County of Elgin

Meeks Bridge Replacement Municipal Class Environmental Assessment

Project File Report

September 2020

B001175

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1. Introduction and Background

1.1. Introduction and Study Area

The County of Elgin has conducted a study to review alternatives for the replacement of Meeks Bridge in the Township of Southwold. Meeks Bridge is located on Sparta Line directly south of the intersection of Sparta Line and Roberts Line spanning Kettle Creek as shown in Figure 1-1. The bridge is located within the jurisdiction of the Kettle Creek Conservation Authority.

Meeks Bridge was constructed in 1900 and is a single span, steel double-intersection Warren truss (Double Warren) bridge structure. Just downstream of Meeks Bridge on the north bank, a 2.5 metre high and 60 metre long retaining wall supports the bank. The bridge currently contains a posted load limit of 8 tonnes and has a total deck length and width of 38.7 metre and 4.9 metres respectively.

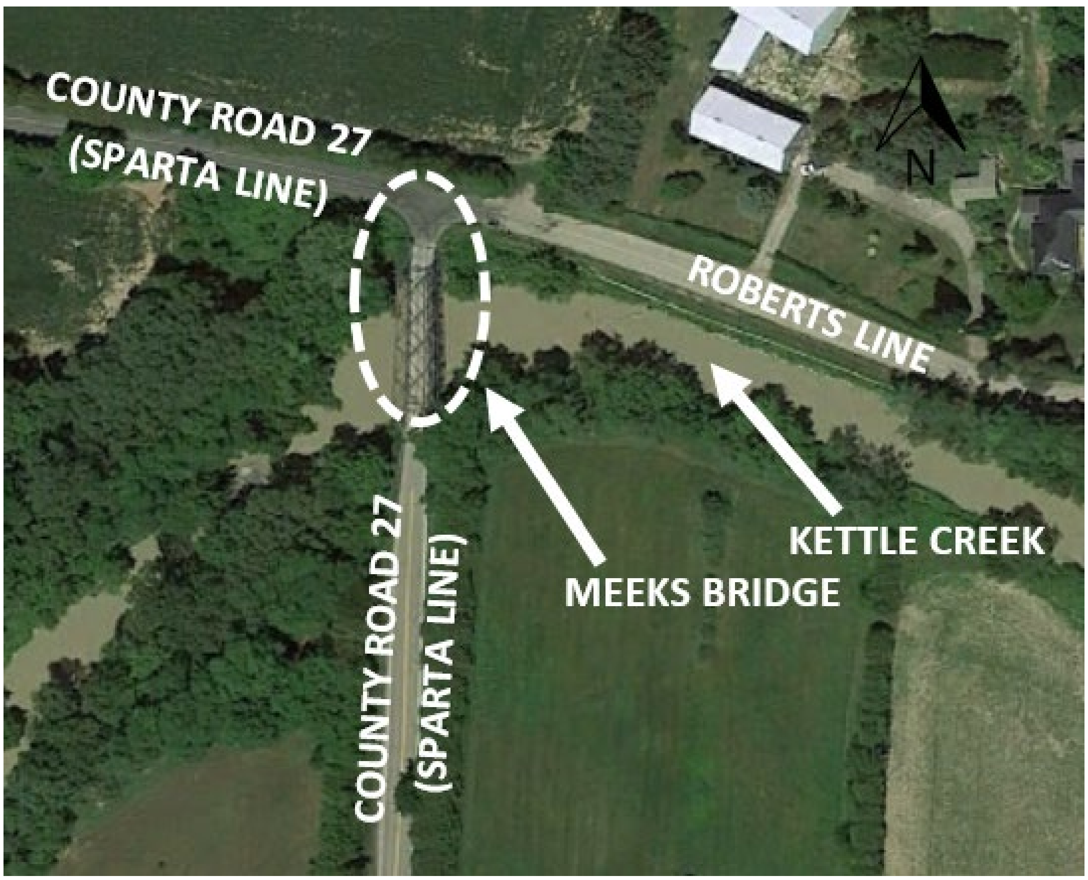

Figure 1-1: Study Area

1.2. Municipal Class Environmental Assessment Process

This study follows the Municipal Engineers Association (MEA) Municipal Class Environmental Assessment process for a Schedule B project (October 2000, as amended in 2007, 2011 and 2015). The Municipal Class Environmental Assessment is an approved planning and design process under the Ontario Environmental Assessment Act. As illustrated in Exhibit 1-2, the planning and design process is comprised of five phases:

Phase 1 Identify Problem or Opportunity;

Phase 2 Identify and Evaluate Alternative Solutions to the problem or opportunity;

Phase 3 Identify and Evaluate Alternative Design Concepts for the preferred solution;

Phase 4 Complete and File Environmental Study Report (ESR) for public review; and

Phase 5 Implement the project (Detail Design, Construction, Operation, and Environmental Monitoring).

Transportation improvements are classified into one of the following schedules:

Schedule A Projects are limited in scale, have minimal adverse environmental impacts, and may be implemented without following the full Class EA process.

Schedule A+ Projects are limited in scale, have minimal adverse environmental impacts, and may be implemented without following the full Class EA process. However, the public is to be advised prior to implementing the project.

Schedule B Projects may have some adverse environmental impacts. The proponent must undertake a screening process, involving contact with directly affected public and technical/regulatory review agencies to ensure that they are aware of the project and that their concerns are addressed. A Project File is prepared for public review.

Schedule C Projects may have significant environmental impacts. The proponent must follow the full planning, design, and documentation process of the MEA Municipal Class EA document. An Environmental Study Report is prepared for public review.

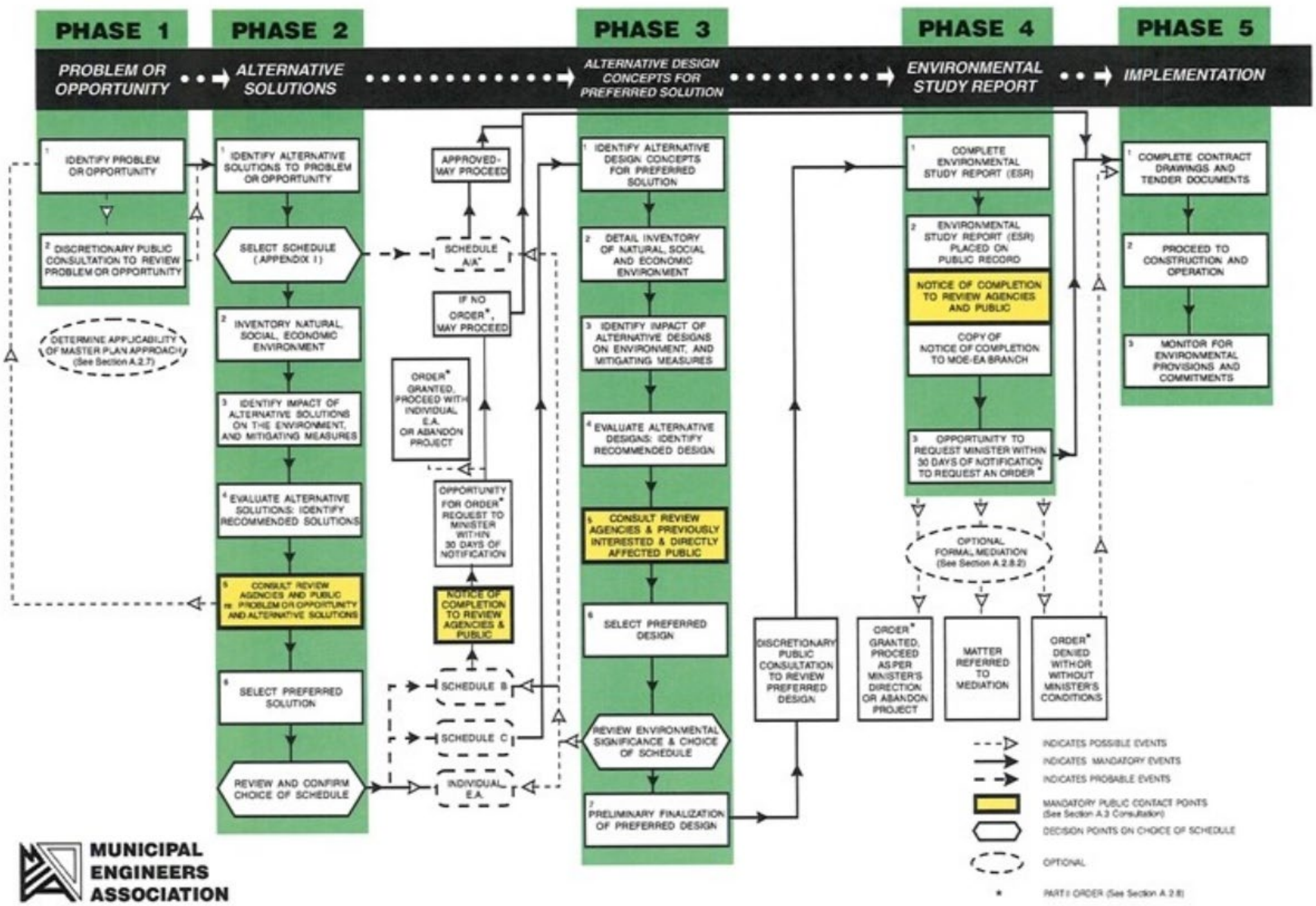

Figure 1-2: Municipal Class EA Planning and Design Process

1.3. Part II Order

This study follows Phases 1 and 2 of the planning and design process for Schedule B projects. The public will have 30 days to review the Project File and discuss any outstanding issues with the County of Elgin. A Notice of Study Completion will be issued notifying the public of the completion of the study and initiation of the 30-day review period.

A request may be made to the Ministry of Environment, Conservation and Parks (MECP) for an order requiring a higher level of study (i.e. requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g. require further studies), only on the grounds that the requested order may prevent, mitigate or remedy adverse impacts on constitutionally protected Aboriginal and treaty rights. Requests on other ground will not be considered by MECP.

2. Existing Conditions

2.1. Meeks Bridge

The existing Meeks bridge was constructed in 1900. The 38.7 metre (126.97 foot) span steel truss bridge has a 4.88 metre wide concrete deck carrying one lane of traffic and has a centre to centre bearing distance of approximately 5.2 metres.

The following was observed during a site visit for Meeks Bridge and were also noted in 2019 OSIM and 1994 reports:

- The bridge currently has a load posting of 8 tonnes due to the structural capacity of truss bottom chords (2- C230 X 20) and transverse beams (W460 X 67);
- Underside bracing has fallen off on numerous panels and the remainder is corroded;
- Existing deck is cast-in-place concrete, and existing abutments are sitting on spread footings; and
- The 2019 inspection report recommended rehabilitation in 1-5 years and replacement in 6-10 years.

The load posting of 8 tonnes has been implemented due to multiple structural deficiencies including but not limited to:

- Steel truss structure's bottom chords (2xC230) and floor beams (W460x67) exhibit section loss due to rusting and deterioration. Most floor system cross bracing members have fallen off on numerous panels and also have section loss;
- Typically, steel manufactured circa 1900 has a significantly lower yield strength than modern steels. The specified yield strength is most likely 180 MPa compared to 350 MPa minimum required strength and this dramatically affects the structural capacity of the bridge;
- Concrete deck exhibits spalling, cracking and severe scaling;
- Abutment condition and age of concrete used on the substructure creates a challenge for rehabilitation. Based on the year the bridge was built, the substructure concrete would not have been air-entrained and is prone to spalling and scaling due to corrosion of reinforcing bars and freeze thaw action.

2.2. Traffic Operations

There is one intersection within the study area directly north of Meeks Bridge. The existing traffic control at the intersection of Sparta Line and Roberts Line is as follows:

- Eastbound approach: yield controlled
- Westbound approach: stop controlled
- Northbound approach: free flowing

The present configuration is somewhat unusual, as stop and yield signs are not usually combined. This setup may be a reflection of Sparta Line being a county road (County Road 27), while Roberts Line is a local road.

Roberts Line has a posted speed of 50km/h. To the north of the bridge structure Sparta Line has a posted speed of 60km/h. No speed signage is present on Sparta Line to the south of the bridge structure, and therefore it is assumed that the posted speed is the same as on Union Road (CR 20), i.e. 80km/h.

2.3. Cultural Environment

2.3.1. Cultural Heritage

A Cultural Heritage Evaluation was completed for Meeks Bridge to evaluate the cultural heritage value of the bridge. Based on the results of the Cultural Heritage Evaluation Report (CHER), it was determined that Meeks Bridge is of cultural heritage value for design/physical and contextual reasons. The Cultural Heritage Evaluation Report is provided in Appendix A.

Built in 1900, Meeks Bridge is the earliest surviving example of a steel through truss, double-intersection Warren truss with riveted connections in the County of Elgin. Many steel through truss bridges, once typical of its time, have now been replaced. Double-intersection Warren truss structures were not commonly built structures. A bridge has existed at the current Meeks Bridge location for 119 years, a testament to its craftsmanship and materials. The structure has not undergone any significant modifications and clearly exhibits its original form and retains its original lattice railings with decorative end posts on both sides of the structure.

Heritage attributes (i.e. character defining elements, under the physical/design value criteria) for Meeks Bridge include the following:

- Single span structure;
- One lane carriageway;
- Cast-in-place, reinforced concrete abutments;
- The steel through truss structure, a double intersection Warren truss as defined by the parallel top and bottom cords and diagonals;
- Built up sections of the truss that include channels, angles, plates and lattice members;
- Steel floor beams and stringers;
- Riveted connections;
- Two maker’s plaques, one on the northwest end post which is complete and one on the southeast post which is broken
- The various examples of “Carnegie” markings on the steel components, in particular the end posts and the vertical at the hip of the end posts;
- Lattice railing and decorative metal end posts with pyramidal caps; and
- Concrete deck

Adhering to accepted principles of conservation practice, it is preferred that, if possible, Meeks Bridge should be preserved in situ (i.e. at the current location) given its demonstrated cultural heritage value or interest.

2.3.2. Stage 1 Archaeological Assessment

A Stage 1 Archaeological Assessment was conducted to identify if any portions of the study area contains archaeological potential. The property inspection determined that parts of the study area exhibit archaeological potential and will require Stage 2 assessment if impacted by project construction activities. The findings of the Stage 1 Archaeological Assessment are illustrated in Figure 2-1.

In light of these results, the following conclusions and recommendations will be carried forward to detailed design:

1. The study area exhibits archaeological potential. If impacted, these lands require Stage 2 archaeological assessment by test pit/pedestrian survey at five metre intervals, where appropriate, prior to any proposed construction activities;
2. The remainder of the study area does not retain archaeological potential on account of deep and extensive land disturbance, low and wet conditions. These lands do not require further archaeological assessment; and,
3. Should the proposed work extend beyond the current study area, further Stage 1 archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.

The Stage 1 Archaeological Assessment report is provided in Appendix B.

Figure 2-1: Stage 1 Archaeological Assessment Findings

2.4. Natural Environment

A natural heritage assessment was conducted for Meeks Bridge to identify the natural heritage constraints in the study area. The Natural Environment Report is provided in Appendix C.

The study area is comprised of a mix of wooded areas and agricultural lands. Kettle Creek, its riparian woodland, and associated habitats are the main natural heritage components in the study area. The riparian woodlands are within the Kettle Creek Conservation Authority's (KCCA) O.Reg.181/06 limits. The natural heritage features within the study area are illustrated in Figure 2-2.

Provincially significant Areas of Natural and Scientific Interest (ANSI) are determined by the Ministry of Natural Resources and Forestry (MNRF). The existing bridge is located within the Port Stanley Till Earth Science ANSI. The Earth Science ANSI is reflected in the mapping of township and county Official Plans as part of the Significant Natural Features and Natural Heritage Features and Areas layers, respectively.

2.4.1. Vegetation

The riparian areas along the banks of Kettle Creek are identified as being significant woodlands and significant valleylands. A vegetation survey was conducted on June 22, 2020 to investigate the extent of the vegetation communities occurring in the vicinity of Meeks Bridge. Natural and semi-natural vegetation features identified within the study area were classified according to the Ecological Land Classification for Southern Ontario as illustrated in Figure 2-3. The following natural and semi-natural communities are found in proximity to Meeks Bridge: Black Locust Deciduous Forest (FOD4); Willow Deciduous Swamp (SWD4-1); Willow Thicket Swamp (SWT2-2); White Spruce Cultural Plantation (CUP3-8); Sumac Cultural Thicket (CUT1-1); Old-field Cultural Meadow (CUM1-1); and, various Eastern White Cedar Hedgerows (H).

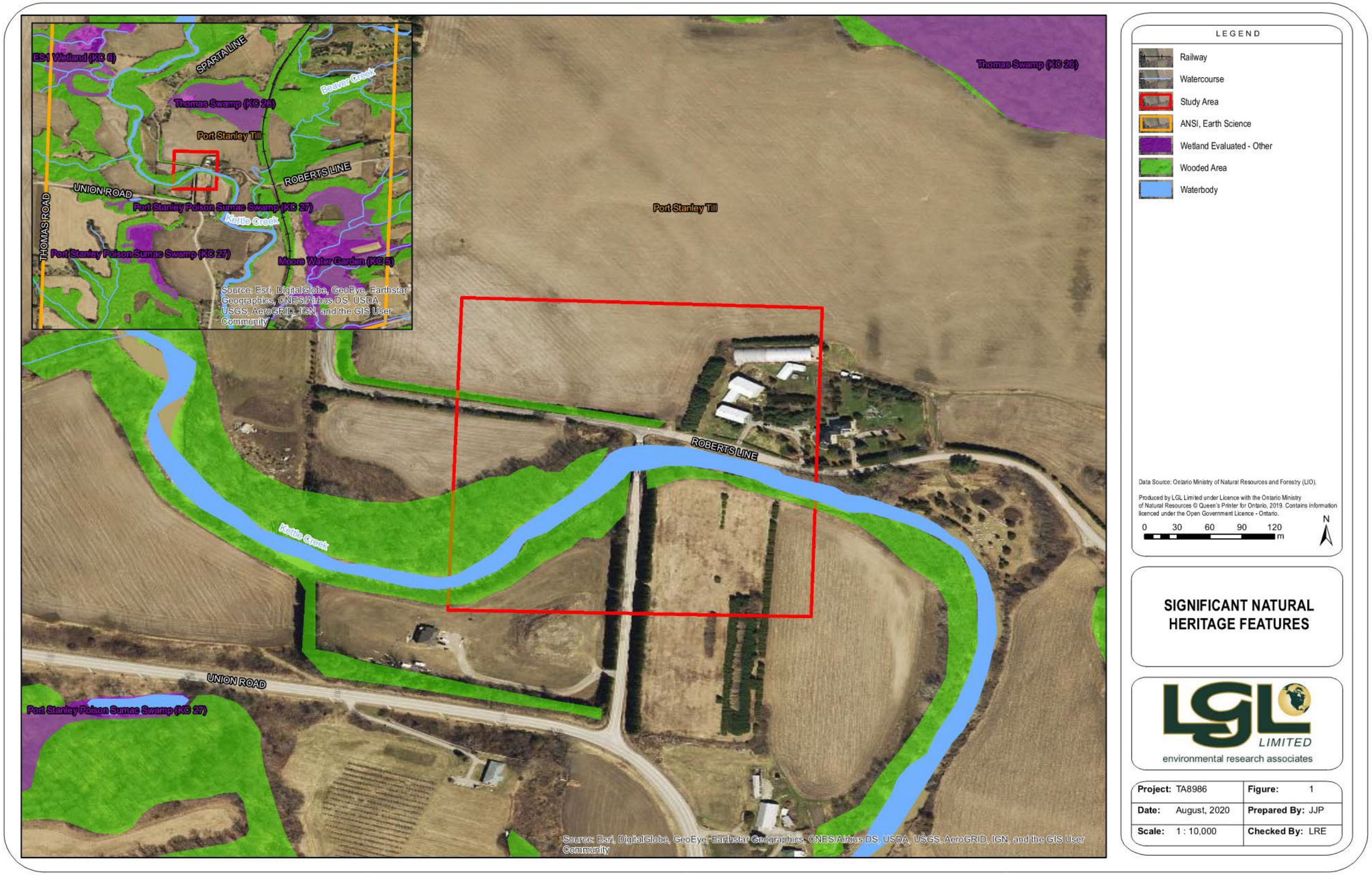

Figure 2-2: Existing Natural Heritage Features

Figure 2-3: Natural Heritage Field Investigation Results

2.4.2. Terrestrial

The terrestrial ecosystem is dominated by riparian woodland and wetland communities. The collection of background information specific to wildlife and wildlife habitat includes a summary of bird species documented in the study area. A total of 54 bird species were documented in the vicinity of the site between 2010 and 2020. Of these, 39 species are considered migratory and regulated under the Migratory Birds Convention Act (MBCA), while eight additional species are protected under the Fish and Wildlife Convention Act, 1997. Only six of the documented bird species are not under any legislative protection. A total of nine bird species are considered area sensitive according to the Significant Wildlife Habitat Technical Guide (SWHTG, 2000). One species, Bald Eagle (Haliaeetus leucocephalus) is listed as Special Concern under the provincial Endangered Species Act, 2007 (ESA).

A breeding bird survey was completed at Meeks Bridge on May 25, 2020 and on June 15, 2020. In addition to the bird survey, incidental wildlife observations were recorded through visual and auditory observations as well as indirect incidental observations (i.e. tracks, scat, and scents).

A total of 32 wildlife species were documented during the field investigation, including one amphibian species, 29 bird species, and two mammal species. One species of herpetofauna was observed in the study area during daytime site investigations as an incidental observation: American Toad (Anaxyrus americanus). The two mammal species included Red Squirrel (Tamiasciurus hudsonicus) and Eastern Chipmunk (Tamias striatus).

Twenty of the bird species observed are regulated under the MBCA. Three of the bird species, Belted Kingfisher (Megaceryle alcyon), Blue Jay (Cyanocitta cristata), and Turkey Vulture (Cathartes aura), are protected under the Fish and Wildlife Conventions Act (FWCA). The two mammal species encountered in the study area are regulated under the FWCA. Several of the species observed are not under any legislative protection: Brown-headed Cowbird (Molothrus ater); Common Grackle (Quiscalus quiscula); European Starling (Sturnus vulgaris); Red-winged Blackbird (Agelaius phoeniceus); and, Rock Pigeon (Columba livia).

Species at risk (SAR) encountered during the field surveys included a pair of Barn Swallows (Hirundo rustica) observed foraging over Kettle Creek on May 25, 2020. The Barn Swallow is regulated as ‘Threatened’ under the ESA and on Schedule 1 of the federal Species at Risk Act. No breeding evidence was obtained during breeding bird surveys, and there were no Barn Swallow nests found on the existing bridge structure.

The study area is located in a predominantly rural setting with natural areas found mainly along the riparian corridor of Kettle Creek including deciduous forest, deciduous swamp and thicket swamp habitats. The existing bridge structure provides nesting habitat for Common Grackle and American Robin, and there were several active nests of both species observed during field investigations. Common Grackle were nesting above the bridge deck on the bridge supports and an American Robin nest was located under the bridge deck on top of the one of the support beams. A recently fledged American Robin was observed under the bridge deck on a support beam during the second survey on June 15, 2020. Both these species are common throughout southern Ontario in urban and rural settings and will use a variety of structures to support their nests. Note that Common Grackle is not protected under the MBCA, however American Robin is. The timing of vegetation removal is subject to the MBCA. Disturbance to any nest, eggs or young is prohibited under the MBCA.

2.4.3. Aquatic

The study area is located within the Kettle Creek Watershed and the jurisdiction of the KCCA. Meeks Bridge is located within the KCAA Regulation Limit and the Regulated Flood Area. A fish community survey was conducted and none of the fish species identified are provincial or federal species at risk. The fisheries records are reflective of a mix of cool and warm water species, therefore any in-water works would be prohibited October 1 to July 15.

Aquatic field investigations were conducted on April 30, 2020 and June 22, 2020. These investigations were focused on the areas where construction activities would occur near the bridge and in or near water. The reach surveyed included an area 100 metres upstream and downstream of the bridge. This stretch of the creek meanders in a southerly direction toward Lake Erie. This watercourse is confirmed to provide direct fish habitat.

2.4.4. Species at Risk

Breeding bird and vascular plant inventories were completed in spring/summer 2020 and no SAR or SAR habitat concerns were identified as a result of those surveys. However, additional study is recommended to confirm presence of candidate roost habitat for SAR bats (i.e. suitable cavities in mature trees) and the project approach to avoid impacts to SAR bats if potential habitat is identified. This data collection will be completed as part of the tree inventory to take place during detailed design.

2.5. Hydraulics

A hydraulic assessment was conducted to assess the Kettle Creek water levels and velocities surrounding Meeks Bridge for existing and proposed conditions. The Hydraulic Assessment report is provided in Appendix D.

No hydraulic models for Kettle Creek within the study area were available from KCCA. Since no existing hydraulic model was available, a hydraulic model was developed using GeoHECRAS and was based on surveyed upstream and downstream cross sections, bridge profile and bridge configuration based on survey and detailed drawings provided by the client as well as available Ministry of Natural Resources and Forestry contour and LIDAR data.

Based on the results of the hydraulic assessment, the existing bridge passes the clearance criteria for the 25-year design storm. The bridge can convey up to the 25-year flow with 0.25m of freeboard, below MTO requirements. During the regional storm, the roadway running east west parallel to Kettle Creek upstream of the bridge, as well as the roadway south of the bridge and farmland to the north is overtopped. Relief flow and velocity x depth over roadway criteria are both surpassed.

Table 2-1 and Table 2-2 below provides a summary of the water surface elevation at the cross-section directly upstream of the bridge, as well as the freeboard, clearance, bridge criteria and existing performance.

Table 2-1: Existing Water Surface Elevation, Freeboard and Clearance

Description	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
Water Surface Elevation (m)	178.89	179.51	179.9	180.31	180.59	180.86	183.01
Top of Road (Low Point): 180.56 m							
Freeboard (m)	1.67	1.05	0.66	0.25	-0.03	-0.3	-2.45
Top of Road Velocity (m/s)	-	-	-	-	-	-	0.72
Soffit Elevation: 180.85 m							
Clearance (m)	1.96	1.34	0.95	0.54	0.26	-0.01	-2.16

Table 2-2: Existing Condition - Summary of Criteria Requirements and Performance

Criteria	Criteria Value	Existing	Meets Criteria (Yes or No)
Passing Design Event	25 Years	25 Years	YES
Freeboard for Design Event (25-year) (m)	0.3	0.25	NO
Clearance for Design Event (25-year) (m)	0.3	0.54	YES
Relief Flow - Depth of Water Over Road (Regional Storm) (m)	0.3 (max)	2.45	NO
Velocity (Regional) (m/s)	-	0.72	-
Velocity x Depth Over Road (Regional) (m^2/s)	0.8 (max)	1.76	NO

2.5.1. Climate Change

A review of intensity-duration-frequency (IDF) parameters based on MTO's Lookup Curves was completed to assess the impact of climate change on Meeks Bridge over the design service life of 75 years. Future IDF parameters based on MTO Lookup Curve Year 2085 compared to 2010 predicts a maximum increase of 15% and 7%, respectively, for the 2-year and 100-year design rainfall intensity. A 7% increase in flows during the 100-year flow results in an increase in water levels of 0.20 m, which is less than the proposed clearance of 0.4 m to the soffit of the bridge. Also, the hydraulic design of the bridge span also considers flow during Regional Event (Hurricane Hazel) which is much greater than the 100-year design event. Based on the assessment, no additional mitigation measures are proposed to address climate change considerations.

Table 2-3: MTO Intensity Duration Frequency Assessment

Active coordinate

42° 41' 44" N, 81° 13' 14" W (42.695833,-81.220833) Modify selection

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Baseline MTO IDF Lookup, 2010

T (years)	2	5	10	25	50	100
5 min	134	176.6	204.5	239.7	265.8	292
10 min	82.6	108.8	126	147.7	163.7	179.8
15 min	62.2	82	94.9	111.2	123.3	135.5
30 min	38.3	50.5	58.4	68.5	76	83.4
60 min	23.6	31.1	36	42.2	46.8	51.4
120 min	14.5	19.2	22.2	26	28.8	31.7
360 min	6.7	8.9	10.3	12.1	13.4	14.7
720 min	4.2	5.5	6.3	7.4	8.2	9
1440 min	2.6	3.4	3.9	4.6	5.1	5.6

75 Year MTO IDF Lookup, Climate Change, 2085							75 Year MTO IDF Lookup, Climate Change, 2085					
T (years)	2	5	10	25	50	100	2	5	10	25	50	100
5 min	141.2	183.8	211.6	246.8	273	299.1	5.4%	4.1%	3.5%	3.0%	2.7%	2.4%
10 min	87.6	113.9	131	152.7	168.8	184.9	6.1%	4.7%	4.0%	3.4%	3.1%	2.8%
15 min	66.3	86.1	99	115.4	127.5	139.6	6.6%	5.0%	4.3%	3.8%	3.4%	3.0%
30 min	41.3	53.4	61.4	71.5	78.9	86.4	7.8%	5.7%	5.1%	4.4%	3.8%	3.6%
60 min	25.7	33.2	38.1	44.3	48.9	53.5	8.9%	6.8%	5.8%	5.0%	4.5%	4.1%
120 min	16	20.6	23.7	27.5	30.3	33.1	10.3%	7.3%	6.8%	5.8%	5.2%	4.4%
360 min	7.6	9.8	11.2	12.9	14.2	15.6	13.4%	10.1%	8.7%	6.6%	6.0%	6.1%
720 min	4.8	6.1	7	8	8.9	9.7	14.3%	10.9%	11.1%	8.1%	8.5%	7.8%
1440 min	3	3.8	4.3	5	5.5	6	15.4%	11.8%	10.3%	8.7%	7.8%	7.1%

2.6. Utilities

Overhead hydro facilities are present on the north side of the Sparta Line and Roberts Line intersection. There are no known utilities along Meeks Bridge. The overhead utilities on Sparta Line/Roberts Line should be protected during construction in order to avoid temporary relocation.

2.7. Problem and Opportunity

Based on an assessment of Meeks Bridge, the problem being addressed is described as follows:

- The bridge currently has a load posting of 8 tonnes due to the structural capacity of truss bottom chords (2- C230 X 20) and transverse beams (W460 X 67).
- Underside bracing has fallen off on numerous panels and the remainder is corroded.
- The concrete deck exhibits spalling, cracking and severe scaling.
- The 2019 bridge inspection report recommended rehabilitation in 1-5 years and replacement in 6-10 years.

Overall, Meeks Bridge is in poor structural condition and is in need of replacement or reconstruction.

3. Alternative Solutions

Four alternative solutions are under consideration for Meeks Bridge:

Alternative 1 – Do Nothing

- Structure remains in an as-is state
- No improvements to current structural state
- Meeks Bridge would be monitored regularly until eventual full closure

Alternative 2 – Rehabilitate the Bridge

- Rehabilitate the superstructure by adding supplementary steel components
- Resurface the substructure and replace the concrete deck

Alternative 3 – Replace the Bridge

- Replace the existing structure with a structure capable of accommodating all vehicles

Alternative 4 – Remove Existing Bridge and Retire Road

- Includes removal of the existing bridge and retirement of the road at the water crossing including construction of a vehicle turn-around on Sparta Line.

3.1. Structural Analysis Screening

3.1.1. Alternative 2 – Rehabilitate the Bridge

In advance of the analysis and evaluation of alternative solutions, a structural analysis pre-screening was conducted to confirm the feasibility of Alterative 2 – Rehabilitate the Bridge.

Based on the screening, it is not considered practical or economically viable to rehabilitate the existing bridge (Alternative 2). Additional rehabilitation work will be required on a recurring basis depending on the extent of the initial rehabilitation work. The following work will likely be required in order to rehabilitate the bridge sufficiently to increase the load posting:

1. Resurfacing substructures: remove 100mm thick concrete from the abutment walls to 25mm beneath the existing reinforcing steel, blast clean, and resurface the substructure with added new reinforcing steel and cast-in-place concrete;
2. Rehabilitate superstructure: adding additional steel components to the existing steel components such as bottom chords, transverse beams and bracings to increase the structural capacity; or alternatively, replace existing steel components with new steel components;
3. Replace concrete deck with new reinforced concrete deck, place waterproofing membrane and protection board, and place asphalt pavement.

Even with the above noted rehabilitation efforts, it is not known whether the bridge can be brought into compliance with current highway loading requirements.

Bridges of this vintage were typically originally coated with red lead paint which is now considered to be a hazardous substance. Any rehabilitation works would disturb the lead paint and require major environmental protection and remediation measures, greatly adding to any cost of work and the potential risk to the local environment.

With rehabilitation, it may be necessary to increase the depth of the lower truss members to achieve the desired capacity increases. This would reduce the freeboard of the existing bridge and add to local flooding concerns.

Based on the above, Alternative 2 – Rehabilitate the Bridge, was not carried forward to the evaluation of alternative solutions as it is considered infeasible.

3.1.2. Alternative 3 – Replace the Bridge

A structural screening analysis was conducted for Alternative 3 (bridge replacement) in order to determine the appropriate replacement span and cross-section in advance of the evaluation of alternative solutions.

It is proposed to use the existing Acrow Port Bruce temporary modular bridge as the replacement structure for Meeks Bridge (if Alternative 3 is selected as preferred) given that a new structure is currently being constructed at Port Bruce and the temporary modular bridge is a suitable structure for the Meeks Bridge location. The Port Bruce temporary modular bridge's length and width can be adjusted to provide various lane widths for traffic and shoulder width for pedestrians. The modular bridge is available in 10-foot increments. Two options for the span of the Meeks Bridge replacement were considered:

- **Option 1 -** 130 ft (39.6 m) span
- **Option 2 -** 140 ft (42.5 m) span

Four cross-section sub-options were considered for each of the span options:

- **Sub-Option A -** 1 traffic lane and additional space for pedestrians
- **Sub-Option B -** 2 traffic lanes (3.5 m) including buffer but no pedestrian space
- **Sub-Option C -** 2 traffic lanes (3.75 m) including buffer but no pedestrian space
- **Sub-Option D -** 2 traffic lanes (3.75 m) including buffer and additional space for pedestrians

Option 2 - 140-foot (42.5 metre) span was selected as the preferred alternative as the new bearings can be located behind the existing abutments and founded on piles or caissons. The existing abutments can remain in place but be modified to allow the Port Bruce bridge to pass over them.

Using a 130-foot (39.6 metre) span (Option 1) would require extensive modification to the existing abutments and this is noted as being a high-risk option as the condition of the existing abutments has not been assessed to determine the potential extents of modification required (noting they are 120 years old).

Neither span option causes a significant change in proposed water levels and both options provide an improvement in hydraulic conditions over existing conditions.

Sub-option B was selected as the preferred cross-section alternative as two 3.5 m traffic lanes is an improvement over existing conditions and pedestrian facilities were not identified as being required since there are no facilities upstream or downstream of the bridge, and there is very little pedestrian activity on the bridge.

Therefore, Alternative 3 is considered to be the best sizing for the Meeks Bridge, Acrow modular bridge, with a 140-foot (42.5 metre) span and 2 traffic lanes (3.5 metres including buffer) but no pedestrian space.

3.2. Analysis and Evaluation of Alternative Solutions

The following technical criteria were established for the analysis and evaluation of alternative solutions:

- **Transportation/Maintenance:** ability to maintain existing access to Sparta Line and improve road geometry
- **Structural:** ability to address structural deficiencies and load limit
- **Hydraulics:** ability to improve hydraulic conditions
- **Natural Environment:** direct and/or indirect impacts on watercourses, fisheries, aquatic habitat, terrestrial ecosystems, and shoreline habitat
- **Socio-Economic Environment:** direct and/or indirect impacts related to property, access and construction staging
- **Cultural Environment:** impact on archaeology, built heritage and cultural landscape resources
- **Cost Estimate:** approximate construction costs.

The alternative solutions have been ranked using the above noted evaluation criteria from least preferred to preferred based on the evaluation scale illustrated in Figure 3-1.

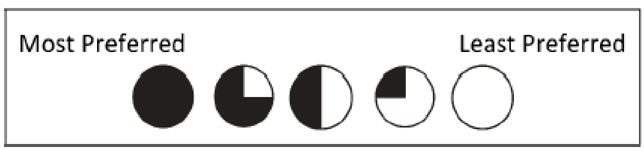

Figure 3-1 : Evaluation Scale

The analysis and evaluation of alternative solutions is provided in Table 3-1. As noted above, Alternative 2 – Rehabilitate the Bridge was not carried forward to the evaluation.

Table 3-1: Analysis and Evaluation of Alternative Solutions

TECHNICAL CRITERIA	Alternative 1 Do Nothing	Alternative 3 Replace the Bridge	Alternative 4 Remove Existing Bridge and Retire Road
Transportation / Maintenance	To ensure public safety, this alternative will eventually lead to the closure of Meeks Bridge and eliminate access to Sparta Line from Union Road (Highway 20). ◔	Maintains access to Sparta Line from Union Road (Highway 20). Provides a two-lane bridge and improvements to the Sparta Line & Roberts Line intersection. ●	Eliminates access to Sparta Line from Union Road (Highway 20). ◔
Structural	Assumes no further work is completed on the existing structure. Existing load limit of 8 tonnes will remain in place. ○	Bridge is replaced with a structure capable of accommodating all vehicles. Current load limit of 8 tonnes is removed. ●	Existing bridge is removed and no replacement structure is provided. ○
Hydraulics	No opportunity to improve current hydraulic conditions. Stream levels will continue to reach the height of the lower part of the existing bridge during high flow events. Significant erosion and ice scour will continue. ○	Opportunity to improve hydraulic conditions with a more shallow bridge deck. The proposed structure will provide approximately a 0.3m reduction in Regulatory water levels due to increased hydraulic capacity under the bridge. New structure can convey the 100-year design flow. ●	Opportunity to improve hydraulic conditions without a bridge in place. ●

TECHNICAL CRITERIA	Alternative 1 Do Nothing	Alternative 3 Replace the Bridge	Alternative 4 Remove Existing Bridge and Retire Road
Natural Environment	No change to existing conditions.High flow events will continue to result in debris from the bridge entering the watercourse, erosion of stream banks, bank scour, and sedimentation impacting the quality of fish habitat and surface water quality.However, no construction impact or permanent removal of vegetation/ habitat.	Given the increased footprint of the bridge compared to existing, permanent vegetation removal in proximity to the creek bank is anticipated (i.e. riparian cover and associated wildlife habitat) and may reduce bank stability.The improvements to the hydraulic capacity of the bridge will reduce the amount of erosion/scour of creek banks, and the introduction of deleterious substances (e.g. road salt and debris) thereby resulting in some improvement to water quality in Kettle Creek long term. A planting plan is recommended to mitigate impacts to the creek bank post construction. Near water work will consider timing windows to avoid sensitive periods for fish.	Bridge removal will result in the defragmentation of aquatic and terrestrial habitats along the creek, improvements to water quality (e.g. reduced road salt) and improved hydraulic capacity to reduce impacts related to frequency of elevated stream levels. Restoration of the road bed at the crossing will improve riparian cover and infiltration/permeability of the surface to help to stabilize creek banks. Overall, this alternative benefits aquatic and terrestrial habitat quality over the long term.
Socio-Economic Environment	No construction impacts.	Moderate construction duration is anticipated. Temporary closure of bridge is required.	Construction impacts include a temporary closure, followed by a full closure.
Cultural Environment	Alternative 1 would result in the complete removal of all identified physical, historical, and contextual values of the subject bridge and would sever the functional and historical association of Sparta Line as a watercourse crossing in this location.	Alternative 3 would result in the complete removal of the subject bridge and physical heritage attributes that were outlined in the Cultural Heritage Evaluation Report (CHER) with the exception of the bridge abutments which will be maintained.Consideration can be given to a sympathetically-designed replacement structure that would continue the historical association as a road crossing in this location as part of a potential mitigation strategy. Additional mitigation measures including the salvage and retention of the subject bridge for reuse at a different crossing, or for use in a commemorative interpretation, would also be considered to reduce impacts. Portions of the study area may require a Stage 2 Archaeological Assessment.	Alternative 4 would result in the complete removal of all identified physical, historical, and contextual values of the subject bridge and would sever the functional and historical association of Sparta Line as a watercourse crossing in this location.

TECHNICAL CRITERIA	Alternative 1 Do Nothing	Alternative 3 Replace the Bridge	Alternative 4 Remove Existing Bridge and Retire Road
Cost Estimate	No cost associated with this alternative. Cost of eventually removing the bridge and retiring road is less that Alterative 3.	Higher cost than Alternative 1 or 4.	Lower cost that Alternative 3. Similar cost to Alternative 1.
Recommendation	Not recommended	**Recommended**	Not recommended

3.3. Preferred Solution

Based on the results of the analysis and evaluation, Alternative 1 and 4 do not provide an opportunity to maintain the existing access to Sparta Line or improve the existing hydraulic conditions. Alternative 4 would result in complete removal of all identified heritage value of the existing bridge. Alternative 1 would eventually lead to full removal. Overall, Alternatives 1 and 4 do not address the problem and opportunity statement. Alternative 2 is not considered feasible.

Therefore, based on the evaluation of alternative solutions, replacement of Meeks Bridge has been identified as the preferred alternative based on the following:

- Addresses the problem and opportunity statement;
- Current load limit of 8 tonnes is removed;
- Opportunity to improve hydraulic conditions and reduces regulatory water levels;
- Minor impacts to vegetation however a planting plan can be developed to mitigate impacts;
- Moderate construction duration; and
- Abutments maintained (identified as having cultural heritage value/interest).

4. Consultation

4.1. Notice of Study Commencement

A Notice of Study Commencement was prepared to inform the public and agencies of the initiation of the Class EA study. It was mailed to approximately 22 agency representatives and stakeholders on February 20, 2020. The notice was also hand delivered to residents within the study area. A copy of the notice is provided in Appendix E.

4.2. Notice of Online Public Information Centre

The Notice of Online Public Information Centre (PIC) was prepared to inform the public and agencies of the opportunity to review the project progress at a virtual PIC. The notice was advertised in the St. Thomas Times Journal on August 25th, 2020, the Aylmer Express on August 26th, 2020 and the Port Stanley Villager on September 4th. The notice was also mailed to approximately 26 residents, agencies and stakeholders. A copy of the notice is provided in Appendix F.

4.3. Kettle Creek Conservation Authority (KCCA)

A Draft Hydraulics report for the Meeks Bridge crossing were prepared which considered existing flows and modifications due to the proposed bridge replacement (see **Section 5.5**). This report together with the Natural Heritage Assessment report were forwarded to the KCCA for their review. An email response was received from KCCA on August 25th, 2020 saying that they had reviewed the draft hydrologic/hydraulic modelling report and that they had no objections or additional comments to add on its content and/or conclusions.

4.4. Online Public Information Centre

Due to COVID-19 and public gathering restrictions in place by the provincial government, an online PIC was held in place of a traditional in-person meeting. PIC display material was available on the County's website for viewing from August 31st to September 18th, 2020. An online comment sheet was available on the project website for members of the public to submit their comments to the project team. A copy of the PIC material and the comments received are available in Appendix F.

Fourteen comments were received in response to the online PIC. The comments received through the online survey are summarized under the following four main headings with an italicized commentary following:

- Support for the replacement of Meeks Bridge
    - *Overall, comments submitted in response to the online PIC generally noted support for the replacement of Meeks Bridge. No comments suggested another option.*
- Meeks Bridge is a preferred route for pedestrians and cyclists travelling to and from Port Stanley
    - *While acknowledging that cyclists will no doubt be present crossing the bridge, within the study area, Sparta Line is not identified or designated as a cycling route*

by the County of Elgin and therefore dedicated cycling facilities are not recommended. Therefore, existing conditions are maintained with the one change that more pavement width is provided allowing vehicles to avoid bicycles more easily.

- Request to make the replacement bridge cyclist-friendly and consider "cycling grade" grating on the bridge deck to improve traction
  - *During detailed design, considerations will be made to ensuring the replacement structure is cycling friendly (i.e. reviewing road surface). One person commenting on the existing Port Bruce bridge (that will be used to replace Meeks Bridge) "The surface in use at present, in its temporary place, makes the bridge very safe for cycling".*
- Several comments were made expressing a concern that an increase in traffic volumes will occur if two traffic lanes are provided across the bridge.
  - *These comments appear to assume that the route will become much faster (more attractive and less safe) once two-way vehicles are allowed on the bridge. However, as part of the reconstruction there is a recommendation to make the Sparta Line/Roberts Line intersection 3-way stop controlled. This will assure that all vehicles will have to come to a stop at the intersection immediately north of the bridge thus assuring that speeds on the bridge will not increase. Furthermore, it was stated in one of the comments that in the current one-lane situation, "I travel that way often and don't find I am constantly waiting for another vehicle" therefore, there is currently little delay offered by the current situation due to the low volumes present. This negligible delay will barely change with one-lane available in each direction, particularly in concert with the 3-way stop control, so therefore it must be concluded that the route does not suddenly become much more attractive from a time/speed perspective and therefore is unlikely to attract significant traffic from parallel routes.*

There were one or two other miscellaneous comments about the curvilinear road alignment present on Roberts Line/Sparta Line, which the County is aware of; however, is not the subject of this project at this time. Another comment talked of not increasing the load limit on the bridge, but if a bridge is to be replaced it needs to be designed to current standards regardless of whether significant truck traffic is present.

4.5. Indigenous Communities

At the onset of the study, the Ministry of Environment, Conservation and Parks (MECP) was contacted to establish the Indigenous Communities that may have interest in this study. Based on the response received from MECP, the following Indigenous Communities were consulted at all key study milestones:

- Kettle and Stony Point First Nation
- Aamjiwnaang First Nation
- Bkejwanong (Walpole Island First Nation)
- Chippewas of the Thames First Nation
- Caldwell First Nation

- Oneida of the Thames First Nation

Comments received from the Indigenous Communities and responses are provided in Appendix G.

5. Description of Proposed Undertaking

5.1. Structure

The Port Bruce temporary modular panel bridge (by Acrow Technology) will be utilized to replace the Meeks bridge superstructure. The Port Bruce bridge is currently a single lane having a 54.8m +/- span, c/c bearings distance of 6.7m and 5.29m +/- wide with an epoxy aggregate anti-skid coated steel deck. The Port Bruce temporary modular bridge's width can be adjusted to provide various lane widths. The bridge's span length can be adjusted in 3.05 metre (10 foot) increments and as such it cannot be reduced to match the existing 38.7 metre (126.97 foot) span of the existing Meeks bridge. Adjusting the width is achieved by purchasing and installing new bridge components from Acrow.

The replacement bridge will have a 140-foot (42.5 metre) span. For a 140-foot span bridge (14 bays at 10 feet), the new span length will be approximately 42.5 metres, which is approximately 3.8 metres longer than the existing 38.7 metre span length. The new bearings will be located behind the existing abutments and founded on piles or caissons. The existing abutments will remain in place but be modified to allow the Port Bruce bridge to pass over them.

The general arrangement drawing for the Meeks Bridge replacement is provided as Figure 5-1.

5.2. Road Construction

As part of the Meeks Bridge replacement, the Trust to Truss width across the bridge will be 7.3 metres. Two ~3.25 metre traffic lanes will be provided over the bridge. Currently Sparta Line on the south approach has two 3.25 m wide lanes but narrows close to the approach to the existing 1-lane bridge. A localized widening of the south approach (~ 20 metres) is required to match the 3.25 m wide lanes. No active transportation facilities will be provided along Meeks Bridge as there is no active transportation connection upstream or downstream of the bridge.

The new bridge will be constructed on the existing road alignment. The design speed of Sparta Line over Meeks Bridge is 50 km/h with a sag curve of k=8.

The guiderail on the northwest corner of the Sparta Line and Roberts Line intersection will be extended and end treatments will be added. End treatments will also be added to the south end of the guiderail on both sides on the road. The grading adjacent to the end treatments will be 3:1 (subject to review in the detail design stage).

The functional design for the Meeks Bridge replacement is illustrated in Figure 5-2.

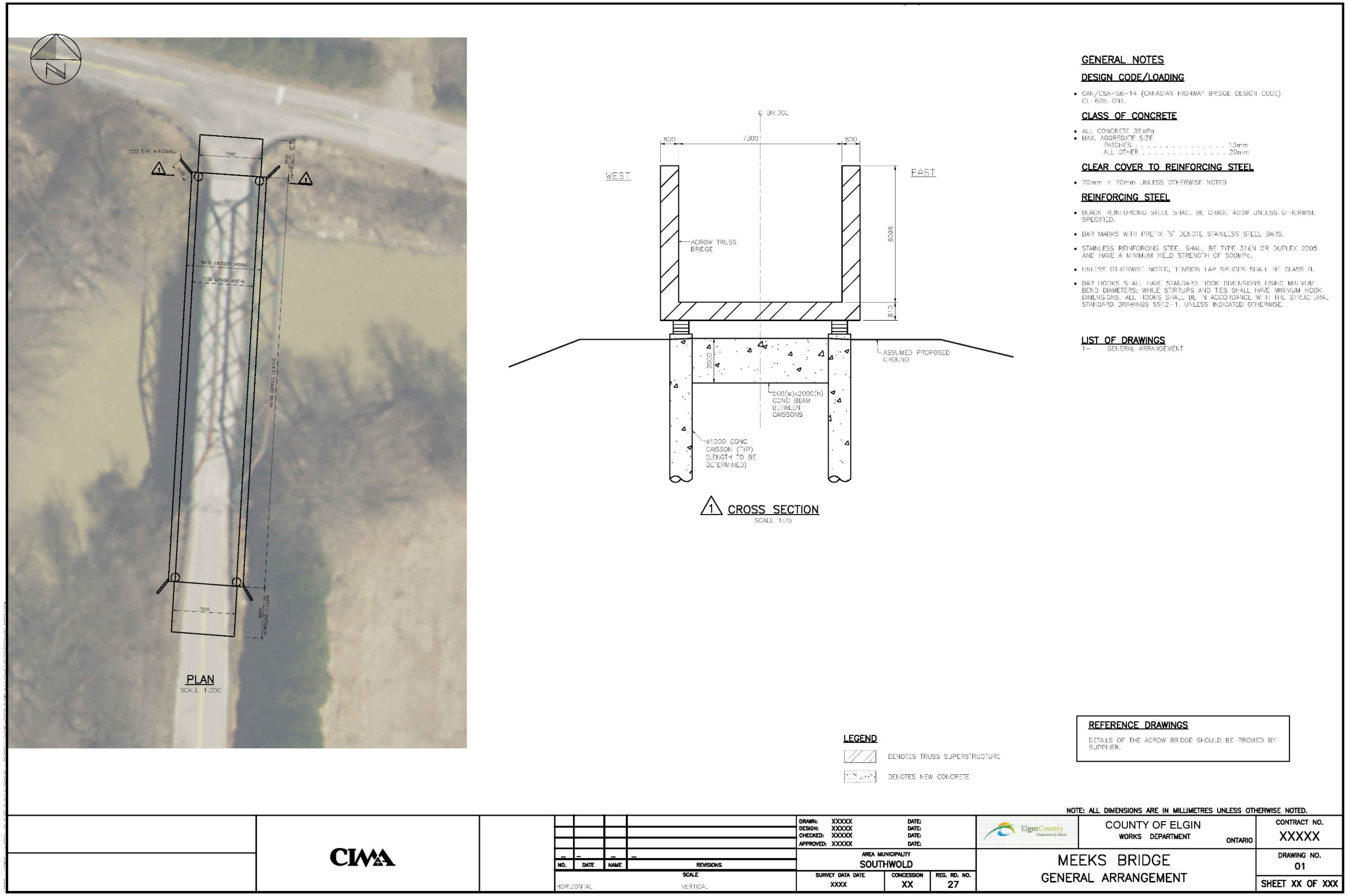

Figure 5-1: General Arrangement

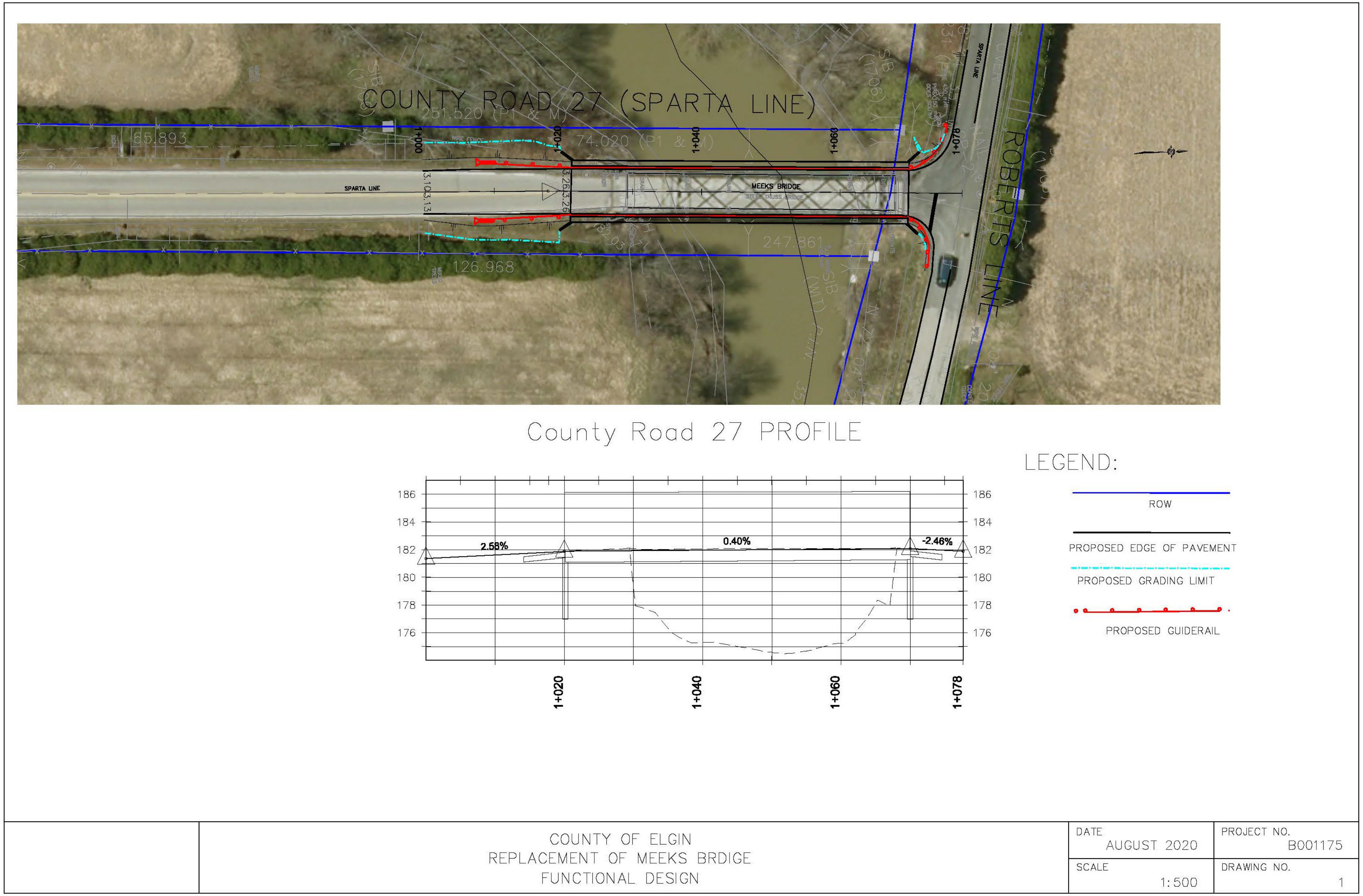

Figure 5-2: Functional Design

5.3. Intersection Configuration

The following alternatives were considered for the traffic control at the Sparta Line and Roberts Line intersection:

- **Alternative A -** Maintain existing (i.e. eastbound approach yield controlled, westbound approach stop controlled, northbound approach free flowing).
- **Alternative B -** East-west movements stop controlled and northbound approach free flowing.
- **Alternative C -** East-west movements free flowing and northbound stop controlled.
- **Alternative D -** All-way stop control.

While traffic counts are not available for the intersection, it was noted that traffic volumes are relatively small, and therefore all four alternatives are anticipated to be viable from a traffic operations perspective. The main issue to be considered when comparing the alternatives are intersection sightlines.

For alternatives A and B, east and westbound drivers must be able to see northbound vehicles approaching on the bridge structure. However, the new bridge structure will likely create more significant sightline obstructions for the eastbound/westbound approaches due to the type of superstructure and the fact that the approach of the bridge structure is proposed to be relocated toward the intersection by approximately 1 metre.

Sightline requirements are higher for existing conditions relative to alternative B, as the intersection sight triangle for yield control is to be established based on a vehicle speed of approximately 30km/h.

For alternative C, northbound drivers must be able to see approaching eastbound/westbound vehicles. While the bridge structure is not anticipated to be a sightline obstruction, the horizontal curvature along Sparta Line is of concern. Given the posted speed of 60km/h, a design speed of at least 70 km/h is assumed. The required intersection sight distance is then 150 metres if a passenger car is used as the design vehicle.

The key issue with alternative C is that roadside vegetation would have to be removed. In addition, regular vegetation control would have to be conducted throughout the spring, summer and fall months.

Sight distances required for all-way stop control (alternative D) are less than for alternatives A, B or C, and the new bridge structure or the existing roadside vegetation will not create sightline obstructions that would require mitigation.

Based on the above, the intersection of Sparta Line and Roberts Line is recommended to be converted to all-way stop control. This configuration is the least problematic with respect to additional sightline constraints created by the superstructure of the new Meeks bridge. In addition, no modification of roadside vegetation is required.

5.4. Natural Environment

The Meeks Bridge replacement makes use of a prefabricated bridge that can be assembled and lifted in place to avoid the need for in-water works and minimize impacts to Kettle Creek and associated fish habitat. As well, the staging and storage of materials associated with removal of the existing bridge and assembly of the new bridge will occur within the existing roadbed and avoid intrusion into adjacent vegetation communities and associated wildlife habitat. The existing bridge abutments will be modified to accommodate the new bridge but remain in place to avoid disturbance to the creek bank. Dewatering is likely to be required during construction of the new bridge supports (caissons).

The proposed construction disturbance area (CDA) is limited to areas of road widening that are required along Sparta Line and Roberts Line and a widening of the turning radius of Sparta Line at the north end of the bridge to accommodate the approach to the wider bridge deck. As well the bridge will occupy a wider footprint on the south side of the creek and some grading will be required to accommodate the bridge connection to the existing roadbed. The footprint of construction will be accommodated within the existing road right-of-way (ROW), including the necessary grading.

Direct impacts are identified to private trees part of a hedgerow planted along the ROW and to the edges of vegetation communities within the identified areas of disturbance. Additional trees in proximity to construction have the potential to be harmed through compaction of soils and/or unintended conflict with construction machinery. No plants listed as threatened or endangered were found within or in proximity to the CDA during field investigation, therefore no impacts to plant SAR are identified.

Wildlife assemblages with potential to use the CDA and surrounding areas are common/secure species tolerant of anthropogenic disturbance. During field investigations, a number of nests were found on the existing bridge structure including those of species protected under the Migratory Birds Convention Act (MBCA). Where works are proposed to occur during the active season for wildlife, there is also potential for incidental impacts to wildlife entering the construction zone. No SAR were identified during field investigations; however, recommendations are made in the following section to further consider potential for impacts to SAR bats during detailed design.

Indirect impacts associated with construction of the new bridge (grading, exposed soils in proximity to the creek, dewatering) also have the potential to degrade water quality of Kettle Creek and impact aquatic habitat.

Construction related impacts can first be mitigated by minimizing the extent of disturbance wherever possible through coordination of all project related planning, including design, staging and scheduling. The extent of construction related activity can be effectively isolated and secured from adjacent natural lands through the installation of erosion and sediment control measures, to mitigate the potential for silt and sediment entry into surface water features and adjacent lands. Construction exclusion and tree protection fencing will also mitigate impacts to trees and vegetation communities associated with soil compaction and accidental intrusion of construction equipment (both overhead and at grade). To some extent, these means of isolating of the work area will also serve to discourage the entry of wildlife into the work zone thereby minimizing risk of incidental encounter of wildlife during construction. Additional mitigation measures to reduce impacts to the natural environment are provided in Section 6.

5.5. Hydraulics

A hydraulic assessment was conducted for the bridge replacement to assess how the proposed design effects water surface elevation and overall hydraulic performance. Given that the proposed configuration does not involve the removal of existing abutments, the proposed bridge will have the same clear span as the existing bridge of 36.8 metres.

While the existing bridge had a trapezoidal truss, which reached a height above the roadway of 5.24 metres at its peak, the modular bridge is a rectangular truss which reaches a height of 3.85 metres. This change in truss shape and height would still reduce the overall amount of truss that the bridge has.

Additionally, the modular bridge has a depth between the road surface and bottom truss (soffit) of 0.81 metres, while the existing bridge had a depth of 1.21 metres. This difference, while keeping the bridge deck surface at existing levels, would provide a higher soffit.

Table 5-1 and Table 5-2 below provides a summary of the water surface elevation at the cross section directly upstream of the bridge, as well as the freeboard, clearance, bridge criteria and performance.

Table 5-1: Water Surface Elevation, Freeboard and Clearance

Description	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	Regional
Water Surface Elevation (m)	178.89	179.51	179.9	180.31	180.58	180.86	182.72
Change in Elevation from Existing (m)	0	0	0	0	-0.01	0	-0.29
Top of Road (Low Point): 180.56 m							
Freeboard (m)	1.67	1.05	0.66	0.25	-0.02	-0.3	-2.16
Top of Road Velocity (m/s)	-	-	-	-	-	-	0.81
Soffit Elevation: 181.25 m							
Clearance (m)	2.36	1.74	1.35	0.94	0.67	0.39	-1.47

Table 5-2: Summary of Criteria Requirements and Performance

Criteria	Criteria Value	Proposed	Meets Criteria (Yes or No)
Passing Design Event	25 Year	100 Year	YES
Freeboard for Design Event (25-year) (m)	0.3	0.25	NO
Clearance for Design Event (25-year) (m)	0.3	0.94	YES
Relief Flow - Depth of Water Over Road (Regional Storm) (m)	0.3 (max)	2.16	NO
Velocity (Regional) (m/s)		0.81	
Velocity x Depth Over Road (Regional) (m^2/s)	0.8 (max)	1.76	NO

The proposed design will reduce the Regional Water Levels approximately 0.29 metres compared to existing conditions. This is due to its comparative increased deck length, and therefore truss length/blockage.

The proposed design will pass the 25-year storm and increase the clearance of the bridge approximately 0.4 metres compared to existing conditions. While the bridge will still continue to not pass the freeboard or relief flow height and velocity x depth criteria, it will reduce them both. Therefore, the hydraulic conditions associated with the proposed design will be an improvement over existing conditions.

5.6. Heritage

A Heritage Impact Assessment (HIA) was conducted to evaluate the potential impacts of the bridge replacement on the identified cultural heritage attributes of the existing Meeks Bridge and to establish mitigation measures. The Heritage Impact Assessment report is provided in Appendix H.

The preferred alternative includes the complete removal and replacement of the superstructure and minor modifications to the substructure of Meeks Bridge which will result in impacts to the heritage attributes identified in the Cultural Heritage Evaluation Report (CHER) (see Section 2.3.1).

As the retention of the subject bridge following rehabilitation was demonstrated to be unviable, the replacement of the subject bridge with a sympathetically-designed replacement structure should be considered. According to available documentation, the replacement bridge is anticipated to be an Acrow modular truss bridge. While not a true replacement of the Double Warren truss, the geometric truss design, open sight lines, scale and massing of the Acrow truss are comparable and should be carried forward to detailed design. While removal of the existing superstructure would significantly impact the identified heritage attributes, the anticipated retention of the cast-in-place concrete substructure and use of an Acrow truss replacement superstructure is considered to be a suitable means of reducing the impacts to the historical and contextual value of the crossing.

Where feasible, consideration should be given to relocating the 1900 Double Warren truss for use at another crossing to carry pedestrian or cycling traffic. If adaptive reuse is determined to be infeasible based on structural deterioration or other technical constraints, consideration should be given to salvaging structural steel elements of the superstructure for use in commemorative or interpretive displays at the bridge site or in another appropriate location, if desired by the County of Elgin. Potential elements that could be salvaged and incorporated in future commemorations include a portion of the truss structure, the intact Dominion Bridge Co. builder's plaque on the northwest end post, or the lattice railing with decorative cast iron posts.

The existing cast-in-place concrete abutments are anticipated to be retained with modification in the reconstructed bridge. Where feasible, the concrete removals required to install the replacement Acrow truss bridge should be limited to the extent practicable, as the concrete abutments are identified cultural heritage attributes.

Prior to modifications of the subject bridge, the following mitigation measures should be considered and implemented, where feasible:

- The bridge and setting should be professionally documented. The CHER (Unterman McPhail Associates 2019) and HIA completed for the Meeks Bridge is sufficient documentation;
- Salvaged elements of the superstructure should be retained for inclusion in a new structure at another crossing, in future conservation work, or for commemorative displays, where feasible; and
- Consideration should be given to a commemorative strategy, such as developing a plaque in the location of the bridge. In this respect, an interpretive historical plaque/commemoration could be prepared including historical information, images and featuring salvaged heritage components from the subject bridge, where feasible. Heritage staff at the County of Elgin should be consulted for input regarding this commemoration.

5.7. Property

No additional property is required for the replacement of Meeks Bridge.

5.8. Utilities

Aerial hydro facilities on the north side of the Sparta Line and Roberts Line intersection will be protected during construction in order to avoid temporary relocation. No utility relocation is anticipated

5.9. Construction Staging

The replacement Acrow bridge will be dismantled at its current location (Port Bruce) and transported to the Meeks Bridge site. Sparta Line will be closed and the existing Meeks Bridge will be removed. The Acrow bridge will be assembled within the work zone and will then be lifted into place by a crane located at the north end of the Meeks crossing. The assembled bridge will be rotated clockwise over the northwest corner of the intersection to limit impact to trees.

All materials will be stored on the road and staging will also be done from the existing roads. Sparta Line and Roberts Line will be closed at the bridge site during construction activities.

5.10. Construction Cost

The estimated total cost of replacing Meeks Bridge is $2,000,000. Road improvements associated with the preferred design account for approximately $120,000 of this total and the bridge replacement is approximately $1,880,000.

6. Mitigation and Commitments to Further Work

Through the Class EA process, the preferred design has mitigated negative impacts to the environment where possible. Where impacts cannot be entirely avoided, mitigation measures and commitments for detailed design and construction have been developed (Table 6-1).

Table 6-1: Commitments to Further Work

Category	Commitment to Further Work
Natural Environment - Vegetation	• Minimize the construction disturbance area to the extent feasible. • Develop an Erosion and Sediment Control (ESC) Plan and install ESC measures prior to construction. These measures should be periodically inspected and maintained during construction to prevent entrainment and transport of sediment into adjacent vegetation communities. • Do not allow heavy equipment (wheeled or tracked) outside of the delineated construction and staging areas. • Complete an arborist assessment during detailed design to identify tree impacts and develop a tree preservation plan with appropriate protection measures for tree resources. • Restrict vegetation removals to outside of the breeding bird season (identified by Environment Canada as April 1 to August 25 for the study area) to ensure compliance with the Migratory Birds Convention Act. • Restrict tree removals to outside of sensitive periods for Bat Maternity Roosting (May 1 to August 31). • Ensure that temporarily disturbed areas within vegetation communities are adequately restored post-construction with native species (seed or nursery stock), and conditions are monitored for effectiveness of restoration and making adjustments as necessary, which may include management of nuisance and invasive species. • Maintain existing drainage patterns to avoid changing character of vegetation communities and associated wildlife habitat.

Category	Commitment to Further Work
	• Locate site maintenance, vehicle washing and refuelling stations where contaminants are handled at least 30 m away from natural features. • Ensure that a Spills Management Plan (including materials, instructions regarding their use, education of contract personnel, emergency contact numbers) is on-site at all times for implementation in event of an accidental spill during construction. • An emergency spill kit should be kept on site and a response plan developed to respond immediately in the event of a spill.
Natural Environment - Wildlife	• Minimize habitat removal through minimizing of access, staging, storage and grading footprints to the extent feasible, and strategic placement of these footprints within manicured or previously paved/disturbed areas. • Stabilize exposed soils promptly post-construction or during any gaps in construction timing to prevent sediment transport, and restore disturbed areas with native and non-invasive vegetation after construction. • Limit tree removal wherever possible, including dead-standing trees that may provide additional wildlife habitat. • Where construction is planned to coincide with seasons of wildlife activity ensure the construction areas are delineated by fencing that can serve to exclude wildlife from entering the work areas to the extent possible. • Limit the presence of exposed material piles that could attract Snapping Turtle to nest during the active season. • Ensure that a Specialist Environmental Monitor is available in the event that wildlife is encountered in the work zone in order to safely document, handle and remove wildlife at risk of conflict with construction activities.

Natural Environment – Aquatic Habitat	• No in-water work is proposed for the project. Should the construction method change during detailed design, mitigation for aquatic habitat and fisheries will need to be reviewed.
	• Locate site maintenance, vehicle washing and refuelling stations where contaminants are handled at least 30 m away from the watercourse.
	• An erosion and sediment control (ESC) site specific plan should be developed that details the ESC plans and responsibilities to include the following, at minimum:
	  ○ Ensure that construction activities are adequately contained with erosion and sediment control (ESC) measures;
	  ○ Intercept sediment laden drainage as close to the source as possible;

Category	Commitment to Further Work
	◦ The contractor should have available on-site supplemental ESC measures that can be utilized should additional ESC measures be warranted. • Locate stockpiles and staging areas at least 15 m away from top of bank/slope. • Ensure that disturbed soils are stabilized and restored as soon as possible after disturbance. • Provide construction monitoring on site to ensure that erosion and sediment controls are working effectively. • Implement measures for managing water being pumped/diverted from excavations, such that sediment is filtered out prior to the water entering a waterbody. For example, pumping/diversion of water to a settling basin or other filtration system (filter bag, settling tanks, etc.), located in a vegetated area, a minimum of 30 m from existing wetlands or aquatic habitat. • Ensure dewatering activities are addressed in a site specific Environmental Management Plan to address alterations to baseflow and discharge of water back to surface features (from both a quantity and quality aspect).
Natural Environment – Species at Risk	• At this time, no SAR or SAR habitat is known to be in conflict with the proposed preferred alternative and methods outlined for the replacement of Meeks Bridge. When the details of tree removal/pruning of edge trees part of wooded vegetation communities or of mature, open grown trees outside of vegetation communities are better understood (i.e. detailed design) further consideration should be given to address the potential for impacts to bat SAR where suitable habitat is present.
Archaeology	• The Study Area exhibits archaeological potential. If impacted, these lands require Stage 2 archaeological assessment by test pit/pedestrian survey at five metre intervals, where appropriate, prior to any proposed construction activities. • Should the proposed work extend beyond the current Study Area, further Stage 1 archaeological assessment should be conducted to determine the archaeological potential of the surrounding lands.
Heritage	• The existing cast-in-place concrete abutments are anticipated to be retained with modification in the reconstructed bridge. Where feasible, the concrete removals required to install the replacement Acrow truss bridge should be limited to the extent practicable, as the concrete abutments are identified cultural heritage attributes.

Category	Commitment to Further Work
	• Salvaged elements of the superstructure should be retained for inclusion in a new structure at another crossing, in future conservation work, or for commemorative displays, where feasible. • During detailed design, consideration should be given to a commemorative strategy, such as developing a plaque in the location of the bridge. In this respect, an interpretive historical plaque/commemoration could be prepared including historical information, images and featuring salvaged heritage components from the subject bridge, where feasible. Heritage staff at the County of Elgin should be consulted for input regarding this commemoration.
Utilities	• Overhead utilities on the north side of the Sparta Line and Roberts Line intersection will be protected during construction in order to avoid temporary relocation.

A

Appendix A

B

Appendix B

C

Appendix C

D

Appendix D

E

Appendix E

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Appendix F

G

Appendix G

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