Highly Vulnerable Aquifers. As per the Official Plan, any development and site alteration should demonstrate no negative impacts to sensitive groundwater features.	August 6, 2019	As the proposed design does not significantly alter the current use of the roadway, no negative impacts to groundwater features are anticipated.
Haldimand County EMS	Wish to be kept informed of the project, particularly if there are any road closures.	September 9, 2016	Haldimand County EMS was updated throughout the project and will continue to be notified through future project stages.
Cogeco Cable	Cogeco does not have any cable plants in this area.	August 22, 2016	Acknowledged by project team.

7.6 PUBLIC STAKEHOLDERS

A number of comments were received from the general public (e.g. local residents, businesses, interest groups) during the study. For comments received from the PICs refer to Sections 7.3 and 7.4, other **Table 27** below documents all other comments received from the public.

Table 27: Summary of Correspondence with the Public

Stakeholder	Comment Summary	Date Received	Project Team Response/Action
Local Business (near RR 27 and Wellandport Road)	Business is located at River Road and Wellandport Road and they have note safety concerns with the intersection. They would like to be kept updated on the study.	Aug 24, 2016	Added the stakeholder to the contact list. The intersection has been realigned into a T-intersection to improve sightlines and the angle at which vehicles would approach the intersection.
	Noted safety concerns with the River Road and Wellandport Road intersection. Particularly cars on the road often cross from the roadway onto their property making it very dangerous for them. Would be interested in seeing a 90-degree stop to slow traffic down.	Nov 9, 2016	The intersection was reviewed as part of the EA study and a T-intersection (~90-degree) was recommended. This allows for better sightlines for vehicles from different directions and helps to slow higher speed movements.
	Email requesting an update on another public meeting.	Jan 5, 2018	Provided an update on project timelines and future public events.
Resident / Local Business	Cannot attend the first stakeholder meeting but is interested in the study as a daily user of the road. Would like to be kept informed of the study.	Nov 22 2016	Added the stakeholder to the contact list and suggested for them to provide written comments.
Local Resident	Concerned with the speed of vehicles on Creek Road. As a resident, they have seen many incidents or close calls as a result of speeding vehicles. Vehicles also often go off the road onto people's driveways which is a safety concern for residents.	Jan 11, 2017	Speed was reviewed as part of the study. The posted speed will be 80 km/h to meet Niagara Region road design standards. Design standards for a 90 km/h design speed will be implanted to allow for safe operations. The speed limit at the Wellandport hamlet will be reduced to 50 km/h. Additional traffic calming measures shall be considered in other areas where speed is a concern.
	Email requesting an update on another public meeting and the project timeline for implementation. Reiterated the concerns with safety on the road and a recent incident.	Sept 6, 2017	Provided an update on project timelines and future public events and general next steps required prior to being able to implement the road improvements. Safety concerns

			passed onto Region's Operations group.
Local Resident	Email requesting an update on another public meeting.	Sept 2, 2017	Provided an update on project timelines and future public events.

7.7 INDIGENOUS COMMUNITIES

Indigenous Communities were contacted at the beginning of the study to ensure that opportunities for communication were available as early as possible. Where the project team did not hear back from Indigenous Community, the project team followed up with Indigenous Communities contacts.

Overall, there were no Indigenous Community concerns with the study. **Table 28** provides a summary of Indigenous consultation undertaking as part of this EA study. For a complete record of the Indigenous Communities consultation undertaken as part of this study, refer to **Appendix H**.

Table 28: Summary of Indigenous Consultation

Indigenous Community	Comment Summary	Date Received	Project Team Response/Action
Mississaugas of the Credit First Nation (MCFN)	MCFN is interested in the project as the study area lies in the treaty lands of the Mississauga. The potential for archaeological remains is very high and there are cultural landscapes that should be preserved as well. MCFN would like to receive a copy of the Stage 1 AA when completed and what environmental studies are planned and would be open to their participation.	August 22, 2016	Project team provided the Stage 1 AA to MCFN when it was completed for their review. Should it be determined that project studies require external input, MCFN will be contacted.
	Contact called to request the project team meet with MCFN to present the details of the project.	February 14, 2017	Project team reached out to contact, though no response was received.
Six Nations of the Grand River	-	November 14, 2016	Project team called and re-sent the project Notice and letter.
Haudenosaunee Development Institute (HDI)	-	November 16, 2016	Project team called and re-sent the project Notice and letter.

7.8 NOTICE OF STUDY COMPLETION

The Notice of Study Completion was published in the *Niagara This Week* on Thursday, November 18, and 25, 2021 for a 30-day public review period from November 22 to December 22, 2021 (see **Appendix H**). The Notice was also posted on the Region's website and sent to all agencies and stakeholders on the contact list. Nearby property owners, residents, and businesses within the study area were delivered the notice.

8.0 Impacts, Mitigation and Commitments

8.1 NATURAL HERITAGE

8.1.1 TERRESTRIAL

8.1.1.1 Loss of Terrestrial Vegetation

Some permanent removal of vegetation will be unavoidable in order to widen Creek Road through the project limits, though the extent of vegetation removal is anticipated to be minimal. A large portion of the study area is open with minimal vegetation adjacent to the existing road, but there are areas where natural habitat is present: at the Oswego Creek crossing, through the Conservation Area lands, and east of the Conservation Area where the Chippawa Creek Slough Forest PSW abuts the existing Creek Road. In these areas, particularly, the removal of roadside vegetation may also impact terrestrial and aquatic wildlife habitat by directly removing suitable habitat and potentially causing erosion. To mitigate these impacts:

- A detailed inventory of vegetation to be removed should be completed once the exact areas for vegetation removal are known at the detailed design stage. This inventory will provide the number and species of plants that will be lost, which will in turn inform the development of a post-construction landscaping/restoration plan. It will also confirm the absence of SAR tree Butternut (*Juglans cinerea*) in removal areas.
- Compensation plantings should be considered based on the trees removed. If compensatory plantings within the ROW is not feasible due to limited space, plantings in other more appropriate areas should be explored.
- Tree removal may require a permit under the Region's Regional Tree and Forest Conservation By-law No. 30-2008.
- During construction, the contractor should install highly visible fencing to delineate the approved work areas and avoid encroachment into vegetation areas that will be retained.

8.1.1.2 Wildlife and Wildlife Habitat, including SAR and SoCC

During construction, there is the potential for wildlife to enter the work area and be at risk of injury or death due to conflicts with construction equipment. The permanent removal of terrestrial vegetation is expected to result in decreased wildlife habitat surrounding the ROW. However, roadside vegetation is generally considered to provide marginal habitat for disturbance-tolerant species so overall impacts to the surrounding natural ecosystem are anticipated to be minimal.

Nonetheless, the following wildlife protection measures should be followed:

- Wildlife should be left and allowed to leave the area under their own power. Capture and relocation of some animals may be necessary if they are unwilling to move or are at risk of immediate harm, but this should only be done by individuals qualified in the safe handling of

wildlife. Any wildlife that is injured by construction activities should be delivered to a NDMNRF-approved wildlife rehabilitator.

- Removal of vegetation during the bird nesting season has the potential to disturb or destroy the active nests of birds which are protected under the MBCA. Removal of woody or herbaceous vegetation should not occur between April 1 to August 31 of the construction year to avoid destroying active nests.
- If vegetation removal is required during the breeding bird nesting season (April 1 – August 31), a qualified biologist must complete a bird nest sweep for active bird nests up 72 hours prior to the removal of the vegetation. If an active nest is discovered during the bird nest sweep, clearing or construction activity cannot occur near an active nest until the young have fledged.
- The bridges and culverts should be inspected for Barn Swallow and other migratory bird nests prior to construction.
- A Notice of Activity must be registered with the NDMNRF if existing, inactive Barn Swallow nests are to be removed. A Barn Swallow kiosk with one artificial nest cup per nest removed must be installed within 1 km of each bridge or culvert with nests to provide temporary habitat during construction. If the new bridge or culverts will not provide suitable nesting sites for Barn Swallow, the kiosk should be maintained for three years following the end of construction.
- Preventative measures such as netting should be installed under bridges and over culvert entrances prior to April 1 to exclude structure-nesting birds. Removal of abandoned nest structures should also occur prior to April 1.
- The potential for bat (including SAR bat) roosting in trees was identified adjacent to the current Creek Road alignment throughout the study area, particularly within the Chippawa Creek CA. Once vegetation removal areas are confirmed, bat habitat assessments and/or acoustic surveys should be carried out to confirm the presence or absence of SAR bats in the area and attempt to locate specific locations which may be valuable for bat maternity. If SAR bats are confirmed in the area, the habitat is protected under the ESA and a permit and compensation may be required.
- Removal or damage of suitable roosting trees in the Creek Road corridor may be required. Compensation for lost habitat should be considered in the form of artificial roosting structures (e.g., bat condos, “rocket boxes”, BrandenBark, etc.).
- Tree removal should not occur between April 1 and October 31 to avoid the bat active season. If bat SAR are identified during bat acoustic monitoring or exit surveys, permits under the ESA may be required.
- Construction noise should be minimized near the Chippawa Creek CA and associated woodlands. Excessive noise could disturb or deter nesting birds including Eastern Wood-pewee, which is provincially ranked Special Concern.
- Opportunities to improve or create wildlife habitat, particularly for SAR or SoCC, should be pursued where feasible. This may include seeding Common Milkweed (*Asclepias syriaca*) in restoration plantings to provide long-term habitat for Monarch or designing the new bridge and culverts to include rough surfaces and overhangs suitable for Barn Swallow nesting.

- Post-construction monitoring of compensation measures such as Barn Swallow kiosks or bat houses may be a requirement of ESA or other permits.
- Wildlife passages where possible and feasible in the design, such as at bridge or culvert crossings.

8.1.2 FISH AND FISH HABITAT

Potential impacts to fish and aquatic habitat can be identified as: a direct loss of habitat; direct injury to fish because of construction; or indirect changes to fish habitat that may occur in the long and short term as well as downstream of the Project and into the Welland River.

In general, bridge and culvert work along the same or similar alignment, as proposed, tends to minimize negative residual footprint impacts (i.e., overprinting) as most of the existing roadway will be reused to replace the bridges, including reusing existing foundations and abutments. Provided that specific mitigation measures and operational constraints are in place to avoid or lessen negative effects on fish and aquatic habitats, the likelihood of causing the death of fish and/or a HADD of fish habitat can be significantly minimized. However, if measures are not implemented and/or fail during construction, the following impacts can occur due to these types of activities:

- Infilling fish habitat by encroachment of the water crossing footprint to accommodate access and/or the design;
- Harmful substrate alteration of fish habitat (e.g., blockage of groundwater upwellings, critical SAR habitat, spawning areas);
- Removal of riparian vegetation and cover along the banks;
- Removal of edge habitat (e.g., undercut bank, shallower areas with lower velocity, aquatic vegetation) creation of barriers to fish movement (e.g., perched crossings, velocity barriers, alteration of the natural stream gradient);
- Alteration of channel flow velocity and/or depth (e.g., oversized culvert resulting in insufficient depth for fish passage at low flow or undersized culvert resulting in a flow velocity barrier at high flow);
- Alteration of channel morphology and sediment transport processes caused by the physical structure of the crossing resulting in upstream and downstream sediment aggradation/erosion;
- Re-entry of sediment that was removed/stockpiled into the watercourse;
- Erosion downstream from sudden release of water due to the failure of site isolation;
- Stranding of fish in isolated ponds following de-watering of the site;
- Impingement or entrainment of fish when de-watering pumps are used; and
- Short term or chronic transport of deleterious substances, including sediment, into fish habitat from construction or road drainage.

With the application of standard mitigation measures and operational constraints, the majority of construction-related impacts are expected to be mitigated. See the following sections for specific discussions at each watercourse crossing.

8.1.2.1 Oswego Creek and Creek Road Bridges

The wider and higher bridge dimensions proposed to accommodate Creek Road widening at both the Oswego Creek and Creek Road bridges will require larger, supporting side slopes as the road approaches the watercourse from either direction. As a result, fill is required immediately adjacent to the existing abutments in all four corners, which will be below the creek's high-water level (i.e., top of bank) and into the water. As a result of infilling to achieve the 2:1 side slopes at each bridge location, approximately 250 m² of existing aquatic habitat will be permanently lost or altered in Oswego Creek and approximately 27 m² at Creek Road Bridge location.

There will be a direct loss of seasonal habitat (i.e., between the top of bank and the normal water mark) and an alteration of existing habitat below the normal water line (i.e., from creek bed to rock embankment). Specifics with respect to construction methods and materials to be used and quantification of habitat impacts will be determined and finalized during detailed design; however, it is anticipated that given the presence of sensitive fish habitat at each location, including the presence of SAR mussels, a detailed impact assessment and review by DFO will be required to determine permitting needs under the *Fisheries Act* and the *Species at Risk Act*.

Given the amount of infill required at Oswego Creek Bridge and Creek Road Bridge in combination with known SAR mussels present, DFO may require a Habitat Offsetting Plan be developed to counterbalance the unavoidable impacts of the project with the goal of protecting and conserving fish and fish habitat as well as addressing limiting factors to fish production. Suitable offsetting measures, if required, will need to be developed in consultation with the Region, DFO, and the NPCA during project permitting and contract preparation.

8.1.2.2 Unnamed Tributary to Welland River Culvert

Road widening at this location will require either a culvert replacement or a culvert extension(s) to accommodate the proposed widened road platform. The length and width and type of culvert replacement or extension proposed is not known at this time; however, given that fish habitat is seasonal at this location and indirect upstream of Creek Road, minor extensions and replacement are not anticipated to cause the death of fish or a HADD of fish habitat provided appropriate mitigation (e.g., timing window and ESC) and site restoration measures are implemented during construction.

8.1.2.3 Centreline Culverts

The remaining centreline culverts within the study area are also expected to be extended to align with the widened road platform, including relocated ditch lines and connections to the culverts. The remaining watercourses that cross Creek Road function as either indirect habitat or road drainage conveyance only. With sufficient mitigation measures in place during culvert and ditching work, impacts to fish and fish habitat downstream or in adjacent areas are expected to be fully mitigated and not in need of review by DFO. Indirect crossings are still required to adhere to the appropriate timing window for in-water work if there is water and flow present at the time of construction. This is in place to protect downstream direct fish habitat during sensitive periods, including at the shoreline of the Welland River.

8.1.2.4 Mitigation Measures

Specific measures and construction methods to avoid and/or minimize impacts will be determined during detailed design in consultation with regulators and contractors. However, the following measures are typical measures often used to mitigate aquatic impacts and will need to be confirmed during detailed design and permitting with the appropriate regulators:

- A warmwater in-water construction timing window of July 16 to March 14 will be implemented at the crossings where water and flow are present. No in-water works will be permitted between March 15 and July 15 of any given year;
- Vehicular and equipment maintenance and refueling will be undertaken in designated areas a minimum of 30 m from a watercourse and drainage features and controlled to prevent any discharge of equipment fuels and fluids onto the ground or into a watercourse;
- All machinery is to be washed a minimum of 30 m from a watercourse or waterbody;
- All machinery and equipment used will arrive on-site in a clean condition, free of fluid leaks, invasive species (e.g., *Phragmites australis*) and noxious weeds;
- No construction equipment shall enter a watercourse without isolation from water and flow;
- In-stream sediment controls (i.e., cofferdams) will be installed to create dry working conditions and to minimize impacts to adjacent creek bed;
- The pumping system used for dewatering for the construction of the bridges will be sized appropriately and monitored at all times;
- Any pipes/hoses conveying water in any watercourse during construction will be screened to prevent the entrainment and impingement of fish;
- If dewatering is required, sediment laden discharge water will be pumped into a vegetated area > 30 m from a watercourse or into a settling basin or similar measure to prevent the entry of deleterious substances from entering the watercourse;
- Both during and following the construction activities, a full restoration plan will be undertaken with phased implementation in conjunction with the construction activities;
- The construction access, work areas and associated requirements for removal of riparian vegetation will be minimized to the extent required for the construction activities, and these areas then delineated in the field using properly installed protective silt fencing. All temporarily disturbed areas will be re-stabilized following construction using appropriate means;
- During construction, areas required for construction works will be isolated from the main flow path of the watercourse. After complete isolation and prior to in-water works, professional ecologists must catch and relocate trapped fish and mussels downstream of the proposed work area using appropriate methods (e.g., electrofishing, seine netting) and under a license to collect fish from the NDMNRF. The mussel relocation must be carried out under an Endangered Species Act (ESA) Schedule C Permit from MECP to address aquatic SAR.
- Poorly installed or maintained mitigation measures have the potential to significantly impact downstream reaches that will be difficult to access and remediate. Therefore, an appropriate ESC Plan and Spill Prevention Plan should be in place and monitoring conducted consistently during construction to prevent offsite impacts.

8.1.3 RESTORATION AND MONITORING

In detailed design, restoration planting plans will include native replanting of marshland native species to restore the natural vegetation which may be impacted during construction activity. Replanting of large riparian tree species will be considered during restoration planting to provide permanent erosion control and nutrient uptake from Oswego Creek. Flow velocities throughout the projected work area are generally quite minimal. To mitigate impacts to fish habitats, naturalized erosion controls (willow wattles, live fascines, brush layering, etc.) will be preferred over hardened engineering techniques (rip rap, armour stone, etc.).

Given the likelihood of a fish and mussel salvage and relocation prior to in-water works beginning, construction and post-construction monitoring is anticipated to be required as per project permits. In addition, DFO Habitat Offsetting Plans, if required, will require annual post-construction monitoring, including documenting the success of site stability and restoration measures in order to correct any deficiencies and remain in compliance with project permits. All monitoring conditions and mandatory documentation will be clearly outlined within project permitting and approvals.

On-site inspection should be undertaken as required during construction to ensure that only specified trees are removed, fencing is intact and there is no damage caused to the remaining trees and adjacent vegetation communities. Construction and/or ESC fencing will be repaired if it is damaged. Post-planting monitoring of restoration areas is recommended for one year after installation to confirm survival of plantings and/or seed mix. Should the plantings and/or seed mix not survive, additional seeding and/or plantings should be undertaken one year thereafter with one additional monitoring visit in the following growing season.

8.2 CULTURAL HERITAGE

A summary of the impacts and mitigation for each cultural heritage resource in the study area is documented in **Table 29**.

Table 29: Summary of Impacts and Mitigation Measures for Cultural Heritage Resources

Feature	Location	Type and Description of Anticipated Impacts	Mitigation Strategies
BHR 1	Oswego Creek Bridge	Direct impacts to BHR 1 as the bridge will be replaced.	See discussion in Section 8.2.1.
CHL 1	74646 Creek Road	Minor indirect impacts to CHL 1, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. Minor direct impacts may occur, such as removal of established trees, though this will not significantly influence its potential heritage value. No direct or indirect	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species.

Feature	Location	Type and Description of Anticipated Impacts	Mitigation Strategies
		impacts to any structures are anticipated.	
CHL 2	84014 Creek Road	Minor indirect impacts to CHL 2, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. No direct impacts to any headstones or landscape features of potential heritage value. Indirect impacts to headstones may occur through vibration from construction.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.
CHL 3	74366 Creek Road	Minor indirect impacts to CHL 3, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. No direct impacts to any landscape features of potential cultural heritage value. No direct or indirect impacts to any structures are anticipated.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species.
CHL 4	75389 Creek Road	Minor indirect impacts to CHL 4, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. Minor direct impacts may occur, such as removal of established trees, though this will not significantly influence its potential heritage value. No direct impacts to any structures are anticipated. Indirect impacts to the subject residence may occur through vibration from construction.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.
CHL 5	75229 Creek Road	Minor indirect impacts to CHL 5, including grading and expansion of the ROW. These impacts are not	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-

Feature	Location	Type and Description of Anticipated Impacts	Mitigation Strategies
		expected to adversely impact any potential heritage attributes. No direct impacts to any landscape features of potential cultural heritage value. No direct impacts to any structures are anticipated. Indirect impacts to the subject residence may occur through vibration from construction.	construction measures include tree planting with sympathetic plant species. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.
CHL 6	75173 Creek Road	Minor indirect impacts to CHL 6, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. Minor direct impacts may occur, such as removal of established trees and fencing, though this will not significantly influence its potential heritage value. No direct impacts to any structures are anticipated. Indirect impacts to the subject residence may occur through vibration from construction.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species and reinstallation of the fence. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.
CHL 7	85014 Creek Road	Minor indirect impacts to CHL 7, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. No direct impacts to any landscape features of potential cultural heritage value. Indirect impacts to a small red barn at the southeast corner of the property may occur through vibration from construction.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.

Feature	Location	Type and Description of Anticipated Impacts	Mitigation Strategies
CHL 8	74978 Creek Road	Minor indirect impacts to CHL 8, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. Minor direct impacts may occur, such as removal of established trees, though this will not significantly influence its potential heritage value. No direct impacts to any structures are anticipated. Indirect impacts to the subject residence may occur through vibration from construction.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.
CHL 9	74830 Creek Road	Minor indirect impacts to CHL 9, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. No direct impacts to any landscape features of potential cultural heritage value. No direct or indirect impacts to any structures are anticipated.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species.
CHL 10	74241 Creek Road	Minor indirect impacts to CHL 10, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. Minor direct impacts may occur, such as removal of established trees, though this will not significantly influence its potential heritage value. No direct impacts to any structures are anticipated. Indirect impacts to the subject residence may occur through vibration from construction.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.
CHL 11	74221 Creek Road	Minor indirect impacts to CHL 11, including grading and expansion of the ROW. These impacts are not	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas

Feature	Location	Type and Description of Anticipated Impacts	Mitigation Strategies
		expected to adversely impact any potential heritage attributes. Minor direct impacts may occur, such as removal of established trees, though this will not significantly influence its potential heritage value. No direct impacts to any structures are anticipated. Indirect impacts to the subject residence may occur through vibration from construction.	and tree protection zones. Post-construction measures include tree planting with sympathetic plant species. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.
CHL 12	74178 Creek Road	Minor indirect impacts to CHL 12, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. Minor direct impacts may occur, such as removal of established trees and fencing, though this will not significantly influence its potential heritage value. No direct impacts to any structures are anticipated. Indirect impacts to the subject residence may occur through vibration from construction.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species and reinstallation of the fence. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.
CHL 13	74154 Creek Road	Minor indirect impacts to CHL 13, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. No direct impacts to any landscape features of potential cultural heritage value. No direct impacts to any structures are anticipated. Indirect impacts to the subject residence may occur through vibration from construction.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.

Feature	Location	Type and Description of Anticipated Impacts	Mitigation Strategies
CHL 14	74033 Creek Road	Minor indirect impacts to CHL 14, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. Minor direct impacts may occur, such as removal of established trees and fencing, though this will not significantly influence its potential heritage value. No direct impacts to any structures are anticipated. Indirect impacts to the subject residence may occur through vibration from construction.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species and reinstallation of the fence. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.
CHL 15	75422 Creek Road	Minor indirect impacts to CHL 15, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. Minor direct impacts may occur, such as removal of established trees, though this will not significantly influence its potential heritage value. No direct impacts to any structures are anticipated. Indirect impacts to the subject residence may occur through vibration from construction.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring plan should be prepared to lessen impacts during construction.
CHL 16	75546 Creek Road	Minor indirect impacts to CHL 16, including grading and expansion of the ROW. These impacts are not expected to adversely impact any potential heritage attributes. No direct impacts to any landscape features of potential cultural heritage value. No direct impacts to any structures are anticipated. Indirect impacts to the subject residence may occur through vibration from construction.	Plan construction works to limit impacts to this CHL, such as using fencing to delineate work areas and tree protection zones. Post-construction measures include tree planting with sympathetic plant species. Baseline vibration monitoring should be undertaken during detailed design. If this monitoring determines features on the property will be subject to vibration, a vibration monitoring

Feature	Location	Type and Description of Anticipated Impacts	Mitigation Strategies
			plan should be prepared to lessen impacts during construction.

8.2.1 OSWEGO CREEK BRIDGE

The Cultural Heritage Evaluation and Heritage Impact Assessment report (**Appendix E**) provided the following recommendations and mitigation measures:

1. Retention of existing bridge and restoration of missing or deteriorated elements where physical or documentary evidence (e.g., photographs or drawings) can be used for their design;
2. Retention of existing bridge with no major modifications undertaken;
3. Retention of existing bridge with sympathetic modification;
4. Retention of existing bridge with sympathetically designed new structure in proximity;
5. Retention of existing bridge no longer in use for vehicle purposes but adapted for pedestrian walkways, cycle paths, scenic viewing etc.;
6. Relocation of bridge to appropriate new site for continued use or adaptive re-use;
7. Retention of bridge as heritage monument for viewing purposes only;
8. Replacement/removal of existing bridge with salvage elements/members of heritage bridge for incorporation into new structure or for future conservation work or displays;
9. Replacement/removal of existing bridge with full recording and documentation of the heritage bridge.

While Options 1-3 are preferred from a cultural heritage perspective, retention of the existing bridge or rehabilitation of only partial parts of the bridge does not address the technical and safety requirements of the bridge and roadway. As such, the bridge must be replaced and the following measures should be considered:

- Replacement/removal of existing bridge and construction of a new bridge with replication of the appearance of the heritage bridge in the new design, with allowances for the use of modern materials. The character-defining elements should be considered for replication.
- Replacement/removal of existing bridge and construction of a new bridge with historically sympathetic design qualities to the heritage bridge, with allowances for the use of new technologies and materials.
- In addition to the above, development of a commemorative strategy, such as plaquing, may be appropriate.
- A documentation report should be completed by a Cultural Heritage Specialist and filed with the Township of Wainfleet, the local section of the Township of Wainfleet Public Library, the Archives of Ontario, and any other heritage stakeholders that may have an interest in this project.

8.3 ARCHAEOLOGY

During the EA study, the Project Team, in consultation with MHSTCI, attempted to complete a Stage 2 Archaeological Assessment (AA) for select key archaeological potential areas throughout the study area so that these can be considered through the evaluation process. However, due to difficulties contacting private property owners and obtaining Permission to Enter (PTE), the Region has opted to complete the Stage 2 AA during detailed design following property acquisition. Therefore, Stage 2 AA is required in all areas documented in the Stage 1 Archaeological Assessment report (**Appendix F**) that are impacted by construction. Depending on the findings of the Stage 2 AA, further Stage 3 and 4 AA may be required on any impacted lands and should be completed prior to any ground disturbing activities.

Stage 3 Cemetery Investigations are required for any works within 10m of the cemetery and Further Stage 2 and/or 3 assessment is required for the AfGu-62 site.

Should any buried archaeological remains be found during construction activities, the MHSTCI and any other relevant agencies will be immediately notified.

8.4 SOURCE WATER PROTECTION

As the recommended design does not significantly alter the existing use of the road, there is not expected to be a significant change in impact to source water.

8.5 EROSION AND SEDIMENT CONTROL

Appropriate ESC will be necessary during construction around all drainage features and wetlands to avoid introducing sediment or other construction-related deleterious substances into the water. These should have a primary focus on erosion control (i.e., cover on exposed slopes, fibre filtration tubes along slope contours adjacent to Welland River, Oswego Creek and unnamed tributaries) and a secondary focus on sediment control (i.e., silt fence, etc.). A complete isolation of any in-water work areas from the open or flowing watercourse will be necessary to avoid introducing sediment or other construction-related deleterious substances into the watercourse.

- Include site-specific ESC measures in the design and construction drawings in detailed design. Incorporate appropriate energy attenuation measures where scouring can occur in detailed design.
- ESC measures should be implemented prior to the start of construction or ground disturbance and should be monitored and maintained throughout construction.
- Stockpiled materials will be stored at least 30m away from the water. Sediment control measures, such as silt fence, should be installed around the base of the stockpile.
- Soils exposed via vegetation removal, grading, excavation, and similar activities are at an increased risk of erosion, which could result in sediment loading in watercourses due to contaminated runoff. Seeding of exposed soils should be completed as soon as possible following the completion of grading activities.

- Temporary seeding of fast-growing cover crops or other erosion control measures should be implemented on areas where construction will be suspended for extended periods of time or where final grade cannot be achieved until other construction is completed in order to stabilize the soil.
- New vegetated side slopes particularly upstream and downstream of the new bridge structure at Oswego Creek will have direct connectivity to the surrounding marshlands. As such, exposed soils due to grading operations shall be seeded with a non-invasive lowland mix.
- Erosion control products with plastic netting or mesh should be avoided, as these can lead to the entanglement and subsequent mortality of wildlife.
- A thorough Erosion and Sediment Control (ESC) Plan will be utilized to prevent deleterious substances from entering the nearby waterbodies. The ESC Plan will outline the schedule of major land disturbing activities, identify local drainage factors, analyze soil information, identify topographic features (including environmentally sensitive areas), describe ESC measures to be used during construction (types, location, dimensions, and design considerations) and the schedule of general maintenance and inspection of ESC activities.
- In the event of a sediment spill, the Contractor should take reasonable action to stop the spread of the spilled materials. Spills will be reported according to the Spill Prevention and Management Plan to be developed by the Contractor.

8.6 TRAFFIC AND ACCESS

Through the traffic study, the traffic operations impacts of the proposed intersections were reviewed. The closure of Creek Road in a cul-de-sac at the intersection with River Road was reviewed and determined that the redistribution of traffic will not adversely impact the operations of the Creek Road / Wellandport Road and Wellandport Road / River Road intersections. Under both 2026 and 2036 scenarios, both intersections are forecast to operate well during both peak hours with no critical movements.

The intersection of Creek Road and Wellandport Road were also reviewed to determine whether an all-way stop should be considered. It was determined that an all-way stop control is not warranted under existing and future conditions. The implementation of an all-way stop under these conditions could cause increased delay for traffic along the major road. It is recommended, however, that the intersection be further monitored in the future to determine if an all-way stop control may be needed.

Temporary construction impacts will have impacts to local traffic. A construction staging plan will be developed in detailed design to minimize impacts to traffic and to maintain open lanes where possible. To maintain access throughout the corridor, Oswego Creek and Creek Road Bridge construction cannot occur at the same time.

During construction, impacts to driveways will be temporarily affected when driveways need to be tied into the new roadway. Efforts will be made to maintain driveway access and to reduce the length of time access will be impacted, though impacts are anticipated to be short-term.

8.7 NOISE

As there is no anticipated increase in traffic / no additional lanes, there is not expected to be a significant long-term noise impact. However, temporary noise impacts from construction, though largely unavoidable, can be minimized. Provisions to minimize construction noise impacts should be included into future contract documents and include:

- Limit noisy construction activities to daytime hours to the extent possible.
- All local noise control by-laws must be obeyed. Exemptions, where required, will be obtained from the local municipality.
- All equipment should be properly maintained to limit noise emissions. As such, all construction equipment should be operated with effective muffling devices that are in good working order.
- Contractors will respond to noise complaints from the public by verifying that the general noise control measures agreed to are in effect. Noise concerns will be investigated to ensure compliance.

8.8 AIR QUALITY

As there is no anticipated increase in traffic / no additional lanes, there is not expected to be a significant long-term air quality impact. However, during construction, air quality can be degraded due to dust and/or emissions from construction activities and equipment. The following measures are recommended to mitigate the potential effects of construction on air quality:

- Dust/debris control measures will be used to control roadway dust. Measures to be included can include, but are not limited to:
 - Application of water or non-chloride-based compounds
 - Soil and other material storage piles to be stabilized/covered to prevent wind erosion
 - Fine particulate materials to be covered during transportation to and from site
- Contractor should use new or well-maintained equipment and machinery, preferably fitted with fully functional emission control systems, mufflers, exhaust systems, and engine covers.
- Minimize unnecessary idling of equipment and limiting the speed of vehicular travel.
- Regular cleaning of the construction sites and access roads to remove construction-caused debris and dust.

9.0 Summary of Detailed Design and Construction Commitments

Prior to Phase 5: Implementation of the Municipal Class EA, the preliminary design developed as part of this study must be further refined through detailed design. The detailed design phase is meant to further refine the preliminary design and generally includes confirmation of the road profile, determination of utility relocation, development of the construction staging and traffic management plans, and continued work to purchase the property needed for the undertaking. The following is a summary of commitments and further work required during detailed design:

Technical and Design

- Refine preliminary design to the 30%, 60%, 90% and 100% detailed design levels
- Incorporate erosion and sediment control measures onto drawings
- Confirm pavement recommendations
- Confirm traffic management strategy and construction staging plan

Natural Environment

- Complete a Tree Inventory and determine tree impacts and compensation requirements
- Review the updated NPCA study on the Welland River Watershed
- Initiate permitting discussions with relevant approval agencies:
 - MECP
 - DFO
 - NPCA
- Complete Bat Habitat Assessment/Acoustic Survey, in discussion with MECP
- Complete a Fisheries Detailed Impact Assessment for the Oswego Creek and Creek Road Bridges and prepare a DFO Request for Review package

Cultural Environment

- Cultural Heritage Documentation report of Oswego Creek Bridge by a Cultural Heritage Specialist and filed with the Township of Wainfleet, the local history section of the Township of Wainfleet Public Library, the Archives of Ontario, and any other heritage stakeholders that may have an interest in this project
- Complete Stage 2 AA for areas identified in the Stage 1 AA that are impacted by construction, with potential for Stage 3 and 4 AA
- Complete Stage 3 Cemetery Investigation for works within 10m of the cemetery
- Complete Stage 2 and/or 3 AA investigations for AfGu-62 site
- Baseline vibration monitoring for the cultural heritage resources with potential for indirect vibration impacts from construction

10.0 Permits and Approvals

The following permits and approvals in **Table 30** have been identified as required or potentially required for implementation of this project.

Table 30. Permits and Approvals

Regulatory Agency	Legislation	Permit/Approval	Comments
Federal			
Transport Canada	<i>Canadian Navigable Waters Act</i>	Major Works - Bridge	Oswego Creek and Creek Road Bridges are navigable waterways that supports recreational watercrafts. Construction may have an impact on the bridge opening and thus navigability.
Department of Fisheries and Oceans (DFO)	<i>Fisheries Act</i>	Request for Review, Fisheries Act Authorization	A DFO Request for Review is likely required for in-water works at Oswego Creek Bridge and Creek Road Bridge. This will be confirmed with a Fisheries Impact Assessment
Environment and Climate Change Canada (ECCC)	<i>Species at Risk Act</i>	SARA-compliant Project Authorization (in conjunction with Permit from DFO)	If the Project is determined likely to cause death of SAR and/or a HADD of SAR fish habitat, this permit will be required in conjunction with the DFO permit.
Provincial			
Ministry of Environment, Conservation and Parks (MECP)	<i>Environmental Assessment Act</i>	Schedule 'C' Class EA (Municipal Engineer's Association Class EA)	Satisfactory completion of EA requirements is a prerequisite for obtaining most other approvals
	<i>Endangered Species Act</i>	Information Gathering Form (IGF), Letter of Advice, 17(2)(c) permit, Overall Benefit Permit	For impacts to potential SAR, including bat SAR and the endangered Lilliput mussel, an IGF should be completed and submitted to MECP to determine what further steps and permits are required.

Regulatory Agency	Legislation	Permit/Approval	Comments
	<i>Endangered Species Act</i> , O. Reg. 242/08	Notice of Activity Registration	If inactive Barn Swallow nests are to be removed. May require the installation of kiosks and monitoring.
	<i>Ontario Water Resources Act</i>	Permit to Take Water (PTTW) / Environmental Activity and Sector Registry (EASR)	PTTW required if >400,000 L/d of surface or groundwater taken, an EASR will be registered as a prescribed activity if the amount of water exceeds 50,000 L/d and is <400,000 L/d.
Ministry of Northern Development, Mines, Natural Resources and Forestry (NDMNRF)		License to Collect Fish	Required during construction where there is mussel salvage of fish relocation from isolated work zones.
Local and Regional			
Niagara Peninsula Conservation Authority	<i>Conservation Authorities Act</i> , O. Reg. 155/06	Development and Interference with Wetlands and Alterations to Shorelines and Watercourses	A permit may be required for works within the NPCA regulated area associated with the two bridges, PSWs, and woodland areas associated with the Conservation Area.
Regional Municipality of Niagara	Regional Tree and Forest Conservation By-Law 30-2008	Tree Removal	
Township of Wainfleet	Noise Control By-law No. 042-2018	Exemption	Required to allow construction works outside of permitted days/hours.