COUNTY OF WELLINGTON

WELLINGTON ROAD 7, BOSWORTH BRIDGE NO. B007028

PROJECT FILE

January 01, 2022

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This limitations statement is considered an integral part of this report.

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1 INTRODUCTION

1.1 BACKGROUND

The Bosworth Bridge (No. B007028) is located 0.9 km east of Wellington Road 11 in the Township of Mapleton on Wellington Road 7. The structure crosses over the Conestogo River and for the purposes of this study is considered to have an east-west orientation. A Key Plan showing the Study Area is provided in **Appendix A.**

Constructed in 1949, the Bosworth Bridge is a two-lane, single span Warren Camelback steel pony truss structure.

A 2019 detailed bridge inspection determined that the bridge requires major rehabilitation or replacement.

The County of Wellington is carrying out this Class Environmental Assessment Study to address the existing structural deficiencies.

1.2 THE ENVIRONMENTAL ASSESSMENT ACT

Under the provisions of the Environmental Assessment (EA) Act and Ontario Regulation 334, certain types of provincial and municipal undertakings can meet the requirements of the EA Act through the use of an approved environmental planning process referred to as a Class EA.

"Undertaking" is defined in the EA Act as "…an enterprise or activity or a proposal, plan or program in respect of an enterprise or activity by or on behalf of Her Majesty the Queen in right of Ontario, by a public body…"

The Class EA process provides a self-assessing procedure by which a group or "class" of undertakings can be planned and implemented in a way that fulfills the requirements of the EA Act without proponents having to prepare an individual environmental assessment for approval. In other words, these undertakings do not require formal submission to the Ministry of the Environment for approval. Upon completion of the appropriate process, the undertaking is considered approved.

The *Municipal Class Environmental Assessment* document, dated October 2000, as amended in 2007, 2011, and 2015 outlines such a process.

The *Class EA* recognizes that certain undertakings require greater or lesser degrees of assessment, depending on the nature of the work, the estimated cost and the potential impacts on the environment (this refers to all aspects of the environment including natural, social, economic, cultural, and technical). Four categories or "Schedules" of undertakings are defined in the *Class EA*:

- **Schedule A:** Includes normal or emergency operational and maintenance activities. Environmental effects of these activities are usually minimal. These

undertakings are considered approved without the need for any further assessment.

- **Schedule A+:** Introduced in 2007, these projects are also pre-approved. The public is to be advised prior to the implementation of the project.
- **Schedule B:** When the potential for adverse environmental effects exists. This includes improvements and minor expansions of existing facilities. The proponent is required to proceed through a screening process including consultation with those who may be affected by the project.
- **Schedule C:** Includes the construction of new facilities and major expansions to existing facilities. These undertakings have the potential for greater adverse environmental effects and must follow the planning and consultation process outlined in the Class EA.

This project, as outlined in the Municipal Class Environmental Assessment document, has been identified as a Schedule B undertaking since it entails the following,

"Reconstruction or alteration of a structure or the grading adjacent to it when the structure is over 40 years old, where the proposed work will alter the basic structural system, overall configuration or appearance of the structure."

For Municipal road projects, categorized as Schedule B projects, the proponent must complete Phases 1 and 2 as shown on the Planning and Design Process flow chart (see **Appendix B**). The steps of each of these two Phases are identified below.

Phase 1:
- Identify the problem
- Discretionary public consultation to review problem

Phase 2:
- Identify alternative solutions to the problem
- Identify impact of alternatives on the environment
- Evaluate alternative solutions, identifying a recommended solution
- Consult with review agencies and public
- Select preferred solution to problem
- Review and confirm selection of schedule type

Throughout the study, the proponent is to contact relevant agencies and affected members of the public to identify and attempt to resolve concerns and issues regarding the project before final decisions are made.

For further information on the Municipal Class EA process, readers are referred to the October 2000, as amended in 2007, 2011, and 2015, Municipal Class EA document. For further information regarding this Class EA Study, please contact:

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1.3 THE PROJECT FILE

The Municipal Class EA document stresses the importance of documenting the planning and design process followed in developing a Schedule B project. This allows for traceability. At the end of Phase 2, the formal planning for the project is considered complete. Thereafter, the process of Phase 1 and 2 is finalized and a Notice of Completion is issued to the Ministry of the Environment, Conservation and Parks (MECP).

Documentation in the form of a Project File is necessary to record the planning process followed throughout Phases 1 and 2. This file is then made available for public review over a 30-day period following issue of the Notice of Completion.

This report has been prepared to serve as the 'Project File' and documents the steps taken in Phases 1 and 2 of the Municipal Class EA process.

1.4 PART II ORDER

It is recommended that all stakeholders work together to determine the preferred means of addressing the problem. If concerns regarding a project cannot be resolved in discussions with the proponent (for this study, the proponent is the County of Wellington), the Municipal Class EA process does include an appeal mechanism. Under the Municipal Class EA, members of the public, interest groups, agencies, and other stakeholders may submit a written request to the Minister of the Environment, Conservation and Parks to require the proponent (the County of Wellington) to comply with Part II of the Environmental Assessment Act before proceeding with the proposed undertaking. This is known as a 'Part II Order'.

The Part II Order triggers 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.

The request should be sent in writing or by email to:

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

and

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

The request for a Part II Order must also be copied to the proponent at the same time it is submitted to the Minister. Written requests for a Part II Order must be submitted to the Minister within the 30-calendar day review period after the proponent has issued the Notice of Completion. Requests after the 30-calendar day review period will not be considered.

The decision on whether a Part II Order (bump-up) is appropriate or necessary rests with the Minister of the Environment, Conservation and Parks. If no Part II Order requests are outstanding by the end of the 30 calendar-day review period, the project is considered to have met the requirements of the Class EA, and the County may proceed to subsequent phases of design and construction subject to meeting any commitments documented in this Project File Report and obtaining the necessary environmental approvals.

For further information regarding Part II Order requests, including specific submission requirements, please refer to:

https://www.ontario.ca/page/class-environmental-assessments-part-ii-order

1.5 PROJECT TEAM

This Class Environmental Assessment Study was managed by WSP Canada Inc., consulting engineers to the County of Wellington. Guidance was obtained from the County of Wellington Engineering Department. A team of consultant specialists and their associated roles included:

WSP Canada Inc.	• Project Management • EA Process • Hydraulic Analysis • Structural Analysis • Natural Environment • Archaeology • Built Heritage Assessment

2 PROBLEM STATEMENT

Phase 1 of the Class EA process involves the defining of the specific problem related to the Municipal Road project, in this case, Bosworth Bridge. Upon assessment of the existing Bosworth Bridge and an overview of the area features, the problem being addressed is described as follows:

- The bridge is in an advanced state of deterioration
- The bridge has deficient barrier protection
- The bridge has narrow shoulders and has substandard roadway width

In general, there are major elements of the Bosworth Bridge that are in an advanced state of deterioration and are approaching the end of their useful service life. These components are in need of maintenance, rehabilitation and/or replacement. In addition, there are several functional/operational deficiencies including substandard roadway width and sub-standard barrier protection and guide rail protection.

The cost of maintaining the current bridge under a rehabilitation approach may meet or exceed the cost of replacement options. The County of Wellington has therefore initiated this Schedule B Class EA Study to define the most appropriate bridge management strategy to carry forward.

3 EXISTING CONDITIONS

3.1 LAND USE

Existing land use along Wellington Road 7 is comprised of prime agricultural with a mix of rural residences and a farming operation with frontage and/or access on Wellington Road 7. Lands buffering the Conestogo River are classified as Core Greenlands and Greenlands, per schedule A4 of the Wellington County Official Plan.

3.2 WELLINGTON ROAD 7

Wellington Road 7 is a two lane rural arterial road on a sag curve vertical alignment with a straight horizontal alignment. The existing lanes are each 3.5 m wide and the shoulders vary from 1.5 m to 2.9 m. The speed limit is 80 km/h. In 2012, a Traffic Improvement Study for Wellington Road 7 was completed between Wellington Road 18 and Wellington Road 109. This study recommended further investigation be completed for providing northbound passing lanes north of Sideroad 11 and north of Wellington Road 12. Given that passing lanes length of 1.5 – 2.0 km were recommended (outside of the limits of the Bosworth Bridge), the proposed alternatives in this study have not considered additional widening for future passing lanes.

3.3 BRIDGE STRUCTURE

The Bosworth Bridge is a two-lane, single span Warren Camelback steel pony truss structure. The structure consists of cast-in-place, reinforced concrete abutments, wingwalls and deck with an asphalt wearing surface and concrete railings at the bridge approach. The traffic barriers consist of three (3) structural steel tees (WT) that are connected directly to the vertical and diagonal members of the truss. The bridge spans approximately 42 m with a 4.2-degree skew, and has a 7.5 m curb to curb width and an overall structure of about 8.6 m. Embankments on either end of the bridge consist of soil and overgrown, low lying vegetation.

The bridge was evaluated in 2008 by McCormick Rankin Corporation (MRC) at which time a load posting of 22t, 31t and 38t was determined to be required. Subsequent bracing of four deficient diagonals were added to improve the bridge capacity for unrestricted traffic. The bridge is not currently load restricted.

The bridge was rehabilitated in 1987 (34 years ago), 2008 (13 years ago) and 2013 (8 years ago) which included:

- Replacement of the north and south expansion joints (1987);
- Coat structural steel (1987);
- Reface abutments (1987);
- Concrete overlay, waterproof and paving of deck (1987);

- Install braces at compression diagonals to improve load capacity (2008);
- Installation of shim plates underneath rocker bearing to level the deck with ballast wall (2013);

Rehabilitation drawings from 1985 (Contract 87-61), 2008 & 2013 are available and were reviewed as part of this investigation.

A detailed "close-up" visual inspection of the Bosworth truss bridge was completed by WSP on October 21st and 23rd, 2019 in accordance with the Ontario Structure Inspection Manual (OSIM) published in May 2018. In general, the majority of current steel coating has failed and there is generally medium corrosion (approximately 5% section loss) on the structural steel truss members with some areas of severe corrosion (up to 10% section loss) and perforations through batten plates and lacing bars. There is medium corrosion (5% section loss) along floor beams and stringers except some areas with severe corrosion (10% section loss) and perforations through the web plate. The key observations from the inspection are summarized below:

- measurements were recorded using calipers, ultrasonic thickness gauge and tape measure in order to estimate section loss in the members. No section loss more than 10% was observed.
- medium corrosion over the entire surface of the structural steel in floor beams and stringers
- medium corrosion over the entire surface of the structural steel in north and south truss with localized poor areas
- medium surface corrosions on the lattice bars and batten plates of the diagonals
- hole through bearing web
- deck drains are generally in fair condition with medium corrosion throughout
- deck soffit is generally in fair condition with some areas in poor condition with spalled and delaminated concrete
- deck surface is generally in fair condition with light to medium scaling over the entire deck surface and medium width cracks;
- abutments are generally in fair condition with medium wet cracks and efflorescence
- spall in southeast curb noted;
- no distorted members were noted;
- no loose rivets were noted. All rivets appeared to be in good condition;
- the expansion joint seals are deteriorated, depressed, torn and there is light corrosion in steel armouring at the expansion joints
- cracks, spalls and scaling in wingwalls

- significant rotation was noted at the north bearing with steel rust perforations

The bridge inspection also identified the following functional deficiencies:

1. Substandard roadway width
2. Deficient traffic barriers

The bridge deck roadway width measures 7480 mm (curb face to curb face) and is considered to be substandard by today's design parameters as it is less than 8500mm (recommended minimum width) for two-way traffic.

The traffic barriers consist of three (3) structural steel tees (WT) that are connected directly to the vertical and diagonal members of the truss. These barriers are deficient by current standards with respect to both strength and geometry. In addition, the fact that the WT sections are mounted to the truss members and the close proximity of the truss members to traffic, means that the trusses, which are the main load-carrying members of the bridge, are susceptible to vehicular damage. This is of particular concern because the bridge is a single load path structure. This means that damage or failure of one truss member may result in complete collapse of the entire structure.

Additional information regarding the existing bridge (photographs and OSIM inspection report) can be found in **Appendix C**.

3.4 NATURAL ENVIRONMENT

3.4.1 APPROACH

The study approach to document the existing conditions encompassed the collection and review of background information and completion of ecological field surveys. The background information reviewed included relevant natural environmental databases and documents (e.g., Natural Heritage Information Centre [NHIC] website, Land Information Ontario [LIO], eBird website, iNaturalist website, Ontario Reptile and Amphibian Atlas website, topographic mapping, aerial photography and existing studies), as well as direct agency contact (Ministry of the Environment, Conservation and Parks [MECP], Ministry of Natural Resources and Forestry [MNRF] – Guelph District and the Grand River Conservation Authority [GRCA]). DFO Species at Risk (SAR) mapping was also reviewed. A County of Wellington Regional SAR list (**Appendix J**), documenting 50 SAR with the potential to occur in the County, was also reviewed with respect to potential habitat availability in the vicinity of the crossing site for each species.

Descriptions of terrestrial and aquatic features are based on secondary source information compiled from previous studies and agencies, augmented with site specific field information collected in 2014, 2016 and 2020.

With regard to SAR, the footprint of the proposed works is confined to the crossing area of the watercourse at this site (bridge replacement), therefore the survey was focused on SAR plants and animals that could occur within the riparian habitat and general vicinity of the bridge site, and for SAR animals that can utilize these types of structures, such as

Barn Swallow (which will nest in culverts and often under bridges) and reptiles (which can shelter in cracks and fissures).

The following environmental surveys / assessments were conducted on the following dates:

- April 15, 2016 (Snake Emergence and Turtle Basking surveys)
- May 31 and June 28, 2016 (Breeding Bird surveys / SAR and General Wildlife surveys)
- May 31, 2016 (Aquatic Habitat Survey)
- October 7, 2016 (Terrestrial Habitat and Vegetation survey)
- April 6, 2020 (Snake Emergence and Turtle Basking surveys / SAR and General Wildlife surveys)
- June 4 and June 22, 2020 (Avian Nest Inspections of bridge / SAR and General Wildlife surveys)
- July 20, 2020 (Terrestrial Habitat and Vegetation survey)
- August 13, 2020 (Aquatic Habitat Survey)

Photographs of the bridge site and the immediate upstream and downstream aquatic and terrestrial habitat conditions were also taken and are presented in **Appendix J.**

3.4.2 DESIGNATED NATURAL AREAS

The Drayton Earth Science Area of Natural and Scientific Interest (ANSI) is located approximately 1.8 km south of the Bosworth Bridge. The background review also identified the presence of a Deer Wintering Area in the forested habitat approximately 150 m downstream (south) of the bridge (LIO, 2020). This area is designated Significant Wildlife Habitat (SWH).

The natural heritage features surrounding the Bosworth Bridge have been identified as Core Greenlands in the County of Wellington Official Plan (2019). As noted in the Official Plan, Core Greenlands are areas that “have greater sensitivity or significance. These areas will be identified in policy and protected”. The designated natural areas and features can be seen on Figure J-1 (**Appendix J).**

3.4.3 AQUATIC HABITAT AND FISHERIES

The Conestogo River is a moderate sized warmwater river that flows south at the Wellington County Road 7 (WR7) crossing where it is conveyed through the Bosworth Bridge. The river originates approximately 24 km upstream (north) and flows into the Conestogo Lake (an artificially created reservoir at the Conestogo Dam) approximately 8.1 km downstream of the crossing. The river continues below the dam and eventually drains to the Grand River just north of Waterloo, Ontario. The road embankments at the bridge are relatively steep, approximately 3.5 m to 4 m high and are colonized by old field dominant vegetation. The road embankments extend between 8.3 and 9.2 m out from shoulder of road.

Parker Creek (a small warmwater tributary), outlets to the Conestogo River in the southeast quadrant (SE) at the base of the road embankment and approximately 9.1 m

south (downstream) of the bridge abutment. Parker Creek flows from the north and crosses to the south side of WR7 approximately 140 m east of the bridge. A section of the creek flows west and parallel to the south road embankment for approximately 50 m reach before it outlets to the Conestogo River (see Figure J-1, **Appendix J).** This tributary has an average bankfull width of 3.75 m (0.4 depth) in the 50 m reach noted above and bank heights average 1m. At the time of the August 2020 survey, backwater flow from the Conestogo River appeared to extend approximately 9 m upstream into the tributary outlet area and as the gradient of the tributary increased further upstream, only a small amount of the flow (approximately 0.5 m wetted width down to a trickle in some areas) was observed. The morphology of Parker Creek in the 50 m reach consists of a slow moving 'flat' in the outlet area (flow depth approximately 0.35 m) and series of small riffles and flats further upstream. Substrates range from a mix of silt, sand and gravel in the outlet area to coarse dominant substrate (gravel 80%, rubble 10% and sand 10%) further upstream.

For the Conestogo River, the existing bridge is a single span (42 m) concrete structure. The river channel is fairly uniform in the vicinity of the bridge and the bankfull channel width averages approximately 30 m (0.5 m depth) within the ROW and further up and downstream. The east abutment is found approximately 9.3 m back from or outside of the bankfull channel. The west abutment is found partially within the bankfull channel. The flow of the river extends directly to and along the full length of the west abutment and the south corner extends out into the channel approximately 0.9 m. The wetted width of the channel at the time of the August 2020 survey was approximately 29 m. The riverbanks within the ROW and further up and downstream range in height from 0.7 m to 1.1 m and are fairly steep. Floodplain (Reed-canary Grass Garminoid Mineral Meadow Marsh) extends further back in the NE and SW quadrants. There is little erosion.

At the time of the August 2020 aquatic habitat survey, flow velocity was low and the water was fairly turbid. Morphology is flat dominant within the ROW and further up and downstream. Flow depth in the vicinity of the bridge ranged from 0.5 to 1.3 m at the time of the survey. Substrates below and downstream of the bridge consisted of 30% rubble, 20% gravel, 20% sand, 20 silt and 10% boulders. Substrates upstream of the bridge along the east side consisted of 50% sand, 40% silt and 10% gravel and a mix of rubble, gravel, sand and silt was found along the west side. Instream cover includes rubble, some boulders and overhanging grasses (mainly Reed Canary Grass) on the banks and a few small clumps found instream along with some rush sp. and iris sp. Riparian vegetation in the vicinity of the bridge ROW generally consists of Reed-canary Grass Garminoid Mineral Meadow Marsh (MAM2-2) in the NE and SW quadrants and Dry – Moist Old Field Meadow (CUM1-1) and mixed forest further back as further detailed in the next section.

Conestogo River is classified as a warmwater watercourse (MNRF LIO 2021). GRCA provided fish data (see Appendix F) and indicated that the Conestogo River and Parker Creek fish community consists of sportfish (*Northern Pike Esox lucius*) and a variety of warm and coolwater bait/forage fish species including Bluntnose Minnow (*Pimephales notatus*), Brook Stickleback (*Culaea inconstans*), Central Mudminnow (*Umbra limi*), Common Shiner (*Luxilus cornutus*), Creek Chub (*Semotilus atromaculatus*), Fathead

Minnow (*Pimephales promelas*), Northern Redbelly Dace (*Chrosomus eos*) and White Sucker (*Catostomus commersonii*). GRCA also noted that confirmed Northern Pike spawning habitat is found in the area, likely Parker Creek, given the minimal amount of emergent vegetation found in the main Conestogo River. MNRF confirmed that Northern Pike spawning habitat is found throughout Parker Creek (see **Appendix F**).

3.4.4 TERRESTRIAL HABITAT / VEGETATION

A total of 120 vascular plant species were recorded at this site during the October 2016 and July 2020 field surveys (see Table J-1, **Appendix J**). Most of the species observed at the site are common roadside, woodland and wetland plants, present in similar habitats throughout the landscape. Sixty-three (63%) percent of the species identified are native to Ontario. One species of conservation concern, Black Ash (*Fraxinus nigra*), was observed within the study area (see Figure J-2, **Appendix J**) and although it is not currently protected under the ESA or SARA, it has been assessed as Threatened by COSEWIC.

Six vegetation communities were identified in the study area, including two wetland community types. All communities are common in Ontario. ELC communities are shown on Figure J-2, **Appendix J.**

RIGHT-OF-WAY (ROW) ECOLOGICAL LAND CLASSIFICATION (ELC) COMMUNITIES

The ROW ELC communities found on the north side of the bridge and road are classified as Dry-Moist Old Field Meadow (Units 1A-1B: CUM1-1) and Reed-canary Grass Mineral Meadow Marsh (Unit 3: MAM2-2). The Dry-Moist Old Field Meadow is found east and west of the watercourse and is dominated by common old field species, such as Awnless Brome (*Bromus inermis ssp. inermis*), Kentucky Bluegrass (*Poa pratensis ssp. pratensis*), Red Fescue (*Festuca rubra*), Common Tansy (*Tanacetum vulgare*), Redtop (*Agrostis gigantea*), Eastern Panicled Aster (*Symphyotrichum lanceolatum ssp. lanceolatum*), Bird's-foot Trefoil *(Lotus corniculatus*) and Cow-vetch (*Vicia cracca*). Ditches and low-lying areas were dominated by Reed-canary Grass (*Phalaris arundinacea var. arundinacea*). The Reed-canary Grass Mineral Meadow Marsh is found on the east side of the watercourse and is dominated by Reed-canary Grass, with Elecampane (*Inula helenium*), Spotted Joe Pye Weed (*Eutrochium maculatum var. maculatum*), Angled False Bindweed (*Calystegia sepium ssp. angulatum*) and Sneezeweed Yarrow (*Achillea ptarmica*).

The ROW on the south side of the road is classified as Dry-Moist Old Field Meadow (Units 1C-1D: CUM1-1) and is dominated by common old field species, such as Awnless Brome, Kentucky Bluegrass, Red Fescue, Common Tansy, Redtop, Eastern Panicled Aster, Bird's-foot Trefoil and Cow-vetch. Ditches and low-lying areas were dominated by Reed-canary Grass. A small area of a Reed-canary Grass Mineral Meadow Marsh (Unit 7: MAM2-2, description below) also extends up into the ROW.

ELC COMMUNITIES NORTH OF ROW

On the north side of the ROW, the channel flows bedside Dry-Moist Old Field Meadow (Unit 1A: CUM1-1, discussed above), Reed-canary Grass Mineral Meadow Marsh (Unit 3: MAM2-2, discussed above) and a Fresh – Moist White Cedar – Hardwood Mixed Forest (Unit 2: FOM7-2). Some of the conifers appear to have been planted in the Fresh – Moist White Cedar – Hardwood Mixed Forest (Unit 2: FOM7-2); however, all layers of vegetation are undergoing natural regeneration. The canopy becomes more open towards the watercourse (approximately 50-60% canopy cover). The canopy is composed of Eastern White Cedar (*Thuja occidentalis*), Black Cherry (*Prunus serotina*), Green Ash (*Fraxinus pennsylvanica*) and Norway Spruce (Pic*ea abies*). The sub-canopy is dominated by Eastern White Cedar, Manitoba Maple (*Acer negundo*), Green Ash and Staghorn Sumac (*Rhus typhina*). The understory is dominated by Red-osier Dogwood (*Cornus sericea*), North American Red Raspberry (*Rubus idaeus* ssp. *strigosus*), Common Burdock (*Arctium minus*) and Virginia Creeper (*Parthenocissus quinquefolia*). The ground layer is dominated by Spotted Jewelweed (*Impatiens capensis),* Herb-Robert (*Geranium robertianum*), European Red Currant (*Ribes rubrum*) and Eastern Panicled Aster (*Symphyotrichum lanceolatum* ssp. *lanceolatum*).

Further east of the watercourse and the Reed-canary Grass Mineral Meadow Marsh there is a small, fragmented Dry – Fresh White Cedar – Poplar Mixed Forest (Units 4A-4B: FOM4-2). The canopy is dominated by Eastern White Cedar and Trembling Aspen (*Populus tremuloides*). The sub-canopy is dominated by Eastern White Cedar, Trembling Aspen and Pussy Willow (*Salix discolor*). The understory is dominated by Awnless Brome, Eastern Tall Goldenrod (*Solidago altissima* var. *altissima*), Virginia Creeper and Red-osier Dogwood. The ground layer is dominated by North American Red Raspberry, Herb-Robert, Common Milkweed (*Asclepias syriaca*) and Virginia Creeper.

ELC COMMUNITIES SOUTH OF ROW

On the south side of the ROW, the channel flows beside Dry-Moist Old Field Meadow (Unit 1C-1D: CUM1-1, discussed above), a Fresh – Moist White Cedar Coniferous Forest (Unit 5: FOC4-1) and a Reed-canary Grass Mineral Meadow Marsh (Unit 7: MAM2-2). The Fresh – Moist White Cedar Coniferous Forest (Unit 5: FOC4-1) occurs on the east side of the watercourse and the canopy is dominated by Eastern White Cedar, with sparse Balsam Poplar (*Populus balsamea*). The sub-canopy is dominated by Eastern White Cedar with occasional Balsam Poplar and Purple Willow near the watercourse. The understory is dominated by Tall Meadow-rue (*Thalictrum pubescens*), Purple Willow and English Hawthorn (*Crataegus monogyna*). The ground layer is dominated by Eastern Tall Goldenrod, Wild Cucumber (*Echinocystis lobata*) and Spotted Jewelweed.

The Reed-canary Grass Mineral Meadow Marsh (Unit 7: MAM2-2), is located on the west side of the watercourse and is dominated by Reed-canary Grass, with occasional Spotted Joe Pye Weed (*Eutrochium maculatum* var. *maculatum*), Dark-green Bulrush (*Scirpus atrovirens*), Eastern Panicled Aster and Fox Sedge (*Carex vulpinoidea*) associates.

Further west of the Reed-canary Grass Mineral Meadow Marsh (Unit 7: MAM2-2), there is a White Cedar Mineral Mixed Swamp (Unit 6: SWM1-1). The canopy is dominated by Eastern White Cedar, Hybrid Crack Willow (Salix x fragilis), Tamarack (*Larix laricina*) and Black Spruce (*Picea mariana*). The subcanopy is dominated by Eastern White Cedar, Hybrid Crack Willow, Balsam Fir (*Abies balsamea*) and Tamarack. The understory is dominated by Reed-canary Grass, Red-osier Dogwood, Hybrid Crack Willow and Tamarack. The ground layer is dominated by Ostrich Fern (*Matteuccia struthiopteris*), Fox Sedge, Soft Rush (*Juncus effusus* ssp. *solutus*) and Spotted Jewelweed.

3.4.5 WILDLIFE AND SPECIES AT RISK (SAR)

WILDLFE SURVEYS AND HABITAT *ASSESSMENT*

Snake emergence and turtle basking surveys (using binoculars) were carried out at the bridge site and in the vicinity under appropriate weather conditions (warm, clear, sunny) by a qualified biologist during the spring season (April 15, 2016 and April 6, 2020). No snakes or turtles were observed at this site at the time of the surveys. No obvious snake hibernacula entry sites were observed around the existing bridge.

As noted in Section 3.4.1, two breeding bird surveys were completed on May 31 and June 28, 2016. In addition, six general wildlife and SAR surveys were completed in conjunction with other surveys in 2014, 2016 and 2020 (see Table J-4, **Appendix J** for a list of species observed at the site).

The background review identified the presence of SWH for Deer Wintering Area in the forested habitat approximately 150 m south of the bridge. Furthermore, the riparian zone appears to provide a wildlife movement corridor as evidenced by tracks and roadkill beneath/adjacent to the bridge (including American Mink and Raccoon). In addition, the bridge provides confirmed nesting habitat for migratory birds, including American Robin (*Turdus migratorius*), Barn Swallow (*Hirundo rustica*), Cliff Swallow (*Petrochelidon pyrrhonota*) and Eastern Phoebe (*Sayornis phoebe*). Migratory birds are protected under the Migratory Birds Convention Act (MBCA). Barn Swallow is also protected as a SAR under the ESA. The results of the SAR surveys are described in the sections below and a SAR impact assessment is discussed in Section 6.4.1.

RESULTS OF BACKGROUND SAR SEARCH

No records of SAR were provided by GRCA, MECP or MNRF within the vicinity of the bridge site. GRCA also indicated that DFO SAR mapping did not identify the presence of fish or mussel SAR within the Conestoga River in the vicinity of the bridge site (see Agency Correspondence, **Appendix F**). Rainbow Mussel (*Villosa iris*, Special Concern under the ESA and SARA) is identified on DFO SAR mapping (July 2021) as being “found or potentially found” approximately 4.75 km downstream of the bridge site.

Eight NHIC 1 km^2 grids were searched using the Make A Map: Natural Heritage Areas tool. No SAR or Species of Conservation Concern (SCC) records were available for the general area.

Nine SAR species listed under the ESA, were recorded within the general area from the online eBird database, including:

- Bald Eagle (*Haliaeetus leucocephalus*; Special Concern)
- Barn Swallow (*Hirundo rustica*; Threatened)
- Bank Swallow (*Riparia riparia*; Threatened)
- Bobolink (*Dolichonyx oryzivorus*; Threatened)
- Chimney Swift (*Chaetura pelagica*; Threatened)
- Common Nighthawk (*Chordeiles minor*; Special Concern)
- Eastern Meadowlark (*Sturnella magna*; Threatened)
- Eastern Wood-pewee (*Contopus virens*; Special Concern)
- Wood Thrush (*Hylocichla mustelina*; Special Concern)

Two SAR species listed under the ESA, Bald Eagle and Barn Swallow, were also recorded within the general area from the online iNaturalist database. One additional SAR species listed under the ESA was confirmed within the general area via the online Ontario Reptile and Amphibian Atlas: Snapping Turtle (*Chelydra serpentina*; Special Concern).

The potential for these species to occur at the bridge site has been assessed in the context of habitat data collected through background information and field surveys (see Section below).

SAR HABITAT ASSESSMENT AND POTENTIAL

WSP confirmed the presence of four SAR species at the bridge site during the field surveys, including Barn Swallow, Bank Swallow, Eastern Wood-Pewee and Monarch. Habitat at the site was also assessed for the potential to support other species on the County of Wellington Regional SAR list (**Appendix J),** and other SAR for which occurrence was deemed a possibility based on known range. Based on this assessment, there is potential for eight other SAR species to occur in the vicinity of the bridge based on the presence of suitable habitat features. See below for further details regarding confirmed and potential SAR at the bridge site:

- **Bald Eagle** (*Haliaeetus leucocephalus* – Special Concern [SC] under the ESA) -- This species was not observed during the field surveys; however, there are recent records within approximately 1 km of the study site (eBird 2019). No Eagle nests were observed in the vicinity of the bridge; however, the ROW reaches provide suitable foraging habitat.
- **Bank Swallow** (*Riparia riparia* – Threatened [THR] under the ESA) – This species was observed foraging over the river during the field surveys in June 2020 and there are recent records within <5km of the study site (eBird 2020). Suitable breeding

habitat may occur further upstream or downstream of the bridge site, beyond the ROW reaches and bridge replacement works.

- **Barn Swallow** (*Hirundo rustica* – Threatened under the ESA) – Barn Swallow nests were confirmed on the bridge during the field surveys in 2014 (at least 16 old [not active at time of survey] nests), 2016 (at least 4 old nests) and 2020 (at least 12 old nests) and there are recent records within <1km of the study site (eBird 2019).
- **Bobolink** (*Dolichonyx oryzivorus* – Threatened under the ESA) – This species was not observed in the vicinity of the bridge during the field surveys; however, there are records within <5km of the study site (eBird 2020). Suitable habitat occurs in the hayfields within 300 m - 400m of the bridge, beyond the ROW and the proposed bridge replacement works.
- **Chimney Swift** (*Chaetura pelagica* – Threatened under the ESA) – This species was not observed in the vicinity of the bridge during the field surveys; however, there are recent records within <5km of the study site (eBird 2020). There is some limited potential for this species to breed within the Mixed Forest and Swamp communities beyond the ROW and the proposed bridge replacement works; however, preferred breeding habitat for this species is comprised of large uncapped chimneys which may occur in the nearby villages of Bosworth and Drayton. This species is most likely to be observed foraging overhead of the study site.
- **Eastern Meadowlark** (*Sturnella magna* – Threatened under the ESA) – This species was not observed in the vicinity of the bridge during the field surveys; however, there are recent records within <5km of the study site (eBird 2020). Suitable habitat occurs in the hayfields within 300 - 400m of the bridge, beyond the ROW and the proposed bridge replacement works.
- **Eastern Wood Pewee** (*Contopus virens* – Special Concern under ESA) – This species was recorded in the vicinity of the bridge during the June 2016 field surveys and there are recent records within <5km of the study site (eBird 2020). Suitable habitat, including breeding habitat occurs within the Mixed Forest and Swamp communities found beyond the ROW and the proposed bridge replacement works.
- **Little Brown Myotis** (*Myotis lucifugus* – Endangered under ESA) – This species was not observed in the vicinity of the bridge during the field surveys; however, no evening surveys or acoustic monitoring was conducted. The study site occurs within the known range for this species and suitable habitat, including breeding habitat, occurs within the Mixed Forest and Swamp communities found beyond the ROW and proposed bridge replacement works.
- **Monarch** (*Danaus plexippus* – Special Concern under ESA) – This species was observed in the vicinity of the bridge during the field surveys. Suitable breeding habitat (i.e., Milkweed) was observed within the ROW reaches and proposed bridge replacement works.
- **Snapping Turtle** (*Chelydra serpentina* – Special Concern under ESA) – The river provides suitable habitat for this species and there are recent records within 10 km of the study site (ORAA 2019). No turtles or turtle nests were observed in the vicinity of the bridge during any of the surveys; however, there is potential for turtles to nest

along the road shoulders and adjacent open upland areas, or to wander into the construction zone. Furthermore, although no turtles were observed in the ROW reaches of the river during the early spring emergence / basking surveys in 2016 and 2020, the ROW reaches do have suitable hibernation habitat potential.

- **Wood Thrush** (*Hylocichla mustelina* – Special Concern under ESA) – This species was not observed in the vicinity of the bridge during the field surveys; however, there are recent records within <5km of the study site (eBird 2020). Suitable habitat occurs within the Mixed Forest communities beyond the ROW and proposed bridge replacement works.
- **Rainbow Mussel** (*Villosa iris* – Special Concern under ESA and SARA) – This species is highlighted on DFO SAR mapping as "being found (or potentially found)" approximately 4.75 km downstream of the bridge where there is suitable habitat. As noted on https://www.ontario.ca/page/rainbow-mussel the "Rainbow mussel prefers small to medium-sized rivers with a moderate to strong current and sand, rocky, or gravel bottoms. It is found in or near riffle areas and along the edges of vegetation in water less than one metre deep". This type of habitat (e.g., fast flow / riffle areas with abundant instream vegetation) is not found in the vicinity of the bridge where a slow moving 'flat' morphology with minimal instream vegetation dominates. Since there are no records of this species in the vicinity of the bridge and the habitat conditions are not suitable, it is highly unlikely that this species is found in the vicinity of the bridge.

3.5 HYDROLOGIC AND HYDRAULIC ANALYSIS

The Conestogo River watershed has a drainage area of 276 km^2 (27600 ha) at the Wellington Road 7 Bosworth Bridge location. Conestogo River flows from north-east to south-west and ultimately outlets to the Grand River.

There is a stream flow gauge station 02GA039 Conestogo River above Drayton for this watercourse. For this gauge station, Flood Frequency Analysis (FFA) results were obtained from the Grand River Conservation Authority (GRCA).

In addition to the FFA, Ontario Flow Assessment Tools (OFAT) and SWMHYMO hydrologic model were also used for flow assessments and comparison.

As per the Hydrology and Hydraulics Report, the FFA flows are the most conservation flows and used in the hydraulic modelling of the existing and proposed bridges. **Table 3-1** below provides the governing flows for the hydraulic modelling.

Table 3-1 Flows at Bosworth Bridge

STORM	FLOW (M^3/S)
1.25-year	86.0
2-year	133
5-year	204

10-year	256
20-year	306
25-year	326
50-year	381
100-year	438
Hurricane Hazel (12hrs)	741

WSP has received HEC-RAS hydraulic model "*UpperCon2011.prj*" prepared for the Conestogo River. The following modifications were made in the existing model to match with the present conditions:

- Two sections 17.199 and 17.191, upstream and downstream of the bridge, respectively, are updated as per the latest survey information.
- Flows at Sections 18.335 and 17.225 are updated as per the Flood Frequency Analysis results provided by the GRCA.
- Road profile of Wellington Road 7 is updated as per latest survey in formation.
- Existing bridge section is updated as per existing General Arrangement (GA) drawing prepared for 1987 rehabilitation work.

The existing bridge, as per the 1987 rehabilitation work GA drawing, has a single span of 40.97 m from centre to centre of the abutments which provides a clear opening of 39.40 m. The hydraulic assessment is carried out for this clear opening. Based on the survey information, the road low point elevation is 411.28 m amsl. The 2-year through 100-year storm events were analysed in the HEC-RAS model; the 50-year storm event is the design storm for the existing bridge.

The hydraulic analysis results of the existing bridge show that the existing bridge meets the freeboard and soffit clearance requirements. However, the Regional storm overtops Wellington Road 7 by 0.06 m, but meets the relief flow depth.

Please refer to the Hydrology and Report (**Appendix D**) prepared for the Bosworth Bridge for the details related to the existing conditions hydraulic modelling.

3.6 BUILT HERITAGE

A Heritage Impact Assessment (HIA) was completed for the Bosworth Bridge by WSP (see **Appendix E**). The following summarizes the key findings:

- The subject structure is not listed on the Township of Mapleton municipal heritage register or inventory of cultural heritage resources and is not designated under the *Ontario Heritage Act* (OHA). The Bosworth Bridge is not provincially-owned, and therefore, is not identified as a provincial heritage property. It is also not recognized

provincially through an Ontario Heritage Trust easement or commemorative plaque and is not included on the Ministry of Heritage, Sport, Tourism and Culture Industries (MHSTCI) Ontario Heritage Bridge List.

- The Bosworth Bridge is not recognized federally as a heritage resource, i.e., national historic site or federal heritage property.
- In advance of the commencement of the MCEA Study, Unterman McPhail Associates completed a Cultural Heritage Evaluation Report (CHER) for the Bosworth Bridge in December 2015 (see **Appendix E**). Following an evaluation using Ontario Regulation 9/06, which was developed for the purpose of identifying and evaluating the cultural heritage value or interest of a property proposed for protection under Section 29 of the OHA, the CHER determined that the bridge is of cultural heritage value or interest, specifically possessing design or physical, historical or associative. and contextual values. Its cultural heritage attributes include the:
    - Cast-in-place concrete abutments and wingwalls;
    - Steel truss components comprising the Warren Camelback steel pony truss structure;
    - One span design;
    - Original horizontal steel guardrail;
    - Cast-in-place, original concrete handrail on all four corners; and
    - Commemorative plaque.

As a requirement of the MCEA Study and to build upon the CHER, WSP completed a HIA of the Bosworth Bridge to assess the impacts of the structure's proposed replacement and recommend appropriate mitigation measures. The HIA recommended that the construction of a new bridge be designed in a manner that draws from the design inspiration and materials of the extant bridge while maintaining legibility. Design considerations were recommended to explore the incorporation of the scale and rhythm of the members of a Warren pony truss, the placement and design of the concrete railings, and siting at the same location over the Conestogo River. A copy of the HIA was provided to the MHSTCI on July 16, 2021, comments were received on August 16th and an updated report was provided to MHSTCI on August 25, 2021. The response from the MHSTCI is included in **Appendix F**.

3.7 ARCHAEOLOGY

A Stage 1 Archaeological Assessment was completed by WSP for Bosworth Bridge. The archaeological recommendations have been made based on the background historic research, property inspection, and indicators of archaeological potential as outlined in the Ministry of Heritage, Sport, Tourism and Culture Industries' 2011 Standards and Guidelines for Consultant Archaeologists.

Based on the results of the Stage 1 assessment, it was determined that areas within the current undertaking are disturbed and do not hold archaeological potential. However, a Stage 2 is recommended if the project is to impact lands outside of the road allowance and a Marine Archaeological Assessment if there are to be in-water impacts.

3.8 UTILITIES

Utilities as shown in **Figure 3-1** have been identified in the general area of the bridge by Enbridge Gas Inc. and Hydro One Networks Inc.

There are overhead hydro and communication wires located approximately 9 meters north of the existing bridge. These are not anticipated to conflict with a potential bridge rehabilitation or replacement; however, clearance requirements must be provided.

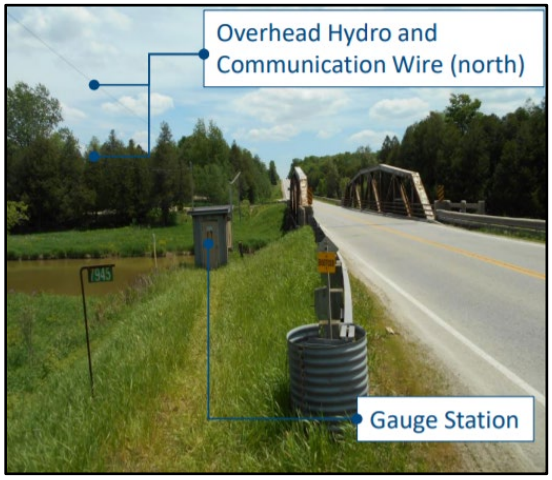

Figure 3-1 Utilities

- A 300 mm diameter gas main located approximately 7 m north of the existing bridge. Impacts are not anticipated.
- It is anticipated that the gauge station located on the northwest embankment of the bridge can be maintained in its current location; however, a temporary protection system may be required.
- An existing communications cable is mounted on the north side of the bridge that may need to be temporarily supported during construction.

4 IDENTIFICATION AND EVALUATION OF ALTERNATIVE SOLUTIONS

Under Phase 2 of the Municipal Class Environmental Assessment process, all feasible and reasonable planning solutions to address the problems are to be considered. To address the poor conditions of the Bosworth Bridge, the following solutions are being considered:

Do Nothing: No improvements would be made to the structure. The structure would continue to be monitored / inspected. Through time, it is expected that load restrictions and eventually, bridge closure would occur as conditions worsen.

Remove Without Replacement: The structure would be removed and the road would be closed. Full and permanent closure of Wellington Road 7 at Conostogo Creek is not a feasible solution and was not evaluated further because of the lack of alternate routes.

Rehabilitate the Existing Bridge: Rehabilitation would include replacement of railings to meet modern standards, local repairs to curbs, soffit and substructure, full replacement of the deck and expansion joints, superstructure repairs, coating of structural steel, repairs to erosion and scour at bridge abutments where necessary.

Bridge Replacement: Replacement involves removal of the existing structure and construction of a new structure, at or close to the existing location. The proposed structure replacement type and construction / traffic staging methods would be verified upon completion of the study during the detailed design.

4.1 ASSESSMENT AND EVALUATION OF ALTERNATIVES

The analysis and evaluation of the alternative solutions was based on a set of evaluation criteria, which is summarized in **Table 4-1**. The evaluation criteria are described as follows:

- ***Roadway Geometrics***, including drainage, grades, horizontal curves
- ***Transportation / Traffic Maintenance***, including existing and future traffic operations, emergency vehicle access, flexibility for staged construction
- ***Structure,*** including advanced state of deterioration, structural deficiencies, functional deficiencies, operational deficiencies, barrier deficiencies, guide rail deficiencies, number of spans/piers, span length(s), depth and width of fill at roadway approaches, embankment widening, and general safety concerns
- ***Hydraulics,*** including hydraulic capacity and performance related to future design storms
- ***Natural Environment***, including direct and/or indirect impacts on watercourses, fisheries, aquatic habitat, terrestrial ecosystems, and shoreline habitat
- ***Socio-Economic Environment***, including direct and/or indirect impacts related to property, utility facilities, site contamination and noise

- ***Cultural Environment***, including impact on archaeology, built heritage and cultural landscape resources
- ***Cost Estimate***, including property and construction costs

The evaluation of the alternative solutions is included in **Table 4-1**.

Based on findings from the analysis and evaluation of Alternatives using the factors listed above, Alternative 3 (Bridge Replacement) has been identified as the preferred alternative solution. Design alternative(s) for the bridge replacement will be developed, reviewed, refined and then carried forward for detail design and construction. Timing of the detail design and construction of the new bridge will be subject to annual council review and funding availability.

Table 4-1 Evaluation of Alternative Planning Solutions

CATEGORY	DO NOTHING	REHABILITATION	REPLACEMENT
Transportation / Traffic Maintenance	- No immediate changes - Long term impacts would arise as travel would become limited due to increasingly restrictive load limits and ultimately, complete closure due to ongoing deteriorating conditions of the bridge	- Some short-term traffic impacts during rehabilitation works (i.e., full road closure with temporary detours for approximately 5 months) - Local and regional traffic may experience delays during rehabilitation works - ongoing future maintenance / rehabilitation with associated traffic disruptions.	- Maintains Bosworth Bridge in its current location in the long-term - Some short-term traffic impacts during construction (i.e., full road closure with temporary detours for approximately 1 year) - Local and regional traffic may experience delays during construction - Wider bridge that meets current standards will result in long term improved safety and operation - New bridge will be more durable and low maintenance design (no steel coating or joints at deck end) which will minimize future maintenance / rehabilitation and associated traffic disruptions.
Rank			

CATEGORY	DO NOTHING	REHABILITATION	REPLACEMENT
Socio-Economic	- No immediate changes to existing conditions; however, as structural conditions decline, significant socio-economic impacts would arise from load restrictions and due to deteriorating conditions of the bridge and likely eventual closure - No impacts to utilities are anticipated - No property impacts	- No impacts outside of existing right-of-way - Temporary alteration of travel/ commuter routes and impact to adjacent/alternative route(s) during construction - Temporary impact to nearby residences, gravel pits and other local commercial, industrial and farm businesses during construction - Noise, dust and other associated inconveniencies during construction - No impacts to utilities are anticipated - No property impacts	- Temporary alteration of travel / commuter routes and impact to adjacent / alternative route(s) during construction - Temporary impact to nearby residences, gravel pits and other local commercial, industrial and farm businesses during construction - Noise, dust and other associated inconveniencies during construction - Minor impacts to utilities are anticipated - No property impacts
Rank			

CATEGORY	DO NOTHING	REHABILITATION	REPLACEMENT
Structural	- Structural conditions would worsen until more drastic measures would have to be taken such as bridge load reduction or closure in order to manage risk to the public - Sub-standard barrier protection and guide rail protection not addressed - Main load bearing components (steel trusses) are exposed to potential traffic impact damage – could result in severe structural damage or even collapse - Remaining lifespan of existing structure is less than 10 years	- Provides short term solution to structural deficiencies; however, does not ultimately address the limited design life and does not address functional deficiencies (e.g. roadway width) - Only defers but does not avoid eventual structure replacement - Deficient traffic barrier upgraded to meet current standards - Main load bearing components (steel trusses) remain exposed to potential traffic impact damage – could result in severe structural damage or even collapse - Lifespan of the rehabilitated structure is less 15-20 years	- Provides a long-term solution to address all structural and functional deficiencies of Bosworth Bridge - Opportunity to consider rapid replacement techniques and other means of minimizing construction duration and associated road closure (e.g., precast components) - New bridge will be more durable and low maintenance design (no steel coating or joints at deck end) - Provides traffic barriers that comply with current standards - - Deficient barrier and guide rail protection is addressed - Lifespan of new structure is 75 years
Rank			

CATEGORY	DO NOTHING	REHABILITATION	REPLACEMENT
Cultural Environment	- No archaeological impacts - No impacts to built heritage resources - No impacts to cultural heritage resources	- Low potential archaeological impacts - Maintains all heritage attributes of the bridge except for the bridge railings which require replacement to meet modern standards.	- Low potential archaeological impacts - Demolition would result in the loss of bridge heritage attributes - Impacts can be mitigated locating the bridge at its original location and adopting a design that draws from the materials and design inspiration of the current bridge while maintaining legibility (i.e. using steel girders instead of concrete) - Mitigation will include documentation and photographic recording prior to removal
Rank			

CATEGORY	DO NOTHING	REHABILITATION	REPLACEMENT
Natural Environment	- No immediate changes to existing conditions	- Potential for indirect impacts (e.g., debris and sediment release with rehabilitation works) can be managed using appropriate mitigation measures (e.g., proper erosion and sediment controls, use of in-water work timing window). - No permanent impacts on the aquatic habitat of the Conestogo River. - Low potential to impact SAR	- Temporary in-stream works and direct impacts associated with removal of existing abutments and installation of new foundation and abutments. Work zone can be isolated from river and the areas will be restored following construction. - Minor direct impacts to common roadside and riparian vegetation Areas to be restored following Construction - Moderate potential to impact SAR - Minor direct impacts and potential indirect impacts can be managed using appropriate mitigation and restoration measures (e.g., proper erosion and sediment controls, use of timing windows for works) - Permits removal of deck drains
Rank			

CATEGORY	DO NOTHING	REHABILITATION	REPLACEMENT
Hydraulics	- No changes to existing conditions	- No changes to existing conditions	- Increased superstructure depth requires profile grade raise to satisfy soffit clearance requirements - Proposed structure meets all required hydraulic criteria
Rank			
Roadway Geometrics	- Substandard roadway width not addressed	- Substandard roadway width not addressed	- Profile grade raise of approximately 500 mm - Improved sight distance due to raised profile, thereby reducing the severity of vertical sag curve - Improves cross section to meet standard requirements.
Rank			
Cost Estimate *Net present value of 50-year life cycle cost	- No initial capital costs - Ongoing costs for monitoring and inspections.	- Initial capital cost of 2.1 million - Net present value of 3.8 million *	- Initial capital cost of 4.1 million - Net present value of 3.8 million *
Rank			

OVERALL ALTERNATIVE RANK			
Recommended Alternative	**Bridge Replacement**		
Legend	Most Preferred    Least Preferred 		

A summary of the evaluation of alternatives solutions are as follows:

Do Nothing: Not a reasonable alternative because significant structural deficiencies would not be addressed. This would lead to load restrictions and eventually, road closure. This alternative planning solution does not address the problem and therefore is not considered an acceptable alternative. **Therefore, this alternative is not recommended.**

Rehabilitate the Existing Bridge: Extensive and ongoing rehabilitation would be required, adding limited additional service life to the bridge. This only defers/delays a longer-term solution (i.e. eventual bridge replacement). This alternative planning solution addresses some of the structural deficiencies but would not address operational/functional deficiencies (i.e., deficient roadway width). **Therefore, this alternative is not recommended.**

Bridge Replacement: The existing bridge would be removed, and a new bridge would be built at the same location. All current design criteria would be met. There would be long-term improved safety and operation. The new bridge will be more durable with a low maintenance design. Complete road closure with temporary detours during construction will be required for 1 year. This will result in temporary traffic disruption/inconvenience. Rapid replacement will be considered in the next study phase to minimize construction duration. This alternative planning solution addresses the structural and functional deficiencies offering a longer-term solution. The initial cost of replacement is $4.1M compared to the initial cost of rehabilitation of $2.1M but a 50-year life cycle analysis indicates equal present values for both alternatives. **This alternative is selected as the preliminary preferred alternative solution.**

4.2 RECOMMENDED SOLUTION

Per the evaluation of alternative solutions in **Table 4-1**, the removal and replacement of the Bosworth Bridge has been identified as the recommended solution and will be further developed in the next phase of the study.

The proposed bridge replacement shall consist of full removal of the existing structure to 600 mm below finished grade and replacement with a new 50 m single span steel plate girder bridge supported on reinforced concrete abutments with driven steel H-piles. The total clear opening will be 48.8 m. The proposed bridge will support a 3.5 m wide lane and 2.5 m wide shoulder in each direction with an overall structure width of 12.6 m. The new bridge foundations and abutments will be constructed behind the existing in order to isolate the work from the river and minimize disturbance.

5 CONSULTATION

This section summarizes the consultation carried out during the Class Environmental Assessment process.

5.1 EXTERNAL AGENCIES

The following **Table 5-1** summarizes the external agencies contacted and their input, where provided (see **Appendix F** for received correspondence from agencies). In addition to the agencies listed in the table below, the following government officials were kept informed of study progress.

- County of Wellington – Councillors and relevant staff.
- Mayors for the Town of Mapleton; and relevant staff.

Detailed mailing lists for all officials and external agencies contacted through this study can be found in **Appendix F.**

Table 5-1 Summary of Correspondence Obtained from External Agencies

AGENCY / UTILITY	COMMENT	FUTURE COURSE OF ACTION
Ministry of the Environment, Conservation and Parks (MECP)	Provided acknowledgment of EA and list of Indigenous Communities to be contacted who have been identified as potentially affected by the project. Comments documented in **Appendix F**.	Comments noted.
Ministry of Indigenous Affairs	No feedback received.	

Grand River Conservation Authority (GRCA)	Discussions with GRCA on flow estimations and Floor Frequency Analysis. WSP received the HEC-RAS hydraulic model prepared for Conestogo River. Comments and response noted in **Appendix F.**	Comments/feedback noted and applied to the hydraulic analysis.
Ministry of Agriculture, Food and Rural Affairs	No feedback received.	
Ministry of Natural Resources and Forestry (MNRF)	Provided comments following the Notice of Commencement and on the HIA Report. Comments documented in **Appendix F**.	Comments noted.
Ontario Provincial Police	No feedback received.	
Ministry of Heritage, Sport, Tourism and Cultural Industries	Provided comments following Notice of Commencement and on the HIA Report. Comments documented in **Appendix F.**	Comments noted. CHER and HIA sent for review. HIA updated based on comments received from MHSTCI.
Ministry of Transportation	Provided comments following Notice of Commencement. Comments documented in **Appendix F**.	Comments noted.
Upper Grand District School Board	No feedback received.	
Conseil Ccolaire de District Catholique Centre-Sud	No feedback received.	
Wellington-Dufferin Student Transportation Services	No feedback received.	

Minto and North Wellington Fire Services	No feedback received.	
Guelph-Wellington Emergency Medical Services	No feedback received.	
Wellington County Museum and Archives	No feedback received.	
Wellington County Historical Society	Requested to be removed from mailing list. Comments documented in **Appendix F**.	Removed from mailing list.
Wightman Telecom	No feedback received.	
Bell Aliant	No feedback received.	
Bell Canada	No feedback received.	
Bell IM Orangeville	No feedback received.	
Mornington Communications Co-operative Limited	No feedback received.	
Hydro One Networks Inc.	Facilities identified within study area. Comments documented in **Appendix F**.	Comments noted.
Enbridge Gas Distribution Inc.	Gas facilities identified within study area. Pipeline not attached to existing bridge. Comments documented in **Appendix F**.	Comments noted.
Rogers Communications	No feedback received.	

Telecon	No underground infrastructure within study area. Comments documented in **Appendix F**.	Comments noted.
Cogeco	No feedback received.	
Wellington North Power Inc.	Requested to be removed from mailing list.	Removed from mailing list.
Union Gas	No feedback received.	
Six Nations of the Grand River	No feedback received.	
Haudenosaunee Confederacy Chiefs Council	No feedback received.	
Aamjiwnaang First Nation	No feedback received.	
Bkejwanong (Walpole Island)	No feedback received.	
Chippewas of Kettle and Stony Point	Provided main contact update. Comments documented in **Appendix F**.	Comments noted. Mailing list updated.
Chippewas of the Thames First Nation	No feedback received.	

5.2 PUBLIC INVOLVEMENT

5.2.1 NOTICE OF STUDY COMMENCEMENT

The Notice of Study Commencement was issued on **January 21, 2021**. Notices were sent to provincial and municipal agencies, as well as Indigenous Communities. Local residents were notified by mail and via posting on the County of Wellington website:

www.wellington.ca/BosworthBridgeEA

Several comments were received from agencies and members of the public and their request to be involved, or not, in the study were noted.

5.2.2 ONLINE PUBLIC INFORMATION CENTRE

Based on the level of interest and nature of the EA Study, the Public Information Centre (PIC) was conducted online with a Public Information Package made available on the County's website for viewing and download starting on **March 31, 2021** (URL as shown above).

The Notice of the Online PIC was sent on **April 1, 2021** to provincial and municipal agencies, as well as Indigenous Communities and those who requested to be on the mailing list. Local residents were also notified about the PIC by mail and via a posting on the County of Wellington website (URL as shown above).

The purpose of the Online PIC was to review the study process, existing conditions, alternative solutions, identification of the preliminary preferred alternative solution, as well as the evaluation criteria for the preferred alternatives.

Links to a digital sign-in sheet and comment sheet were provided on the PIC displays. No comment sheets were submitted. Copies of the notice and PIC materials, are included in **Appendix G**.

6 PROPOSED UNDERTAKING AND NEXT STEPS

6.1 BRIDGE WORK

The replacement of Bosworth Bridge will take into consideration all of the Environmental Assessment findings.

During the upcoming preliminary design stage, the final details regarding the type of new replacement structure will be developed and a preliminary General Arrangement drawing will be updated. The replacement bridge will include a two lane (one lane in each direction) structure. The new bridge will be designed to meet current standards for minimum lane widths, minimum shoulder widths, side clearances and drainage. Other parameters that will be considered during the preliminary and final design stages will include the following:

- Geotechnical Investigation and findings;
- Cultural Heritage Investigation findings;
- Foundation type;
- Hydraulics;
- Protection of fisheries and species habitat;
- Drainage and other safety requirements of bridge code (i.e. 0.5% longitudinal grade);
- Minimum (low point) soffit elevation; and
- Depth of proposed superstructure (girders, deck).

During preliminary design and detailed design, consideration shall be given to a compatible replacement structure that reflects the cultural heritage attributes of the existing bridge, such as the incorporation of horizontal steel guardrails, architectural railing features reflective of the arrangement of steel members in a Warren Camelback pony truss and the placement and design of the concrete handrail on all four corners, and integration of the existing commemorative plaque.

Conclusions made during the preliminary design stage will then be carried forward into detailed design. The detailed design of the new replacement would be based the requirements of the Canadian Highway Bridge Design Code (CHBDC) CAN/CSA-S6-19 and the Structural Manual published by the Ministry of Transportation of Ontario.

Timing of the detailed design and construction of the new bridge will be subject to annual council review and funding availability.

A preliminary General Arrangement drawing has been prepared as part of the EA Study, included in **Appendix H**. Design of the new structure will be finalized in detailed design subject to consultation with the County, GRCA, and other relevant agencies.

6.2 ROAD CONSTRUCTION

Major road reconstruction has not been considered as part of the EA Study but will be evaluated during preliminary and detailed design.

6.3 CONSTRUCTION STAGING

During construction, Wellington Road 7 will be closed at the bridge. Traffic will be detoured to adjacent roads and would likely follow the 8.2 km long signed detour route illustrated in **Figure 6-1**, which includes travel along County Road 11, 12 Line, and County Road 12. This route avoids the unpaved roads of Side Road 16 and Side Road 17. The detour route will be evaluated further during preliminary and detailed design.

Figure 6-1 Proposed Preliminary Detour Route

6.4 NATURAL ENVIRONMENT – PROPOSED WORKS, IMPACTS AND MITIGATION

6.4.1 AQUATIC HABITAT AND FISHERIES

PROPOSED BRIDGE REPLACEMENT WORKS

Once the new abutments are constructed and existing structure abutments are removed, new banks will be angled back and restored to a more natural condition with mixed sizes of sub angular stone. The stone should include larger rock (sized to withstand flows) and smaller rock (down to pea sized gravel) to fill in the voids. Any stone used below the highwater mark (e.g., if needed beyond the existing footprint of the west abutment to connect to the existing riverbed), should be embedded to match the profile of the existing channel bed and banks. The road embankments approaching the bridge will be re-graded as noted on the GA **(Appendix H**). In the SE quadrant these grading limits will not encroach on Parker Creek, a tributary that outlets to the Conestogo River in this area.

IMPACTS

The bridge replacement works will be confined to the ROW of WR7 at the crossing, therefore, potential impacts to fish and fish habitat will be localized to this area of the Conestogo River. The total span of the new clear-span bridge structure will be increased by approximately 8 m over the span of the existing bridge structure and will remove the footprint of the existing bridge abutment (west side) from within the bankfull channel.

Although it is possible to construct the new bridge without disturbance to the existing stream bed, the existing bridge removal (e.g., partial removal of the abutments to 600 mm below finished grade of restored banks, and removal of the super structure) will require localized alteration of the channel banks and bed on the west side where the west abutment is located partially instream. Therefore, mitigation measures to prevent entry of debris into the watercourse (e.g., cofferdams for isolation of the west abutment removal works) should be implemented (see Section 6.4.2). Although the east abutment is located outside of the bankfull channel, a cofferdam should also be considered for these removal works in anticipation of high flows. Once the existing abutments are removed, there is opportunity to restore the banks and bed to more natural conditions including overbank areas / ledges to enhance wildlife movement opportunities, which are presently limited on the west side.

Direct impacts of the structure replacement and removal of the existing abutments should be limited to:

- Localized minor removal of riparian vegetation associated with the widening and construction access;

- Alteration of the channel bank and bed along the west side resulting from the removal of the existing abutment (within bankfull channel) and subsequent restoration, which can be managed with the implementation of standard and site-specific mitigation measures (see section 6.4.2).

Effects of the increased span and width of the new structure are relatively minor with the implementation of standard and site-specific mitigation measures outlined in Section 6.4.2. The new bridge abutments will be constructed well back from the existing abutments and will be outside of the bankfull width of the channel. This will result in a wider span width across the river and improvement of hydraulics. The existing west abutment (part of which is located within the bankfull channel) and the east abutment (which is located outside of the bankfull channel) will be removed and the new banks below the bridge (and a small area of the bed on the west side) will be angled back and restored to a more natural condition using mixed sizes of sub angular stone. The stone used below the bankfull channel (e.g., to connect the new bank to the existing bed of the channel on the west side), should be embedded to match the existing profile of the channel.

There will be some minor additional shading from the increased width of the structure, which may reduce the vigour of the riparian vegetation along the banks in this area. There will also be some minor vegetation removal due to the widening as discussed in the next section. These are considered minor effects to fish habitat.

The construction of the new bridge abutments outside of the bankfull width of the channel, along with subsequent restoration of the banks to more natural conditions, will improve the aquatic habitat in the area of the bridge over the existing conditions (e.g., removal of existing instream abutment on the west side and subsequent bank restoration) and improve wildlife movement through the structure as discussed further in the wildlife section below.

In the vicinity of the bridge works, the aquatic habitat conditions include a flat dominant morphology found upstream, through the bridge structure and downstream. Substrates below and downstream of the bridge consisted of 30% rubble, 20% gravel, 20% sand, 20 silt and 10% boulders. Substrates upstream of the bridge along the east side consisted of 50% sand, 40% silt and 10% gravel and a mix of rubble, gravel, sand and silt was found along the west side. The fine substrates could be susceptible to downstream transport; however this can be managed using appropriate mitigation measures as outlined below in Section 6.4.2. Impacted vegetation communities on both sides of the bridge and the bridge embankments are Dry-Moist Old Field Meadow (Units 1A-1B: CUM1-1) and Reed-canary Grass Mineral Meadow Marsh (Unit 3: MAM2-2) as further detailed in the next section.

With the proper design and implementation of appropriate mitigation and restoration measures during and following construction, it should also be feasible to manage the potential for indirect construction related impacts (e.g., potential for erosion and downstream sediment transport, entry of debris from the bridge structure during removal and construction) as outlined in Section 6.4.2.

The Conestogo River is classified as a warmwater river that supports bait and sportfish species including Northern Pike. There should be no permanent / long term impacts from the bridge replacement as noted above, and the aquatic and fish habitat conditions will be improved through the restoration of the stream banks through the new structure. Also, it is not anticipated that the road embankment grading in the SE quadrant will impact Parker Creek (a tributary that outlets to the Conestogo River in the SE quadrant) and the tributary will be protected during the bridge replacement works. This will be confirmed during Detailed Design and if impacts are anticipated at that time, a retaining wall should be considered to avoid any encroachment into the creek.

6.4.2 TERRESTRIAL HABITAT AND VEGETATION

IMPACTS

The bridge replacement works at Bosworth Bridge will result in some reduced vigour of the vegetation below the new bridge due to the wider bridge deck, and some minor removals of Dry-Moist Old Field Meadow (Units 1A-1B and Units 1C and 1D: CUM1-1), found mainly along the road embankments, along with minor edge impacts to Reed-canary Grass Mineral Meadow Marsh (Unit 3: MAM2-2). The Dry-Moist Old Field Meadow is dominated by common old field species that are found throughout the ROW. The Reed-canary Grass Mineral Meadow Marsh is dominated by Reed-canary Grass and other common facultative wetland species noted previously. The Black Ash that were observed in Unit 2 (FOM7-2) will not be impacted by the works.

The impacted vegetation is tolerant, culturally influenced and found along the edges of the existing vegetation communities within the ROW. The removals are considered a minor effect.

In addition to direct impacts to vegetation, there is potential for indirect impacts during construction. Indirect impacts include:

- Vegetation clearing / damage beyond the working area
- Increased potential for introduction or spread of non-native species
- Spills of contaminants, fuels and other materials that may reach natural or semi-natural areas

None of the potentially impacted vegetation communities or associated species recorded / expected in the area, or their habitat values are rare or limiting within the general area, and any temporary impacts associated with construction can be managed using appropriate mitigation measures as outlined in Section 6.4.2.

6.4.3 WILDLIFE HABITAT INCLUDING POTENTIAL SAR

IMPACTS

Impacts to wildlife and wildlife habitat are limited to local incremental impacts since the bridge replacement works involve a wider structure. As outlined above, there will be minor removals along the edges of existing vegetation communities in the vicinity of the bridge

structure and the wildlife habitat associated with these communities will therefore also be affected. These vegetation communities generally support common wildlife habitat types and the majority of the wildlife species observed in the vicinity of the bridge are common, tolerant species.

Anticipated impacts including temporary loss of nesting habitat and disturbance to migratory birds which are known to nest on the underside of the bridge and potentially in adjacent vegetation, can be managed using appropriate mitigation measures as outlined in Section 6.4.2.

The SWH for Deer Wintering Area occurs beyond the ROW, approximately 150 m south of the bridge, and therefore no impacts are anticipated to this habitat from the bridge replacement works.

Generally, with the increased span of the bridge and subsequent bank restoration, wildlife movement opportunities will be enhanced with more bank area under the bridge (overbank/ledge areas) for wildlife passage; particularly on the west side of the bridge where there is currently no available overbank area for wildlife to pass under the bridge.

Regarding the 12 SAR noted in Section 3.4.5, three have the potential to be impacted with the bridge replacement works as discussed below:

- **Barn Swallow** (THR and a protected species under the ESA) - breeding habitat was confirmed directly on the underside of the bridge structure (i.e., nests) during the SAR field surveys. There is good potential that this species will nest again on the structure during the year of construction and for the nests / young to be directly impacted by the bridge replacement works. However, impacts will be minimized with the use of appropriate mitigation measures (i.e., registration under O. Reg 242/08 of the ESA including a Barn Swallow mitigation plan, bird nesting exclusion measures) as further outlined in Section 6.4.2 below.
- **Monarch** (SC) – this species and suitable breeding habitat (i.e., milkweed) were observed within the ROW. The proposed works are expected to have minor impacts on Monarch habitat, wherever milkweed is disturbed and / or removed. However suitable habitat will remain within the broader landscape and all disturbed areas will be restored with native species (including milkweed) as outlined in Section 6.4.2 below.
- **Snapping Turtle** (SC) - although turtles and nests were not observed during the SAR field surveys, the river does provide suitable hibernation potential and nesting potential along the road shoulders and adjacent upland areas, which could be impacted by the bridge replacement works (e.g., in-water works, construction along road). Mitigation measures outlined in Section 6.4.2 provide timing restrictions and exclusion fencing recommendations to minimize the potential for direct impacts to this species.

It is the proponent's responsibility to ensure that wildlife generally, and SAR specifically, are protected. To that end, additional measures to address any incidental encounters during construction and to reduce the potential for SAR encounters during construction are also outlined in Section 6.4.2. As noted previously, the ESA provides species and habitat protection for Threatened and Endangered species only

6.4.4 ENVIRONMENTAL MITIGATION

The following mitigation measures are recommended to minimize impacts to the fisheries and aquatic habitat, terrestrial vegetation, wildlife and wildlife habitat (including SAR) located in the vicinity of the works during and following construction.

6.4.5 AQUATIC AND TERESTRIAL HABITAT PROTECTION

DESIGN-RELATED MEASURES OF NEW BRIDGE

The following measures are recommended for incorporation into the design of the new bridge at the Detail Design stage to minimize impacts to fish, fish habitat and wildlife:

- Completely span the bankfull channel of the river.
- Drain the structure such that deck drains that outfall directly to the river are not required.
- Restoration of the existing channel banks to more natural conditions and development of overbank / ledge areas along both banks to enhance wildlife movement opportunities (particularly on the west side). The new banks and bed restoration areas will consist of mixed sizes of sub-angular rock including larger rock sized to withstand scouring and smaller rock (down to pea size gravel) to fill in the voids.

CONSTRUCTION-RELATED MITIGATION MEASURES

- Erosion and sediment control measures will be implemented during all phases of construction and clean-up to prevent sediment laden runoff from entering the watercourse directly from the construction zone. At a minimum, the plan will address the following elements:
  - All disturbed areas / construction zones will be isolated standard perimeter silt fencing to isolate the general construction zone up and downstream. Two rows should be used where needed for disturbed areas that drain to the Conestogo River and Parker Creek. The silt fencing will be heavy duty / reinforced fencing, but with no exposed mesh that might entangle wildlife. Silt fencing will be regularly inspected and maintained as required.
  - No dewatering discharge will be released directly to the watercourse without appropriate treatment. Appropriate settling / filtration and energy dissipation measures will be used for discharge to ensure no erosion or sediment release occurs.
  - All salvaged or stockpiled materials will be located a safe distance from the edge of the watercourses and stabilized to prevent migration of any sediment or other material to the watercourse.
  - Protection over the river if mass demolition of the existing bridge deck is required during the removal process (e.g., temporary platform), so that no debris or deleterious substances enters the watercourse.

  - All work areas or other disturbed surfaces draining to the watercourses and/or in the floodplains will be stabilized and re-vegetated with native species (including milkweed) as soon as feasible following construction.
  - The erosion and sediment control measures will be left in place, monitored and maintained in proper working order until all disturbed areas draining to the watercourse are fully stabilized, including establishment of vegetative cover, if required.

- The use of a warmwater timing window (construction allowed from July 1 to March 14 of the following year) is recommended by GRCA and MNRF based on the thermal classification and fish community. That is, there will be no in-water activity between March 15 and June 30 of any year to protect the sensitive life stages of the warmwater fishery in the Conestogo River. Although no in-water activity is anticipated for Parker Creek, the same the timing window would apply.

- As noted in the Wildlife Protection measures below, to protect hibernating turtles it is also recommended that no in-water works should occur between September 1 and April 30 unless the aquatic construction zone is isolated prior to September 1.

- All in-water works will be isolated using appropriate techniques to be approved by GRCA (e.g., clean gravel bags, turbidity curtain, sheet pile) to maintain clean flow downstream of construction. Measures to isolate the construction of the new sub structure / abutments should initially include cofferdams that utilize the existing abutments to work behind. If pumping is required, flow withdrawal hoses will be sited to avoid entrainment of fine sediment off the bed, and discharge hoses sited to prevent bed erosion and downstream sediment transport. Dewatering hoses will be screened to prevent entrainment of fish.

- A fish rescue will be undertaken in the zones isolated for the bridge replacement works (e.g., the removal of the south abutment). Fish (and any other aquatic or semi aquatic species [e.g., frogs, turtles]) will be captured using appropriate techniques by a qualified person and transferred unharmed to a downstream location. A License to Collect Fish for Scientific Purposes permit from the MNRF will be required for this work.

- No equipment shall ford or otherwise enter the watercourse except as outlined above and stipulated in the Contract documents to construct the specified works.

- Ensure a clear delineation of the work zone to minimize the risk of unnecessary vegetation disturbance and avoid incidental impacts as a result of temporary stockpiling, debris disposal and access.

- If the Contractor wishes to alter any of the erosion and sediment control or other mitigation measures approved by GRCA, the Contractor will apply to the respective agency(ies) to obtain approval for the proposed changes.

- All activity will be controlled to prevent entry of any petroleum products, debris or other potential contaminants / deleterious substances, in addition to sediment as outlined above, to the watercourse. Storage, maintenance or refueling or maintenance of equipment will be conducted at least 30 m away from the watercourse. The Contractor will have an appropriate spills management / response plan in place throughout construction, including spill control and absorbent materials, instructions regarding their use and notification procedures. Appropriate clearing and disposal of all construction-related debris will occur following construction.

- Every effort will be made to retain and protect as much of the natural vegetation as reasonably possible to help ensure bank stability and control erosion, and to expedite the re-colonization of native plant species.

- Construction will be carried out in accordance with the Clean Equipment Protocol for Industry (https://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf). Specifically, construction equipment shall be inspected and cleaned prior to arrival on site to ensure non-native and invasive plant species are not being transported to and released on site.

- If scour / rock protection is required for the areas around the bridge structure and/or for bank and bed restoration (e.g., abutment removal areas), it will be designed and installed so as to minimize alteration of the channel form and profile (e.g., inset to match existing grade).

- GRCA will be notified of the initiation of construction in advance.

- An experienced environmental inspector will be on-site and responsible for ensuring the erosion and sediment control measures are functioning effectively and being maintained, and that all of the other mitigation measures are being implemented as intended.

WILDIFE PROTECTION INCLUDING SAR

The following measures are recommended for the protection of wildlife:

- Registration of the project for Barn Swallow under O. Reg 242/08 of the ESA and preparation of a Barn Swallow Mitigation Plan will be required prior to the start of construction. Furthermore, as noted in the section below for the protection of migratory birds, it is recommended that bird nesting exclusion measures are installed

on the bridge prior to April 1st and maintained until August 31st during the year(s) of construction.

- The work areas will be isolated using sturdy temporary protection fencing. Reinforced silt fencing (with no nylon mesh netting) will be properly installed throughout the project limits. This will protect vegetation and provide exclusionary fencing to deter terrestrial and semi aquatic wildlife species (e.g., turtles, snakes) from accessing the construction area. Just prior to installation of the silt fence, the construction zone will be walked at a slow pace to flush any wildlife species out of the construction zone.

- To protect hibernating turtles, it is recommended that no in-water works should occur between September 1 and April 30, unless the aquatic construction zone is isolated prior to September 1.

- Any wildlife incidentally encountered during construction will not be knowingly harmed and will be allowed to move away on its own. In the event that an animal encountered during construction does not move from the construction zone and construction activities are such that continuing construction in the area would result in harm to the animal, all activities that could potentially harm the animal will cease immediately and the Contract Administrator will be notified. A protocol for dealing with wildlife encounters will be developed by the contractor in consultation with the Environmental inspector, as required.

- The construction zones will be inspected prior to construction start-up each morning during the active period for turtles and snakes (approximately April 1 to October 31) to ensure none has become trapped inside the fencing. Any equipment parked overnight in the area will also be inspected to ensure no snakes have climbed into / under it.

- In the event that a turtle is encountered while nesting, all activities within 30 m shall cease until the turtle has finished nesting and left the area on its own accord (this may take several hours). Any turtle nests laid within the construction zone shall be protected with a 10 m buffer and an MNRF authorized local wildlife rehabilitator shall be contacted immediately (https://www.ontario.ca/page/find-wildlife-rehabilitator) to relocate the nest to a suitable location outside the construction zone or to collect the nest for ex-situ incubation under an approved permit.

- In the event that a SAR or possible SAR is found in the construction area, all construction that could potentially harm the animal will cease immediately and the Contract Administrator will be notified.
  - Confirm species identity (using a specialist if required) and notify MECP if the animal is a SAR or potential SAR

- Allow the animal to move away on its own
- Use a trained individual to move species that are not specifically protected under the ESA using accepted handling and relocation procedures.
- The Contract Administrator will contact the MECP for direction on relocation of SAR protected under the ESA (2007).

MIGRATORY BIRD PROTECTION

The contractor is responsible to protect migratory birds and to be in compliance with the Migratory Birds Convention Act (1994) and Regulations. The "Regional Nesting Period" for the project area is the end of March to the end of August, as identified on the Environment Canada website by "nesting zone" C2: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html#toc1.

It is recommended that bird nesting exclusion measures are installed on the existing bridge prior to April 1st and maintained until August 31st during the year(s) of construction. If a migratory bird builds a new nest on the bridge while works are occurring, construction must cease until the young have fully fledged or the nest is no longer active.

It is recommended that vegetation clearing (including grubbing and removal of trees, shrubs, grasses and plants) be avoided during the identified "Regional Nesting Period" (i.e. April 1 to August 31).

For more information on reducing risk to migratory birds, the contractor should consult Environment Canada's website at: https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/reduce-risk-migratory-birds.html .

6.5 HYDRAULICS

Three options were presented in the Hydrology and Hydraulics Report and out of them, Option 3 was selected as the Preferred Option; Option 3 includes:

- A 50 m single span bridge structure with clear opening 48.8 m
- Soffit elevations at left and right abutments are considered as 409.69 m and 409.45 m, respectively.
- Road low point is set to 411.50 m.

The hydraulic analysis result for Option 3 shows that:

- The 2-year to the 100-year water levels are lower than existing conditions.
- Option 3 generates the Regional flood level upstream of the bridge as 411.14 m, which is lower than the existing Regional flood elevation by 0.20 m. This option will

not create any flooding impact upstream of the bridge and is hydraulically efficient than the existing bridge.

- The Regional water level does not over top Wellington Road 7.

Based on the analysis above, Option 3 is the most hydraulically efficient option and does not create any flooding impact upstream of the bridge. With this option, Wellington Road 7 will also be free from flooding during the Regional Storm event. Therefore, this option was considered as the Preferred Option.

Refer to the Hydrology and Hydraulics Report for the details related to the hydraulic modelling for various options (**Appendix D)**

6.6 CULTURAL ENVIRONMENT – BUILT HERITAGE

Completion of the HIA for the Bosworth Bridge and the understanding of its cultural heritage value or interest resulted in the following recommendations:

- The structure should be recorded through a Documentation and Salvage Report containing measured drawings, a thorough photographic recording and written description of the bridge as well as recommendations for elements worthy of salvage prior to demolition (i.e., steel truss members, commemorative bridge plaque). This report should be shared with the County of Wellington and the County of Wellington Museum & Archives.
- Commemoration opportunities should be explored for the bridge with community input.
- The construction of a new bridge should be designed in a manner that draws from the design inspiration and materials of the extant bridge while maintaining legibility. Design considerations should explore the incorporation of the scale and rhythm of the members of a Warren pony truss, the placement and design of the concrete railings, and siting at the same location over the Conestogo River.

6.7 ARCHAEOLOGY

The Stage 1 Archaeological Assessment determined the road allowance to be disturbed and does not require further archaeological assessment. Should design changes impact lands outside of the road allowance, a Stage 2 Archaeological Assessment is required.

6.8 PROPERTY

It is anticipated that no additional property will be required for the replacement of the Bosworth bridge. However, the potential impacts to properties will be reviewed again during detailed design.

6.9 UTILITIES

The proposed bridge replacement is expected to only impact an existing communication cable on the north side of the bridge; however, the potential impact to utilities will be re-evaluated during detail design, including the need for either temporary or permanent utilities relocation.

6.10 SUMMARY OF FUTURE COMMITMENTS

The following summarizes the commitments to further work, as outlined in the forgoing.

- Provisions to protect the natural environmental features as noted in Section 6.4.2 will be further developed at during detailed design for the construction contact.
- The structure should be recorded through a Documentation and Salvage Report prior to demolition. The report should be shared with the County of Wellington and the County of Wellington Museum & Archives.
- Commemoration opportunities should be explored for the bridge with community input.
- All lands within the study area have been disturbed by previous construction activities and therefore, archaeological materials are not anticipated to be encountered during construction activities. If archaeological materials are encountered during construction, all work shall cease, and a licensed archaeologist shall assess the material's cultural heritage value or interest.

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APPENDIX

A KEY PLAN

APPENDIX

B

CLASS ENVIRONMENTAL ASSESSMENT PROCESS CHART

APPENDIX

C

STRUCTURAL INVESTIGATION REPORT AND SITE PHOTOGRAPHS

APPENDIX

D HYDRAULIC ANALYSIS

APPENDIX

E CULTURAL HERITAGE EVALUATION REPORT AND IMPACT ASSESSMENT

APPENDIX

F

AGENCY CONTACTS / CORRESPONDENCE

APPENDIX

G PUBLIC INVOLVEMENT

APPENDIX

G-1 NOTICE OF STUDY COMMENCEMENT

APPENDIX

G-2 ONLINE PUBLIC INFORMATION CENTRE

APPENDIX

H

PRELIMINARY GENERAL ARRANGEMENT

APPENDIX

I

STAGE 1 ARCHAEOLOGICAL ASSESSMENT

APPENDIX

J ENVIRONMENTAL INFORMATION

Figure J-1 – Bridge Location and Natural Heritage Features
Figure J-2 – ELC Vegetation Communities
Table J-1 – Vascular Plant List
Table J-2 – Breeding Bird and Wildlife List
Wellington County Regional SAR list
Representative Site Photographs