County of Elgin

Meeks Bridge Replacement Municipal Class Environmental Assessment

Project File Report

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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.

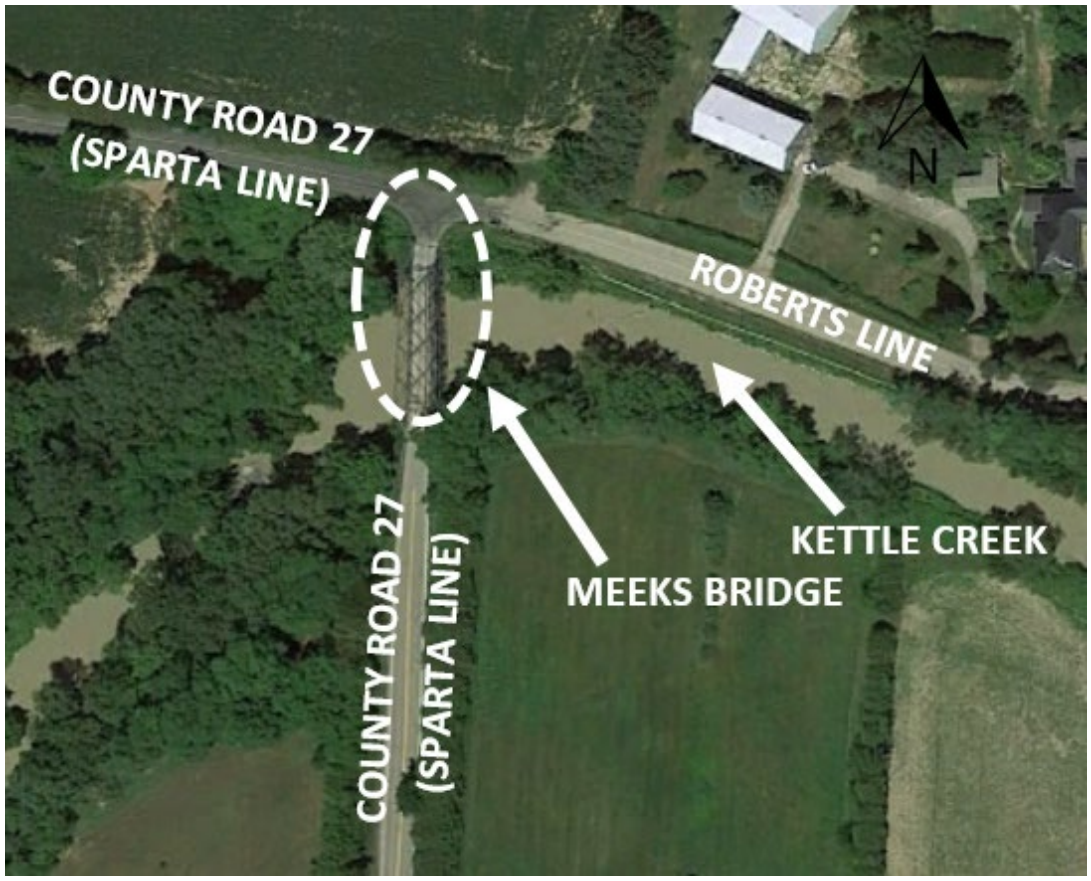


Figure 1-1: Study Area

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.

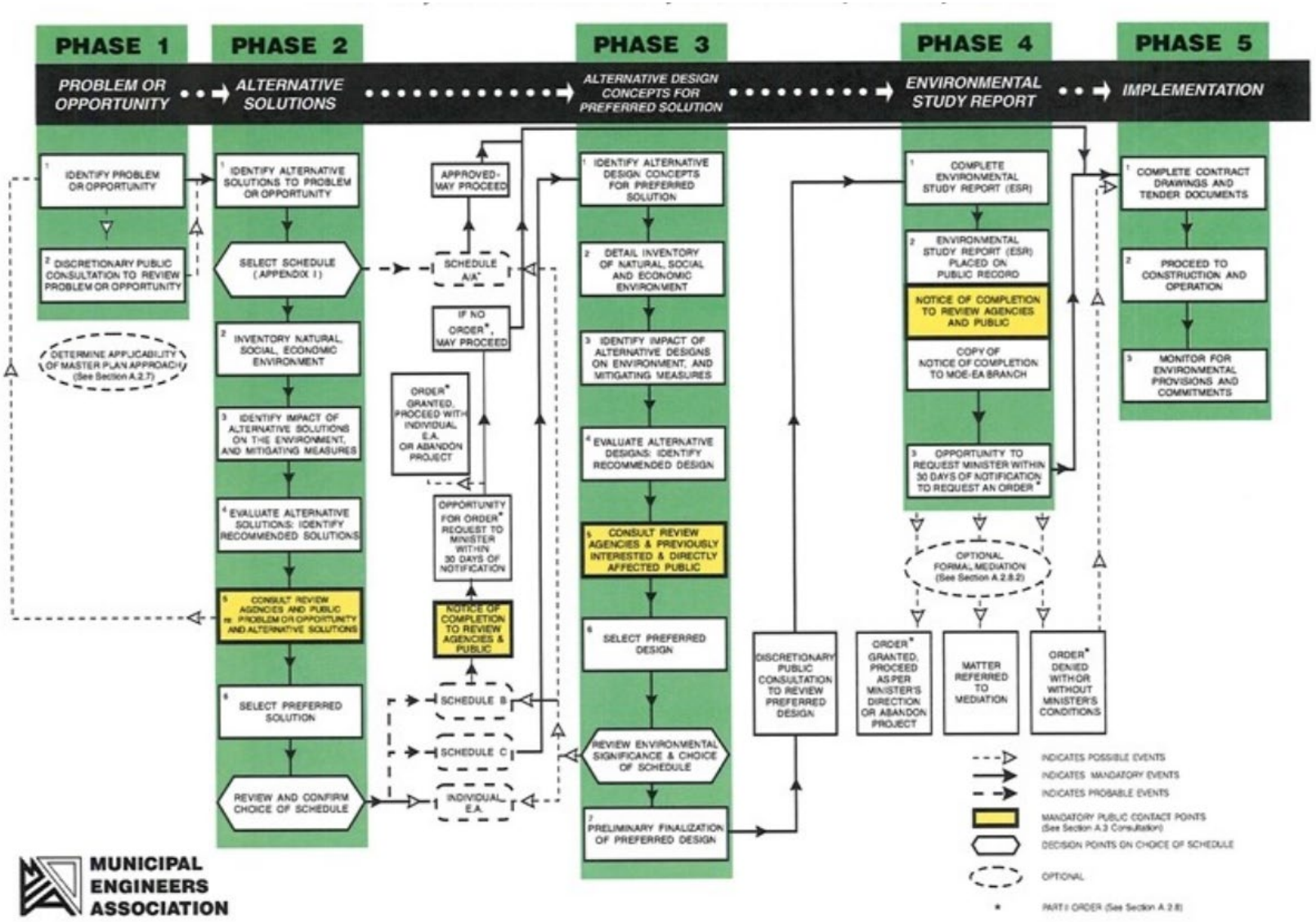


Figure 1-2: Municipal Class EA Planning and Design Process

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).

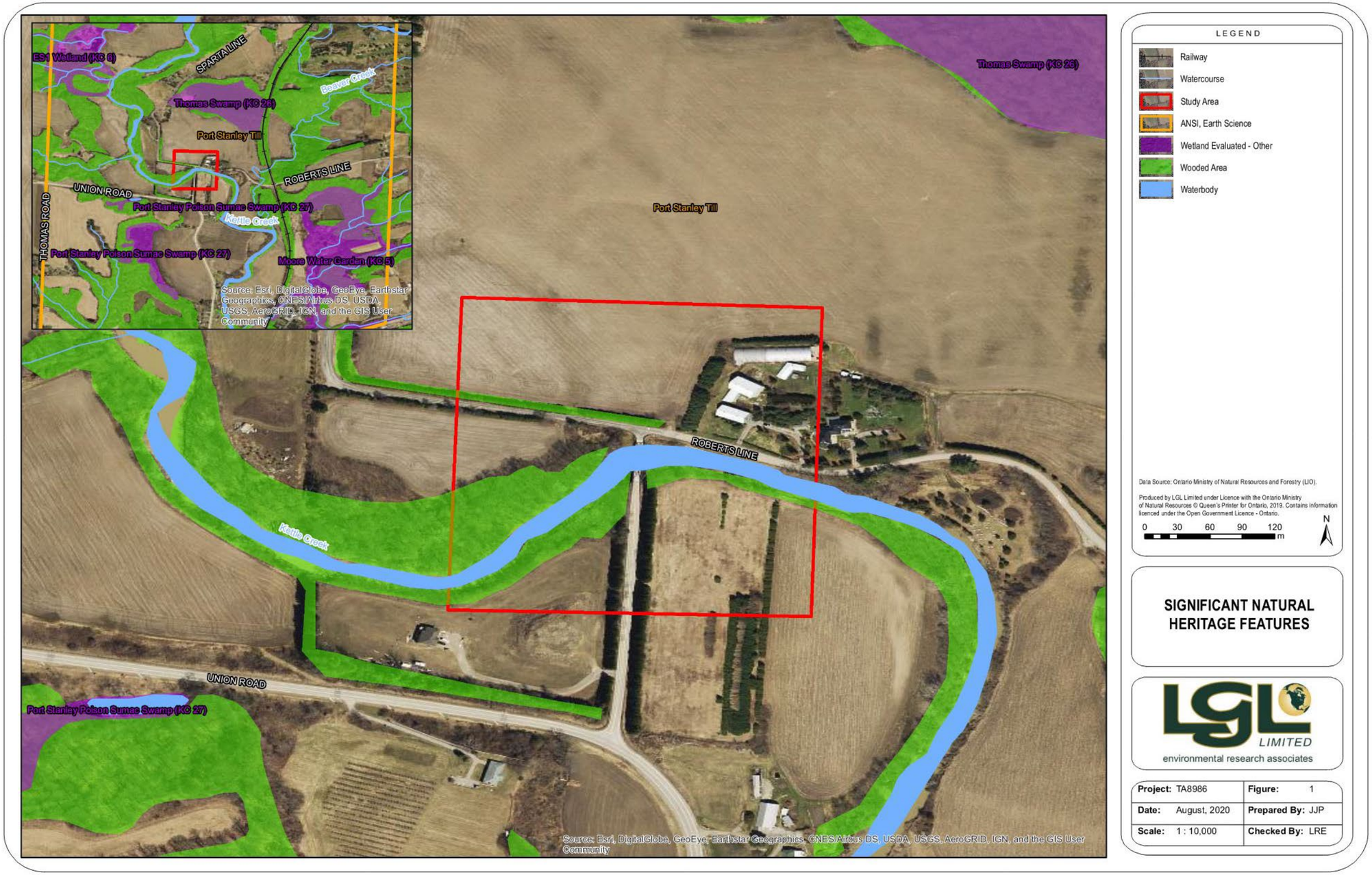


Figure 2-2: Existing Natural Heritage Features

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

Retrieved: Tue, 08 Sep 2020 13:48:22 GMT

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

T (years)	2	5	10	25	50	100
5 min	141.2	183.8	211.6	246.8	273	299.1
10 min	87.6	113.9	131	152.7	168.8	184.9
15 min	66.3	86.1	99	115.4	127.5	139.6
30 min	41.3	53.4	61.4	71.5	78.9	86.4
60 min	25.7	33.2	38.1	44.3	48.9	53.5
120 min	16	20.6	23.7	27.5	30.3	33.1
360 min	7.6	9.8	11.2	12.9	14.2	15.6
720 min	4.8	6.1	7	8	8.9	9.7
1440 min	3	3.8	4.3	5	5.5	6

75 Year MTO IDF Lookup, Climate Change, 2085

2	5	10	25	50	100
5.4%	4.1%	3.5%	3.0%	2.7%	2.4%
6.1%	4.7%	4.0%	3.4%	3.1%	2.8%
6.6%	5.0%	4.3%	3.8%	3.4%	3.0%
7.8%	5.7%	5.1%	4.4%	3.8%	3.6%
8.9%	6.8%	5.8%	5.0%	4.5%	4.1%
10.3%	7.3%	6.8%	5.8%	5.2%	4.4%
13.4%	10.1%	8.7%	6.6%	6.0%	6.1%
14.3%	10.9%	11.1%	8.1%	8.5%	7.8%
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.

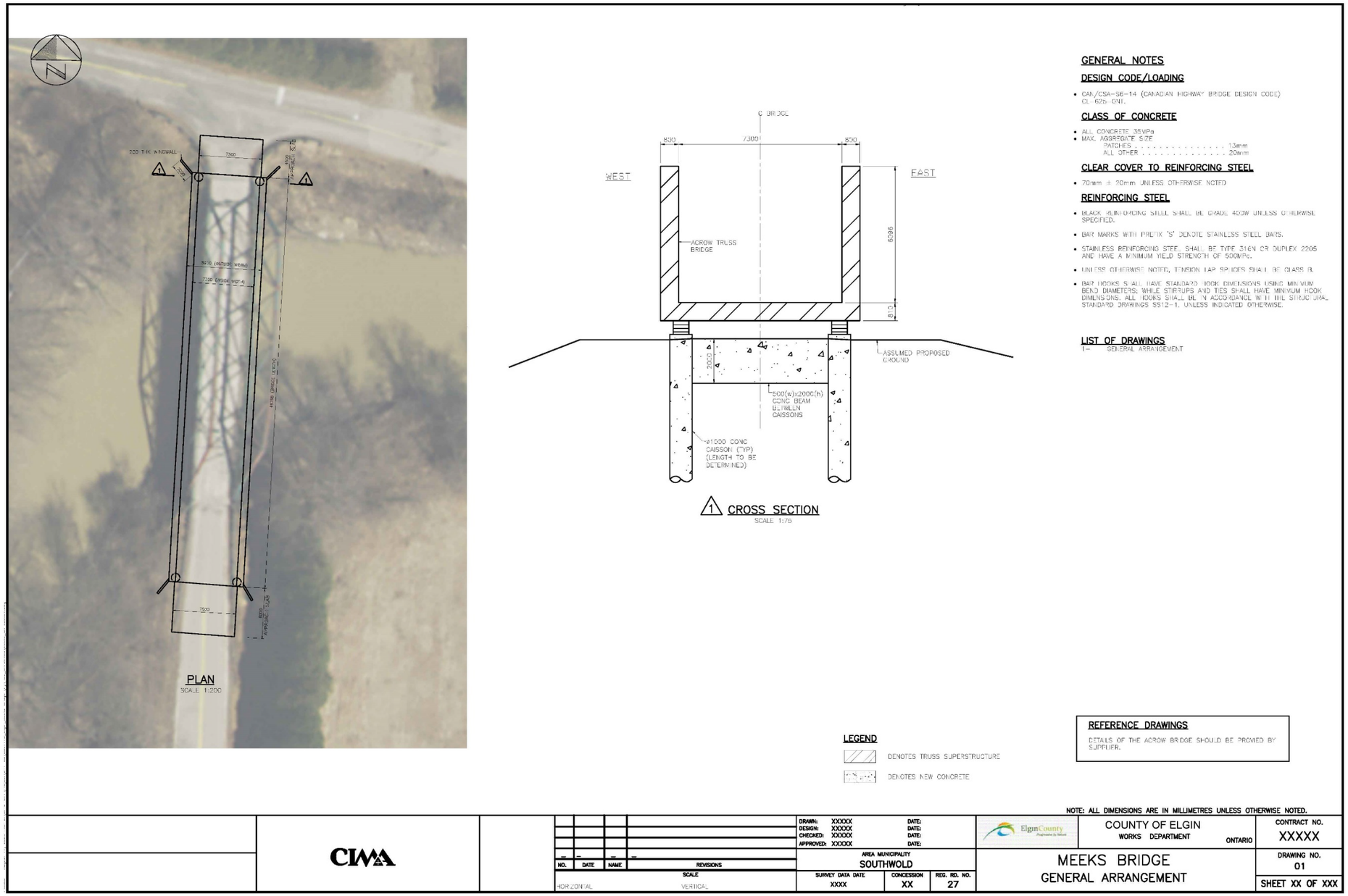
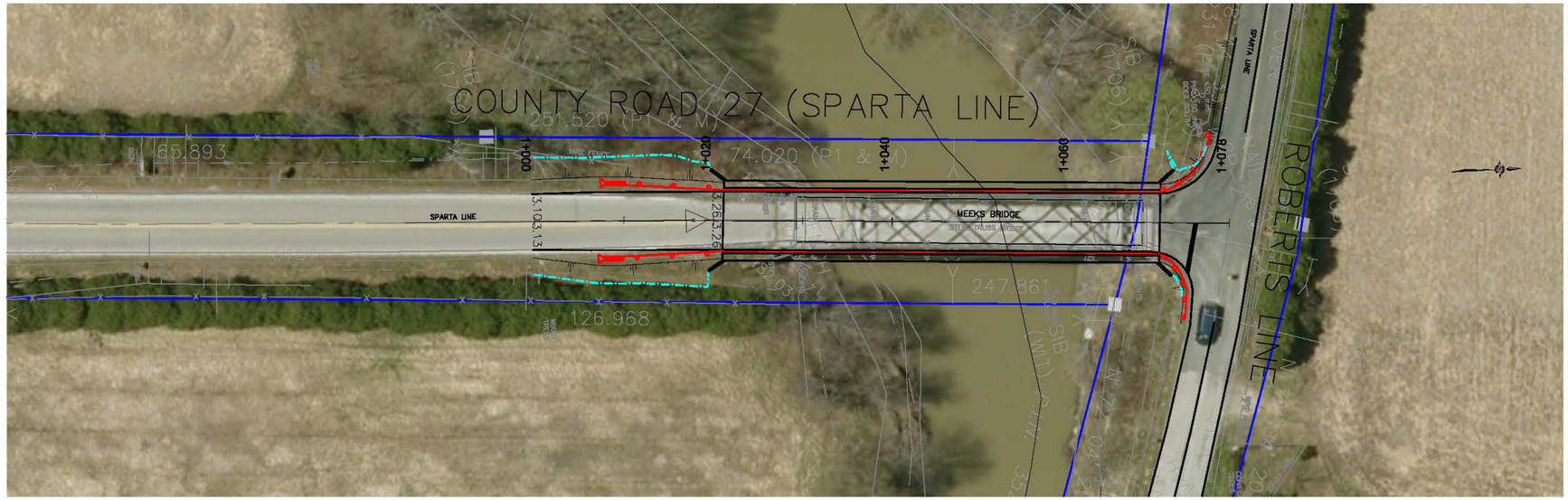
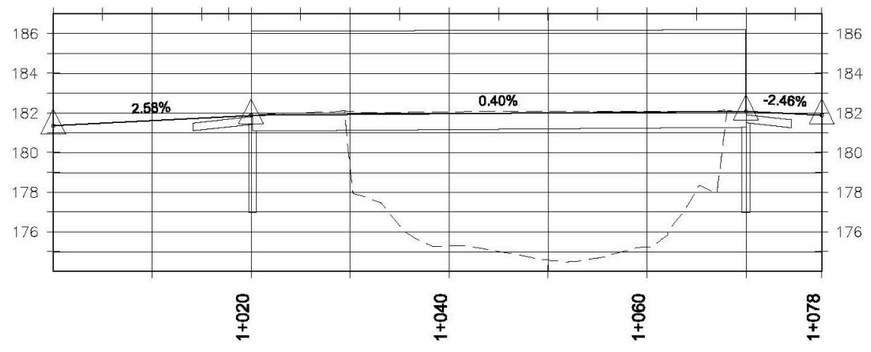


Figure 5-1: General Arrangement



County Road 27 PROFILE



LEGEND:

ROW

PROPOSED EDGE OF PAVEMENT

PROPOSED GRADING LIMIT

PROPOSED GUIDERAIL

	COUNTY OF ELGIN REPLACEMENT OF MEEKS BRDIGE FUNCTIONAL DESIGN	DATE AUGUST 2020	PROJECT NO. B001175
		SCALE 1:500	DRAWING NO. 1

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

CULTURAL HERITAGE EVALUTION REPORT

MEEKS BRIDGE, COUNTY No. B-24
(LOT 16, RANGE 1, NORTH OF UNION ROAD
GEOGRAPHIC TOWNSHIP OF SOUTHWOLD)
SPARTA LINE COUNTY ROAD 27

TOWNSHIP OF SOUTHWOLD
COUNTY OF ELGIN, ONTARIO

September 2019

Prepared for:
County of Elgin

Prepared by:

UNTERMAN McPHAIL ASSOCIATES
HERITAGE RESOURCE MANAGEMENT CONSULTANTS

CULTURAL HERITAGE EVALUTION REPORT

MEEKS BRIDGE, COUNTY NO. B-24
(LOT 16, RANGE 1, NORTH OF UNION ROAD
GEOGRAPHIC TOWNSHIP OF SOUTHWOLD)
SPARTA LINE COUTY ROAD 27

TOWNSHIP OF SOUTHWOLD
COUNTY OF ELGIN, ONTARIO

September 2019

Prepared for:
County of Elgin

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1.0 INTRODUCTION

1.1 Project Description

The County of Elgin retained Unterman McPhail Associates, Heritage Resource Management Consultants, to undertake a Cultural Heritage Evaluation Report (CHER) for Meeks Bridge, County No. B-24, located over Kettle Creek on Sparta Line County Road 27 (CR 27) in the Township of Southwold. The County of Elgin plans to replace Meeks Bridge with a modular panel bridge currently being used as a temporary bridge structure in Port Bruce. A formal Schedule 'B' MCEA is to be undertaken.

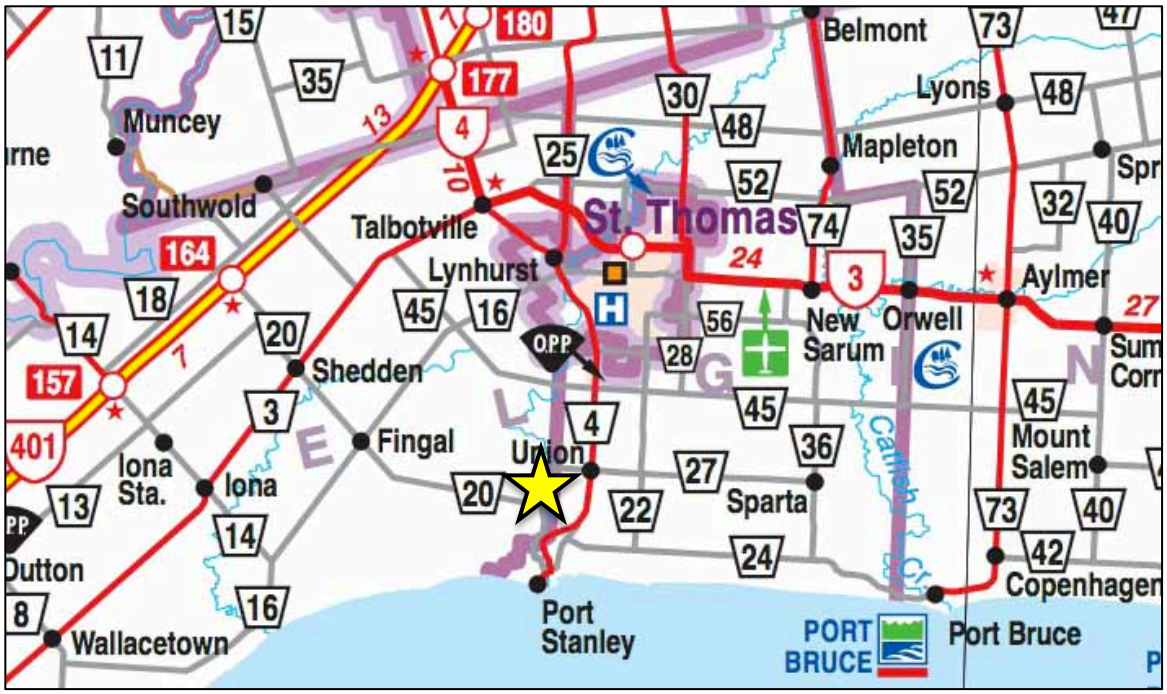

Figure 1. Location of Meeks Bridge, Sparta Line CR 27, Township of Southwold, County of Elgin, Ontario [Ontario Ministry of Transportation. 2018. Southern Ontario Road Maps].

A *Municipal Heritage Bridges Cultural, Heritage and Archeological Resources Assessment Checklist* (revised April 11, 2014) concludes a CHER is required for Meeks Bridge ***(Appendix B)***.

Meeks Bridge, County No. B-24, is a single span, steel double-intersection Warren truss (Double Warren) with verticals. The bridge forms part of the county road network and is located on Lot 16, Range 1, North of Union Road, Township of Southwold approximately 0.25 km north of Union Road (or County Road 20). The bridge has been situated over Kettle Creek at this location since 1900.

This CHER includes a historical summary of the bridge, a description of the bridge and its setting, an evaluation of the cultural heritage value of the bridge and a summary of cultural heritage value mitigation recommendations. The site was evaluated using the criteria set out

under Ontario Regulation 9/6 (O.Reg. 9/6), which were 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 *Ontario Heritage Act* (OHA). O. Reg. 9/06 describes the three criteria as design value or physical value, historical value or associative value, and contextual value.

Appendix A contains historical map, photographs and a drawing. Appendix B includes a *Municipal Heritage Bridges Cultural, Heritage and Archeological Resources Assessment Checklist* (revised April 11, 2014) and Appendix C includes a bridge survey form with current photographs of the structure and the setting. Appendix D includes Section E2, Cultural Heritage Resources of the County of Elgin OP (Consolidated February 2015).

For the purposes of this report, Meeks Bridge is considered to run in a north to south direction.

1.2 Heritage Recognition

The County of Elgin owns Meeks Bridge. The Township of Southwold does not have a municipal heritage committee and does not maintain a municipal heritage register under the OHA. The Township confirms Meeks Bridge is not municipally designated or listed on a municipal heritage register under the OHA. Furthermore, it is not included on a local heritage inventory of cultural heritage resources or a municipal register adopted under the OHA.

There are no examples of a steel through truss, double-intersection Warren trust, included on the Ontario Heritage Bridge List (June 2019) maintained by the Ministry of Tourism, Culture and Sport (MTCS).

The subject bridge has not been identified or recognized as a provincial, federal or international cultural heritage resource. It is not commemorated provincially, federally or internationally with a plaque or protected by a heritage easement

The website HistoricBridge.org, which is a private citizen's initiative, offers professional, detail-oriented photo-documentation, information, and preservation advocacy for all types of historic bridges, principally in North America. It describes Meeks Bridge, referred to as Sparta Line Kettle Creek Bridge, as an excellent example of a double-intersection Warren truss configuration.[1]

[1] Historic.Bridges.org, Sparta Line Kettle Creek Bridge.
Access: <https://historicbridges.org/bridges/browser/?bridgebrowser=ontario/spartalinewest/> (August 2019).

2.0 HISTORICAL SUMMARY

2.1 County of Elgin

In 1788, the lands of present day County of Elgin were divided between the Districts of Hesse and Nassau. When the Province of Quebec was separated into Upper and Lower Canada in 1792, the Hesse District became the Western District and the Nassau District was renamed the Home District. As the population grew new districts were created and boundaries changed. The London District was created in 1800 and comprised the lands within the existing counties of Middlesex, Huron, Norfolk and Oxford. The London District was reduced in size with the formation of Talbot, Brock and Huron Districts in the 1830s.

The *Division of Counties Act* (1850) eventually abolished all districts and replaced them with counties. The former London District became Middlesex and Elgin counties. Initially, the two counties were administered together; however, in February 1852, Elgin received Provisional County status with St. Thomas selected as the county seat. Full county status was achieved the following year. At that time the County of Elgin contained the Townships of Aldborough, Dunwich, Southwold, Yarmouth, Malahide, Bayham and South Dorchester as well as the Village of Vienna and the Village of St. Thomas. St. Thomas separated from the county as an independent government in 1861.

In January 1998, local restructuring created seven municipalities within the County of Elgin including the Townships of Southwold and Malahide.

2.2 Township of Southwold

The Township of Southwold was originally constituted as part of the County of Middlesex in the District of London in 1800. It was formally incorporated in 1850 as part of Middlesex County and then became one of the inaugural townships in the County of Elgin in 1852.

2.2.1 Nineteenth Century Development

Colonel Thomas Talbot (1771-1853), a prominent military man and colonizer in Upper Canada, became Lieutenant-General Simcoe's secretary in Upper Canada in 1792. After leaving Simcoe's staff by 1794 and resigning his commission in 1800, he began farming at the mouth of Kettle Creek. In 1803, the Crown gave Talbot a land grant of 5000 acres in Dunwich and Aldborough townships (then part of Middlesex County) in return for populating it with British settlers. Talbot settled at Port Talbot and he became the Crown Land Agent for a large expanse of land that became known as the Talbot Settlement, which stretched from Sandwich Township at the Detroit River to Middleton Township in Norfolk County. As District Road Commissioner, Talbot was responsible for survey and the construction of the Talbot Road that supported settlement.

Southwold Township was opened for settlement in 1792 as part of the Talbot settlement; however, the earliest settlers, many United Empire Loyalists, came around 1809. Mahlon

Burwell surveyed the Township of Southwold. All of the township lots were taken up by 1817.

The Township of Southwold held its first council meeting in 1850 and a town hall was built in Fingal, a thriving manufacturing centre at that time. In 1857, Fingal was bypassed by the London and Port Stanley Railway and went into an economic decline. The nearby town of St. Thomas took over as the leading county centre.

Local roads were opened in the Township of Southold in the early 1800s. "Given" roads were special roads did not follow the surveyed right-of-ways of the concession roads and sideroads usually to avoid natural obstacles that interfered with the imposed survey grid. The right-of-way (ROW) for a 60-ft. wide "given road" over Kettle Creek was laid out under Report 102, dated April 3, 1833, on Lot 16, Range 1, North of Union Road, Township of Southwold. By-Law 102, dated November 15, 1844, for a 60-ft., given road was then approved on November 15, 1844. The road provided a connection from Union Road on the south side of Kettle Creek to the road immediately north of the creek. It is reasonable assume the first bridge structure was of timber construction and there may have been replacements at this location from 1833 to the 1900.

As shown on the *Tremaine Map* (1864) and the *Illustrated Historical Atlas* (1874), Sparta Line ran east to west through Yarmouth Township, through the village of Sparta and into the Township of Southwold north of Kettle Creek and then turned in a southerly direction to cross Kettle Creek in Lot 16, Range 1, North of Union Road and connect with a road that became Union Road (CR 20) between Fingal and Port Stanley.

The Crown granted all 100 acres of Lot 16, Range 1, North of Union Road in the Township of Southwold to Jesse Zavitz in March 1837. The Zavitz mill was located on Beaver Creek, a tributary of Kettle Creek, to the east of the bridge crossing over Kettle Creek in Lot 16 ***(Appendix A)***. Sparta Line provided access to the mill and the bridge on Sparta Line over Kettle Creek became known as the Zavitz Bridge. In the later 19th century. John Meeks acquired ownership of the part of Lot 16, Range 1, North of Union Road and the subject bridge became known as Meeks Bridge in the early 1900s.

The Union Road (CR 29) was opened through the Township of Southwold from Fingal to Port Stanley as the principal road to the Port Stanley harbour, an important shipping port for farmers and merchants. In the 1850s, the road was a trail; however, as traffic increased it was gradually improved under the Union Road Company. Initially, it was proposed to gravel the road from the west end of the Selbourn Bridge (Warren Street, Port Stanley) over Kettle Creek, northerly through Fingal to the rear of the lots on the north side of Talbot Road East. However, many of the residents on the North Branch of the Talbot Road wanted the Union Road project extended northerly to the rear of the North Branch of the Talbot Road. The Southwold Township Council, private residents and business owners acquired company stock and a construction contract was let. Unfortunately, the contractor encountered numerous difficulties and four years later the road still had not been improved. The company petitioned the County of Elgin Council in both 1855 and 1858 for an

extension of time to complete the road and the Southwold Township Council provided a loan. In 1857, the company indicated the economic depression that had followed the Crimean War contributed to its lack of financing to undertake work. The road company failed and management of the Union Road project was returned to the Township of Southwold during the 1860s.

By the early 1870s the Canada Southern Railroad by-passed Fingal some three miles north of the community and created the hamlet of Shedden. Better economic times in the 1890s did not revive the economies of Fingal or Port Stanley. Consequently, the Talbot Road from Fingal to St. Thomas eventually superseded the Union Road to Port Stanley as the main transportation route in the area and the Union Road became a more local road.

2.2.2 Twentieth Century Development

Topographic maps from the 20th century indicate Southwold Township continued to be essentially rural in character ***(Appendix A)***. The Kettle Creek Conservation Authority (KCCA) was incorporated in 1965 by a Provincial Order of Council (OC-1116/65) to address municipal concerns regarding deforestation, erosion and sedimentation of watercourses, wetland loss, and declining quality and quantity of water resources.

Currently, the Township of Southwold is a rural municipality. Its communities include, but are not limited to the township seat of Fingal, Iona Station and Shedden. The Township supports a large number of fruit and vegetable producers and participates in the Erie Shores Wind Farm. Manufacturing, agriculture and business services characterize its industrial base. The municipality recorded a slight population change from 4,494 in 2011 to 4,421 in 2016.[2]

2.3 Meeks Bridge, County No. B-24

By-Laws for right-of-way (ROW) for Sparta line through Lot 16, Range 1, North of Union Road, Township of Southwold were approved in 1833 and again in 1844.[3] The road provided a connection from Union Road on the south side of Kettle Creek to the road immediately north of the creek. It is reasonable to assume the first bridge structure was of timber construction. By the late 1800s, the bridge was known as the Zavitz Bridge after the Zavitz family who were adjacent landowners. Traditionally, bridges were usually named after nearby landowners.

[2] Census Profile, 2016 Census, Southwold, townshi0{Census Division], Ontario and Ontario [Province]. Access: --<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=3534024&Geo2=PR&Code2=35&Data=Count&SearchText=southwold&SearchType=Begins&SearchPR=01&B1=All&TABID=1> (September 2019).

[3] Elgin County, County Road 27, Plan No. 276-1-89, Sheet No. 9, 1989; and,
Misc. Excerpt of Plan showing Lot and Concession, Meeks Bridge, Roads noting Given Road, By-Law #102, Nov, 15, 1844. No date

In 1882, the County of Elgin appointed a County Engineer, James A. Bell, to attend to all county works as required by statute and/or order-in-Council. The county engineer was responsible for all work plans, specifications and estimates and superintending all works and improvements and constructions belonging to County and to attend County Council meetings. As well the county engineer was to visit and inspect all county bridges and works, and report to Council and to carry out council and committee directions as required.[4] Bell refers to replacing the Zavitz Bridge 1887 and repair to its approaches in 1888.[5] In 1894, Elgin County By-Law No. 525 indicated the County had assumed the Zavitz Bridge in January 1888.[6]

In 1899, Bell reported the Zavitz Bridge, described as being the next bridge above the Selbourn on Kettle Creek needed to be replaced.[7] In January of the following year, Bell prepared a report for the county council that described the existing Zavitz Bridge and made a recommendation for a new one span, steel bridge. Bell noted,

> *The Zavitz Bridge over Kettle Creek, which is the next bridge above the Selbourn, should also be rebuilt. This bridge consists of two spans of the Queen Truss pattern, one span 75 feet and the other 60 feet, with a central pier in the creek. This bridge should be made of one span, and would require to be about 140 feet in the clear. I would recommend steel bridges on concrete abutments…*[8]

In January 1900, the Public Improvements Committee reported the county engineer had been instructed to prepare plans and specifications for the rebuilding of the Zavitz Bridge and to advertise for construction tenders. The superstructure of the new bridge was to be steel, the foundations concrete and the floors either stone or brick. The Public Improvements Committee was empowered to receive tenders and award bridge contracts.[9]

By June 1900, bridge plan and specifications for a steel superstructure, solid floor and a substructure of concrete had been completed. Tenders for the foundation work on the new Zavitz Bridge were received the bidders included:

Ponsford Bros.	*$2.670.00*
G. A. Ponsford	*$2,529.00*
A, J. Brown	*$3,844.00*
Patterson, Ellis & Whelihan	*$3,890.00*
G. C. Bulmer	*$2,250.00*[10]

[4] County of Elgin By-Law No. 364 (June 8, 1882).
[5] Elgin Council Minutes, County Engineer's Report (January 25, 1887) 48; and, Report of the Public Improvement Committee (June 7, 1888) 51.
[6] County of Elgin By-Law No. 525, June 7, 1894.
[7] Elgin County Council Minutes, County Engineer's Report (January 23, 1900) 75.
[8] Ibid., Public Improvements Committee (January 25, 1900) 71.
[9] Ibid.
[10] Ibid., 75.

The G. C. Bulmer tender was the lowest; however, upon making inquiries, the Committee decided to award the foundation contract to the next lowest tenderer, which was G. A. Ponsford. [11]
Four bids were received in response to the County tender for the steel superstructure for the Zavitz Bridge. The bidders were:

Hamilton Bridge Co'y	*$4,790.00*
Dominion Bridge Co'y	*$4,280.00*
King Bridge Co'y	*$6,441.00*
King Bridge Co'y (Pin Connected)	*$5,580.00*[12]

The Dominion Bridge Company being the lowest bidder was awarded the contract for the steel fabrication.

Construction on the Zavitz Bridge had not commenced by June 18, 1900; however, in November 1900, a Special Committee, which had the power to engage a professional expert to report as soon as possible on the condition of all concrete abutments erected in connection with county bridges, reported to Council that the committee had visited the Zavitz Bridge while under construction and that is was "*highly satisfied with the concrete work in progress at the time'*.[13]

County Engineer James A. Bell reported on November 30, 1900, that the Zavitz Bridge had been completed with the exception of the rail guards on the approaches.[14] The associated construction costs for the Zavitz Bridge were noted as:

Contract for abutments	*$2,529.00*
Contract for superstructure	*$4,280.00*
Concrete floor	*$365.70*
Filling approaches and gravel	*$112.00*
Paid for right of way	*$5.00*
Inspector	*$52.00*
Making a total of	*$7351.00*[15]

In 1904, James Meeks, the adjacent landowner submitted a claim to the County of Elgin saying the waters of Kettle Creek at Zavitz Bridge had damaged his property. The Public Infrastructure Committee noted the bridge site had been inspected and it was recommended the county engineer raise the Zavtiz Bridge by 2 ft. (0.61 m) to address the issue.[16] The committee recommended no further action with regard to the claim by James Meek. Bell reported in November 1904 that,

[11] Ibid., 76
[12] Ibid., 76.
[13] Ibid., Special Session Re: Concrete Inspection (Adopted November 23, 1900)
[14] Ibid., County Engineer's Report, Special Session Re: Concrete Inspection (November 30, 1900) 78.
[15] Ibid.
[16] Ibid., Public Improvement Committee Report (June 11, 1904) 70.

> *The Zavitz Bridge over Kettle Creek which was struck by ice in a spring freshet has been raised up two feet. This necessitated the raising of the approaches for a considerable distance and the raising of the concrete foundations, the cost was $329.74'.*[17]

In 1908, the Public Improvements Committee reported another complaint from James Meek and his solicitors for damage caused by a flood on Kettle Creek at the Zavitz Bridge. The committee recommended the County not pay Meek for the damage.[18]

The topographic map (1910) shows a metal bridge located over the Kettle Creek at the current Meeks Bridge ***(Appendix A)***. In 1929, the County Road Commission reported Meeks Bridge had new concrete floors and had been strengthened with a steel joist.[19]

Meeks Bridge was painted in 1946.[20] In 1959, the Road Committee recommended the Ontario Department of Highways (DHO) inspect Meeks Bridge.[21] The DHO London representative had completed his inspection by May.[22] In June, the DHO indicated to County Council it would subsidize 50% of the cost to straighten the Kettle Creek channel at Meeks Bridge.[23] In 1963, the DHO representative addressed the County Road Committee about the channel improvements at Meeks Bridge.[24] Minutes of the Road Committee in 1964 reported the diversion of Kettle Creek at Meeks Bridge was completed.[25]

Meeks Bridge was reportedly repainted in 1963.[26] In 1966, its weight limit was noted as 20 tonnes.[27] In 1978, concrete maintenance was completed for the structure.[28] Over the years, the weight limit was lowered to 18 tonnes and is currently set at 8 tonnes.

In 1983, it was recommended the entire steel structure of Meeks Bridge should be repainted. By 1984, the handrail had been repainted and a partial priming coat had been applied to the superstructure. In 1985, the repainting of the steel structure, except for the underside, was completed. In 1994, the bottom chord of the truss on the upstream side of Meeks Bridge was reported as being bent, probably due to trapped ice or debris during high flow of the creek. At the same time the clearance of the bridge was posted as 4.3 m.[29] A new cable rail was installed on the bridge in 1997. Vehicular damage on the southeast corner was repaired with a new railing and post in 1999.[30]

[17] Ibid., County Engineer's Report (November 14, 1904) 67.
[18] Ibid., Public Improvement Committee Report (June 1908) 73.
[19] County of Elgin Council Minutes, County Road Committee (November 1929) 87.
[20] Ibid., County Road Committee Minutes (November 1946) 93.
[21] Ibid., County Road Committee Minutes (April 23, 1959) 2.
[22] Ibid., (May 7, 1959).
[23] Ibid., (June 8, 1959).
[24] Ibid., (December 10, 1963) 2.
[25] Ibid., (1964)
[26] Ibid., County Road Committee Minutes (January Session, 1964) 4.
[27] County of Elgin By-Law 1916, Schedule 2 (January 20, 1966).
[28] County of Elgin Road Department Bridge Inspection, Road #27, Meeks Bridge, #24. n.d.
[29] MIG Consulting Engineers, Meeks Bridge. November 1994.
[30] Ibid.

2.4 Bridge Type: Steel Truss

Steel truss bridges are categorized into three types based on the location of the deck or travel surface in relation to the truss superstructure. In a pony truss or half through truss the travel surface is located between two parallel superstructures that are not cross-braced at the top. In a through truss the travel surface passes through the superstructure that is connected with overhead lateral bracing above the deck. In a deck truss the superstructure is entirely below the travel surface of the truss and is not visible to the traffic crossing the bridge. Generally, pony trusses, which are smaller and lighter structures, are used to cross narrow spans while the through truss and deck truss types are used for longer spans.

In southern Ontario most bridges built in the 19th century were of timber construction, either of King and Queen post trusses for longer spans and simple beam for shorter structures. Due to cost, few iron or metal trusses were built on roads in Southern Ontario in the 1870s and 1880s. Steel truss bridges began to appear at a greater rate on Ontario roads in the mid-1880s. In the 1890s, improved production methods had brought the cost of steel down to that of wrought iron, thus making steel bridges more economical and more widely available for townships and counties to use. The truss designs from this period, particularly the Pratt and the Warren truss that dominated the early 20th century bridge construction, continued to be commonly used into the 1930s. A double-intersection Warren truss was less commonly used. Due to the demand for steel trusses, several specialized bridge companies were established locally and provincially.

Canadian companies such the Hamilton Bridge Company, Hamilton (1872) and the Dominion Bridge Company, Montreal (1881) were of particular importance as well as the Ontario Bridge Company, Toronto and the Canadian Bridge Company, Walkerville. In later years. Other smaller and more local or regional companies quickly entered the rapidly growing business of fabricated steel bridges. Almost all the steel used in the bridge construction in Ontario was fabricated in the United State. The Carnegie Steel Company of Pittsburg, Pennsylvania dominated the field. Many of the first steel bridges were constructed for railways; however, road bridges were also constructed. The first all steel highway bridge in Ontario dating to 1885 carried Dundas Street over the Bronte Creek.

Typically, a bridge fabricator constructed its product on abutments built by local contractors and then the deck was installed. The use of metal trusses eliminated piers in the river and provided a longer life service for a lower cost. By the beginning of the First World War, there was a shift to the construction of steel road bridges to address increasing traffic volume on the road. An important development with steel road bridges was the replacement of a timber deck with reinforced concrete slab deck after 1900. The pony truss bridge with its deck between the top and bottom chords and no top lateral bracing proved easy to erect and was relatively inexpensive. It found widespread application, proving particularly useful for shorter spans. Many were constructed in the first part of the 20th century. The stronger through trusses were used in applications requiring longer spans or carrying heavier traffic. In 1917, the Ontario Department of Public Highway issued *General Specifications for Steel Highway Bridges*.

Pratt and Warren truss bridges were the most commonly used steel through truss designs. The span length dictated which of the two designs would be utilized in a cost effective way with regard to the amount of material required. Bridge suppliers optimized the Warren truss with additional vertical members and /or double-intersection designs that were statically indeterminate. British engineers, James Warren and Willoughby Monzoni patented the Warren truss in 1848. The original form of the truss comprised a series of equilateral triangles. The diagonals set between parallel chords carried both compressive and tensile loads. Verticals were later added to provide bracing for the triangular web system.

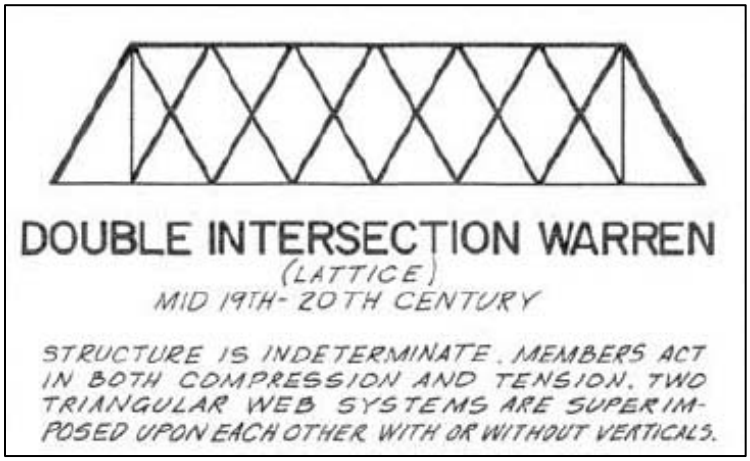

Figure 2. Illustration of a Double-intersection Warren truss configuration [Historic American Engineering, Record, National Park Service, Truss Identification: Bridge Types, 1974; revised Oct. 1976].

The Warren truss and its variants were widely built throughout North America from the mid 1800s into the 20th century The double-intersection Warren truss ***(Figure 2)***, a subtype of the Warren truss, consists of two triangular truss systems that are superimposed upon each other, with or without verticals. Its design displays a distinctive crosshatched appearance and in profile it appears one triangular web system has been superimposed upon another. This type of truss often has riveted connections and usually it does not have verticals.[31] Depending on the configuration the main structural members act in compression and in tension. The purpose of overlapping the diagonals was to increase stiffness and load carrying capacity.[32]

The steel through truss, double-intersection Warren truss, is considered to be a relatively rare bridge type. Character-defining features of the steel through truss, double-intersection Warren truss, bridge include:

- the parallel top and bottom chords;
- diagonal members, floor beams, stringers, struts;

[31] Nathan Holth, An Introduction to Historic Bridges. Historic Bridges of Michigan and Elsewhere. Access: --<http://historicbridges.org/info/intro/index.htm> (August 2019).
[32] Parsons Brinckerhoff and Engineering and Industrial Heritage, *A Context of Common Historic Bridge Types.* NCHRP Project 25-25, Task 15 (Prepared for the National Cooperative Highway Research Program, Transportation Research Council, National Research Council, October 2005) 3-43.

- method of connection, riveted or pinned;
- and portal features (e.g., struts, bracing); and
- vertical members as an additional character-defining feature of the subdivided Warren truss.[33]

Either a rivet or a pin connection was used for the metal truss members of early steel bridges. Riveted connections became the preferred bridge assembly technique in the 20th century until replaced by bolted connections in the post Second World War period. Pin and riveted connected steel truss bridges dating to the late 1800s and early 1900s are now rare in Ontario although once there were many.

Unlike most other types of bridges, truss structures retain a degree of mobility allowing them to be moved and re-erected if there are no longer required at their original location.

2.5 Bridge Designer/Builder

2.5.1 County Engineer James A. Bell

The County of Elgin's engineering department undertook the design and maintenance of public works within the county. County Engineer James A. Bell (1882-1927) was responsible for the design and construction of the Meeks Bridge in 1900.[34]

James Anthony Bell (1851-1929) was born on a farm in Lobo Township, Middlesex County, to parents who emigrated from Paisley, Scotland to Upper Canada in the 1830s. He received his early education at schools in Lobo Township and Chatham before taking up the study of land surveying as an apprentice to W.G. McGeorge of Chatham. Bell was registered as a Provincial Land Surveyor in 1875. He moved to St. Thomas in 1876 and began the practice of land surveying and civil engineering.

By the mid 1880s, Bell had built a successful general practice in surveying and municipal engineering. In 1885, Bell with A.W. Campbell, surveyed the Lyndhurst area into residential lots for the St. Thomas Real Estate Company.[35] As was common at the time, he pursued private commissions and public appointments concurrently. James Bell, who became the County Engineer in 1882[36], held this post for 45 years. He also served as town engineer and later as the city engineer for St. Thomas from 1882 to 1891 and from 1896 to

[33] Ibid.
[34] Unterman McPhail Associates. *Cultural Heritage Evaluation Report, Edison Bridge, County No.B-45, Vienna, Municipality of Bayham, County of Elgin, Ontario.* (Prepared for Spriet Associates London, Ontario and County of Elgin. February 2016). The biographical information on James A. Bell includes from material at the Elgin County Archives: "James A. Bell passes", *Dutton Advance*, (July 4, 1929) and "James A. Bell, Builder of Bridges, Roads, Waterworks Plants", *St. Thomas Times-Journal* [?], no date; and, George A. McCubbin, "The Late Jas. A Bell", *Association of Ontario Land Surveyors*, (1930).
Access: --<http://www.aols.org/sites/default/files/Bell-J.A.pdf> (January 2016).
[35] Hugh Joffre Sims, *Sims's History of Elgin County*, Volume III (Elgin County Library, St. Thomas: 1988) 107-108.
[36] County of Elgin By-law No. 364 (June 8, 1882).

1911. Additionally, the Canada Southern Railway retained Bell in the early 1880s to survey new railway lines in Southwestern Ontario and to fill the post of the Canadian resident engineer on the construction of the company's cantilever bridge at Niagara Falls.

Bell developed an expertise in the design and construction of road bridges that was applied extensively within the St. Thomas-Elgin area and in neighbouring counties. Throughout his long career bridge construction evolved from wood and wrought iron structures to steel and concrete. He embraced new technologies in bride building. In 1907, Bell began to build girder span road bridges in Western Ontario[37] and was responsible for three concrete arch bridges built in the County of Elgin in 1908.[38] The Lynhurst Bridge at St. Thomas, one of the three built under Bell's direction, was the longest recorded span for a concrete arch bridge in Canada when it was built in 1908.[39] Later, Bell was involved, with his son Fred Bell, in the construction of the high-level Tansley Bridge and Sixteen Mile Creek Bridge on the Dundas Highway in Halton County.

Bell's experience in St. Thomas exposed him to a wide variety of municipal projects including the construction of a trunk sewer, sewage disposal works, waterworks system and storage basin and paving of a long main street, first with cedar blocks then with bricks and finally with asphalt. In 1902, Bell was put in charge of the St. Thomas Street Railway.[40] Bell and his associates applied their engineering expertise further afield and constructed waterworks or pavements in Aylmer, Tillsonburg, Paris, Milton, Port Stanley, Lambeth, Tilbury, Forest, Rainy River, Oakville and North Bay. Additionally, Bell became well known in municipal drainage practice. He was a pioneer in the good roads movement in Ontario and the roads in the County of Elgin were noted as being among the best in the province during his tenure as county engineer.

Mr. Bell was elected as a member of the Canadian Society for Civil Engineers in 1887 and served as a member of the council. He was also a member of the Association of Ontario Land Surveyors and the Association of Professional Engineers. In recognition of his contributions to railway engineering, James A. Bell was inducted into the North America Railway Hall of Fame in 2006.[41] Under the category of Railway workers and Builders, Bell was noted as being of local significance as a land surveyor, mapmaker, county engineer, and city engineer of St Thomas, Ontario and assistant engineer on the Niagara or MCR Cantilever Bridge.

During his practice years Bell had a number of apprentices who became well known in the profession. Of note are A.W. Campbell and W.A. McLean. In 1896, Campbell was

[37] C.R. Young, "Bridge Building", *The Engineering Journal* (June 1937) 490.
[38] Concrete Arch Bridges In Canada", *The Contract Record and Engineering Review*, Volume 33 (March 26, 1919) 277.
[39] Young, 492; and, "Concrete Arch Bridges In Canada", 277.
[40] Emily Bergen, *History of the St. Thomas Street Railway* (St. Thomas Public Library, July 2013).
[41] Wikipedia, List of North America Railway Hall of Fame Inductees.
Access: --<https://en.wikipedia.org/wiki/List_of_North_America_Railway_Hall_of_Fame_inductees> (September 2019).

appointed good roads commissioner for the province of Ontario, and four years later, he became the deputy minister of public works in Ontario. Campbell moved to Ottawa in 1910 as deputy minister of railways and canals for Canada and later, federal commissioner of highways. McLean joined the provincial government in 1896 and served in variety of roles including instructor in road construction, chief engineer and deputy minister of the Department of Pubic Highways from 1916-1923.

James Bell married Katherine (Kate) Darrach, whose family came from Islay in the Inner Hebrides, in 1882. Kate Darrach taught at the Wellington Street School in St. Thomas before her marriage. Together James and Kate Bell had five sons – George E., Arthur R., Frederick [Fred] A., Walter A. and William D. Fred Bell, the third son of Kate and James Bell, joined his father in private practice and upon his father's retirement from county service in 1927, succeeded him as county engineer. The youngest son Walter A. Bell became one of the most a distinguished members of the Geological Survey of Canada.

2.5.2 Dominion Bridge Company Ltd.

The Toronto Bridge Company began operating in Toronto in 1879. It obtained the right to manufacture, steel as well as build iron and steel bridges in Canada. In 1882, it renamed the Dominion Bridge Company (DBC) and moved its operations to Lachine, Québec to be near head offices of the major Canadian railway companies in Montreal and the transportation provided by the Lachine Canal and the St. Lawrence River.

The DBC attracted business from the expanding railway business and from municipal governments for small highway bridges. It's first major bridge project was a cantilever railway bridge over the Saint John River, Saint John, New Brunswick (1882-1884). In 1886 it built a continuous truss bridge over the St. Lawrence River at Lachine, Quebec. In 1890, it completed a second bridge across the St. Lawrence River between Coteau and Valleyfield, Quebec. Over the next 20 years the DBC built some of the largest and most important bridges in Canada. Starting in the 1880s, it began fabricating steel-framed buildings and in the 1890s, it progressed to the production of a wide variety of industrial equipment and innovative structures such as the Trent Canal Lift Lock, Peterborough (1902-07) and at the beginning of the 20th century, the company diversified into the manufacture of equipment for hydroelectric power stations. In 1910, the company joined the Canadian Bridge in Walkerville, Ontario and formed the St. Lawrence Bridge Company to build the Quebec Bridge. In the 1920s, the DBC set up metal fabricating companies. It became a multinational corporation in the 1970s. DBC played a major role in steel bridge construction for over 100 years.

The company declared bankruptcy in 1998 and was bought by the ADF Group and the Solidarity Fund of the FTQ. It was sold again in 2003 to Cintube, a former partner of the

Dominion Bridge Company, specializing in precision bending, tubes, pipes, beams and profiles.[42]

2.5.3 Carnegie Steel

The structural steel on Meeks Bridge bears the name 'Carnegie' marked with a distinctive font with a stylized "N" that dates from the 1890s and 1900s.[43]

Andrew Carnegie built his first steel mill in the mid 1870s in Braddock, Pennsylvania. With the profits Carnegie and others bought other nearby steel plants. Carnegie Steel Company was formed in 1892 with its headquarters located in Pittsburgh, Pennsylvania. The company was sold to the United Steel Company in 1901 as a subsidiary. Manufactured steel continued to be marked with the name Carnegie for some years. The company name was changed to the Carnegie-Illinois Steel Company in 1936.

2.5.4 G. A. Ponsford

G. A. [George Alfred] Ponsford was a local contractor and mason based in St. Thomas, Ontario. Three of his brothers had formed the Ponsford Bros., a construction contracting and brickmaking business in St. Thomas in 1893. County Council minutes in the late 19th century and early 20th century record Geo. A. Ponsford as a frequent tenderer and successful bidder on county bridge projects with regard to concrete foundation work.[44] G. A. Ponsford often bid against Ponsford Bros. for county bridgework projects.

3.0 CULTURAL HERITAGE LANDSCAPE DESCRIPTION

3.1 Area Context

The Township of Southwold was established on January 1, 1998, as part of the County of Elgin.

It is located between Lake Erie and the Thames River immediately west of St. Thomas. The Municipality of Centre Elgin is to the east and City of London to the north. It is one of the few municipalities in Ontario unchanged in terms of its original name and boundaries. The township offices are located in Fingal.

[42] LAC, Collection and fonds – 98440, Dominion Bridge Company fonds, Record Information, Biography/Administrative history.
Access: --http://www.bac-lac.gc.ca/eng/CollectionSearch/Pages/record.aspx?app=FonAndCol&IdNumber=98440> (August 2019).
[43] HistoricBridges. Iron and Steel Brands: A Catalogue of Steel Mill Marks.
Access: --<https://historicbridges.org/info/brands/index.php> (August 2019).
[44] County of Elgin Council Minutes, Various years from 1890s to 1910.

The Norfolk Sand Plain physiographic region is located in the vicinity of the subject bridge. It encompasses the Lower Kettle Creek Subwatershed in the study area, which is characterized by predominately sandy soils and has a high forest cover. The sands and silts of the region were deposited as a delta in glacial Lake Whittlesey and Warren. The meltwater discharge from the Grand River area entered the lake between the ice front and the moraines to the northwest depositing the delta from west to east as the glacier withdrew. Sparta Line CR 27 was opened in the early 19th century. It provided access north from Union Road through Lot 16, North of Union Road and over Kettle Creek. Initially a township road, it was assumed at a later date as a county road and became CR 27.

A bridge structure was probably located at this Kettle Creek crossing a soon after the road was opened. The Zavitz Mill was established on Beaver Creek, a tributary of Kettle Creek just east of the creek crossing. By the latter part of the 19th century James Meek owned the land adjacent to the bridge over Kettle Creek on Sparta Line. Generally, land in the Township of Southwold was settled in the early-to-mid 19th century. It was developed as an agricultural area by the mid 1870s. Twentieth century ***(Appendix A)*** maps of the Sparta Line CR 27 crossing of Kettle Creek show agricultural land use throughout the century. Aerial photographs show continued agricultural use to the present.

3.2 Site Description

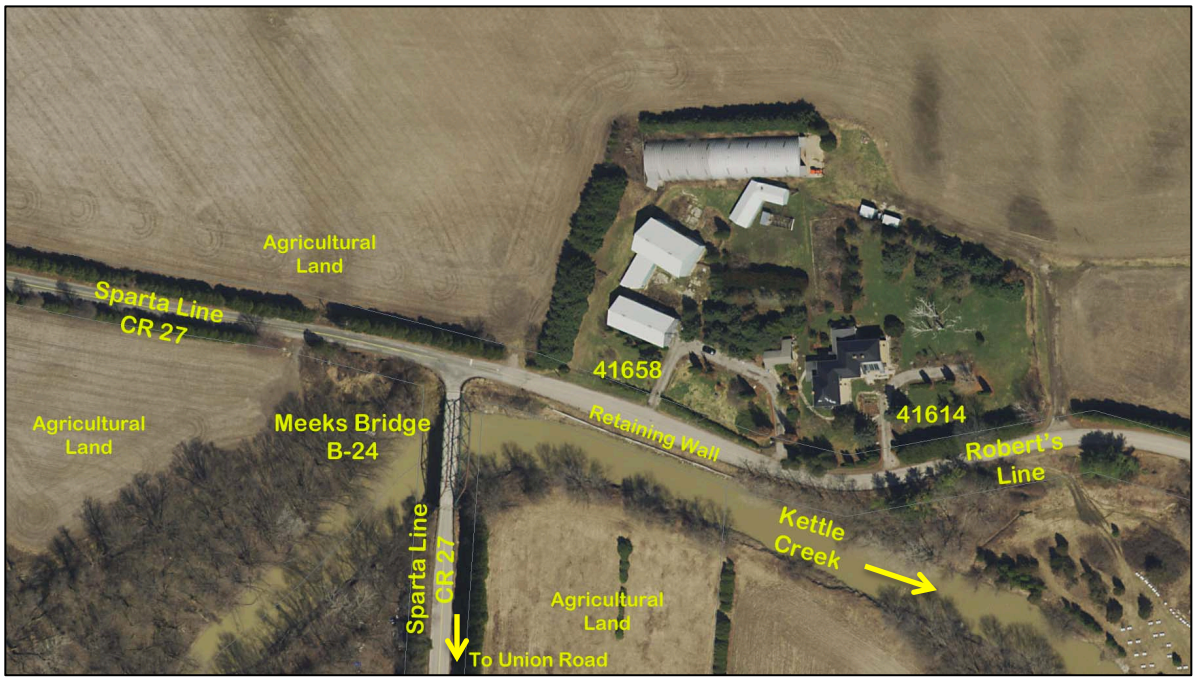

Figure 3. An annotated aerial photograph identifies the land uses in proximity to Meeks Bridge [As adapted, Google 2019].

Meeks Bridge is located in the Township of Southwold, approximately 0.25 km north of Union Road (County Road 20) on the banks of Kettle Creek. Specifically, it is located on Lot 16, Range 1, North of Union Road in the Township of Southwold. Kettle Creek in the

County of Elgin generally runs in a north to south direction in the Township of Southwold and empties into Lake Erie at Port Stanley. It flows through parts of the City of London in Middlesex County and the City of St. Thomas in the County of Elgin. Some of Ontario's rare remaining stands of Carolinian Forest are in the Kettle Creek watershed. Most of the Kettle Creek watershed is in agricultural use. At Sparta Line #27, Kettle Creek flows in an eastward under Meeks Bridge.

Sparta Line CR 27 is a two lane paved road with double centre line, narrow, gravel and grassed shoulders, deep grassy ditches that forms part of the local county road network. It intersects with Union Road to the south. At Kettle Creek, the road narrows to one lane and then continues to the west. To the east of the north end of the bridge the road is known as Robert's Line ***(Figure 3)***. The road is lightly travelled.

Land on the east and west sides of Sparta Line CR 27 immediately to the south of Meeks Bridge is in agricultural use. A modern residence is located at 41108 Sparta Line CR 27 to the south of the bridge. To the north of the bridge and Sparta Line CR 27 it is agricultural with a residence to the east at 41614 Robert's Line and an adjacent barn structure at 41658 Robert's Line. To the east of the bridge on the north side, there is a concrete retaining wall on Kettle Creek.

Kettle Creek flows generally west to east in proximity to the subject bridge. Its high banks are covered with dense vegetation on all four corners. An 8 tonne capacity sign and 4.3 m vertical height sign are located on the south corner of the bridge and a 8 tonnes sign on the northwest corner of the structure. There are two hazard signs at the south and one on the northeast corner. The bridge carries one lane of traffic with a posted speed of 50 km/hr. A stop sign is located on Sparta Line CR 27 at the T-junction with Robert's Line and a yield sign on the west side of the junction. A T-junction sign is located is located immediately north of the bridge on Sparta Line CR 27. Both ends of the bridge are posted with vertical height signs of 3.4 m/ 4.3 m/ 3.4 m. The total structure width is 4.90 m (16-ft. 5 $^{9}/_{10}$-in.).

4.0 BUILT HERITAGE RESOURCE DESCRIPTION

The following description of Meeks Bridge is based on a structure drawing (1994), inspection reports (2014 and 2019) and a site visit (August 2019). For the purposes of this report, Meeks Bridge runs in a north to south direction. Metric measurements are used in the description of the bridge to maintain consistency with the 1994 design drawing. Imperial equivalents, which would have been used for the original design, are provided in brackets.

The engineering drawing (1994) is included in Appendix B and a bridge survey form with current photographs of Meeks Bridge is found in Appendix C.

4.1 Meeks Bridge, County No. B-24

The single span Meeks Bridge, County No. B-24, over Kettle Creek in the Township of Southwold is classified as a through steel truss, double-intersection Warren truss ***(Figure 4)***. The abutments are constructed of cast-in-place concrete. The steel truss was fabricated in 1900 and the connections are rivetted.

Figure 4. View looking north on Sparta Line CR 27 to the south portal of Meeks Bridge located in the Township of Southwold, County of Elgin, Ontario.

Substructure

The substructure comprises cast-in-place reinforced concrete abutments on the north and south creek banks. The two original abutments were raised 2-ft. (0.61 m) in 1908.

Truss

The superstructure is a double-intersection Warren truss design ***(Figure 4)***. From the elevation views, this truss configuration appears to be two offset Warren trusses superimposed on each other forming a repeating "X" shape. The total length of the steel trusses and structure is 38.7 m (126-ft. 11 $^{6}/_{10}$-in). The total height is 6100 mm (20-ft. $^{1}/_{5}$-

in.). The east and west trusses each comprise 12 panels and have hip vertical members that meet the top (upper) of each end post.

The truss members above the deck are built up of structural steel sections that include channels, angles, plates and lattice members. The resulting appearance is much lighter and airier than a truss using rolled steel shapes. The steel members of the truss are marked in several locations with "Carnegie" and are riveted in place. The two trusses are tied together at the top with transverse and diagonal bracing. The portal frame is formed of transverse ties and diagonal stiffeners that form a diamond pattern. The posted clearance on both ends of the bridge portal is 4.33 m at the centre and 3.0 m at the sides.

There are two (2) makers' plaques, "Dominion Steel Co. Ltd, Lachine, P.Q.", installed on the bridge. One plaque is located on the northwest end post and one, which is broken in half, is on the southeast end post.

Deck

Original transverse steel floor beams run east to west and are located at the base of each of the truss panel points. The floor beams support five (5) north to south steel deck stringers. Bracing extends diagonally between the truss panel points. The overall width of the deck set on the deck stringers is 4.40 m (14-ft. 5 $^{2}/_{10}$-in.) and the wearing surface of the deck is tarmac over concrete.

Original lattice railings run along the east and west sides of the structure. The lattice railing contribute to the visual appreciation of the bridge by creating a defined geometric art and a complexity of form. Additionally, the decorative end posts with pyramidal caps add visual appeal to the overall composition of the bridge

4.2 Modifications

The subject bridge has undergone few modifications to its original design intent and materials and retains its original lattice railings with decorative end posts. The makers' plaque on the southeast end post has been broken. Known structural and replacement work on Meeks Bridge includes, but is not limited to:

- In 1908, concrete abutments were raised 2-ft (0.61 m).
- In 1997, a new cable rail was installed on the bridge in 1997.
- In 1999, a new railing and post installed on the southeast corner.

4.3 Comparative Analysis

The County of Elgin provided inspection reports for the steel through truss bridges under its jurisdiction to inform a comparable analysis of this bridge type. Additionally comparative information for steel through truss bridges in the County of Elgin contained in the CHER

for the Edison Drive Bridge, Vienna, (UMcA February 2016)[45] and the website Historicridges.com was reviewed.

The reviewed information was used to provide an indication of the technical merit of Meeks Bridge. The date of construction, the length of the longest span of the steel through truss structures and truss type were analyzed to determine whether Meeks Bridge is an early example of the type or notable in the execution of the style.

A total of seven (7) through truss structures are located in the County of Elgin. They include the Gillets Bridge, County No. B-27, built in 1930. As a two span, Pratt truss, the Gillet's Bridge was not included in Table 1 as a comparable bridge type.

The remaining six (6) examples of steel through truss bridges in the County of Elgin are single span and double-intersection Warren trusses. From information provided by the County of Elgin, the three (3) examples of county-owned, are from the oldest to the more recent:

- Meeks Bridge, County No. B-24 (1900);
- Jamestown Line Bridge, County No. B-26 (1909)[46]; and
- Fulton Line Bridge, County No. B-23 (1912).

Of the other three (3) known examples of double-intersection Warren truss bridges in the County of Elgin that are not under county jurisdiction, two (2) are still in use as road bridges. The third example is now used as part of a trail system. Listed below in order from the oldest to the more recent, the bridges include:

- Southdale Line Bridge (1920);
- Brouwers Bridge (1920); and
- Sutherland Bridge (date unknown), no longer in road use.

Figure 5 provides a location map for the comparative bridges examples.

Table 1 includes a description and current digital photograph of the three (3) county-owned steel through truss, double-intersection Warren truss, bridges noted above.

Table 2 includes a description and current digital photograph, as available, of the three (3) known steel through truss, double-intersection Warren truss, bridges in the County of Elgin that are not under county jurisdiction and noted above.

[45] Unterman McPhail Associates. *Cultural Heritage Evaluation Report, Edison Bridge, County Site No. B-45, Vienna, Municipality of Bayham, County of Elgin, Ontario.* Prepared for Spriet Associates London, Ontario and County of Elgin. (February 2016). Appendix C.
[46] Inspection reports and other secondary source indicate a construction date of 1900 and 1908; however the Elgin County Minutes record the bridge was completed in 1909.

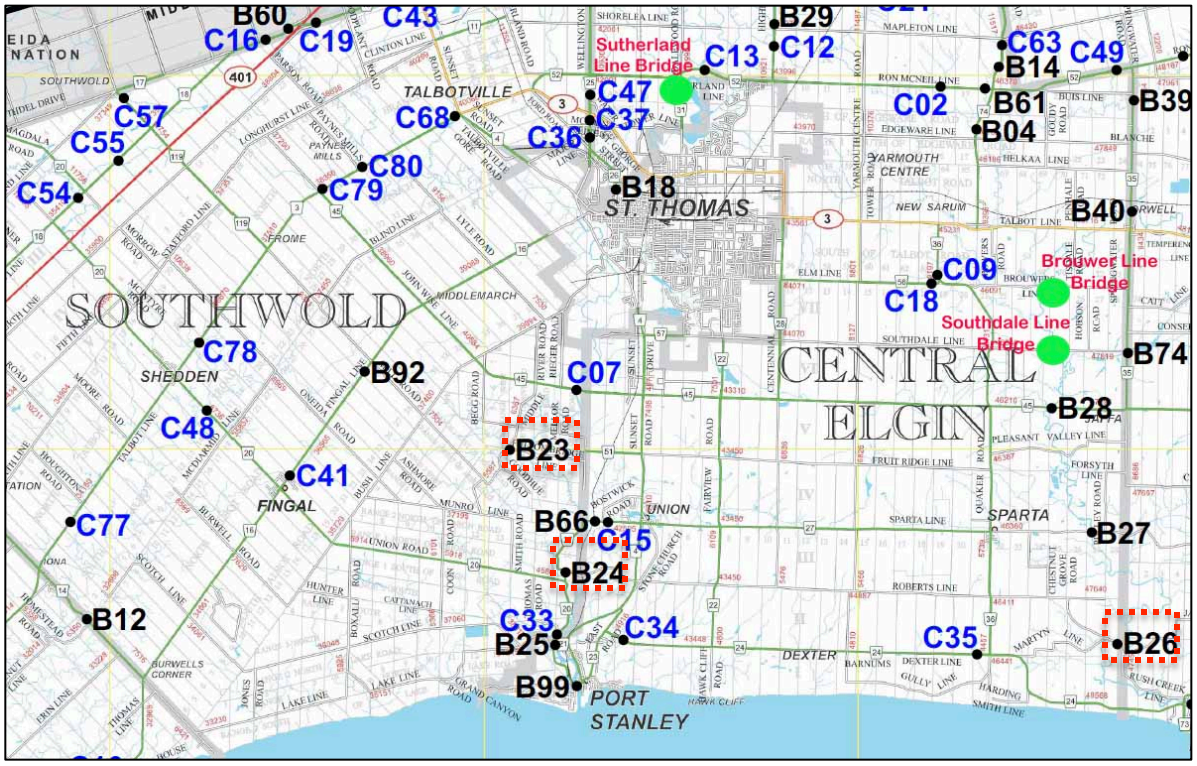

Figure 5. The locations of the three county bridges, B-23 (Fulton Line Bridge), B-24 (Meeks Bridge) and B-26 (Jamestown Line Bridge), are highlighted by a dotted line. The three bridge examples in Table 2 not under county jurisdiction are named and shown by a green dot [As Adapted, Spriet Associates, Map of County of Elgin Bridges and County of Elgin Culverts, May 2013].

TABLE 1: EXAMPLES OF COUNTY-OWNED STEEL THROUGH TRUSS, DOUBLE-INTERSECTION WARREN TRUSS BRIDGES

Bridge Name / County No.	Location	Construction Date	Span / Length	Digital Photographs
1) Meeks Bridge B-24	Sparta Line CR 27 over Kettle Creek, Township of Southwold	1900 Dominion Bridge Co, Ltd., Lachine Markings: Carnegie Steel	1 span - 38.7 m (126-ft. 11 6/10-in.)	
2) Jamestown Bridge B-26	Jamestown Road over Catfish Cree, Township of Southwold	1909 Bridge company unknown Markings: Carnegie Steel, Lackawana	1 span – 33.3 m (109-ft. 3-in.)	

TABLE 1: EXAMPLES OF COUNTY-OWNED STEEL THROUGH TRUSS, DOUBLE-INTERSECTION WARREN TRUSS BRIDGES

Bridge Name / County No.	Location	Construction Date	Span / Length	Digital Photographs
3) Fulton Bridge B-23	Fulton Bridge Line over Kettle Creek, Township of Southwold	1912 Bridge company unknown Markings: Carnegie Steel	1 span – 48.8 m (160-ft. 1 2/10-in.)	

TABLE 2: EXAMPLES OF NON-COUNTY STEEL THROUGH TRUSS, DOUBLE-INTERSECTION WARREN TRUSS BRIDGES

Bridge Name	Location	Construction date	Span / Length	Digital Photo
4) Southdale Line Bridge	Southdale Line over Catfish Creek, Municipality of Central Elgin	1920 Markings: Carnegie Steel	1 span – 34.3 m (112-ft. 6 4/10-in.)	
5) Brouwers Bridge	Brouwers Line over Catfish Creek, Municipality of Central Elgin	1920 Markings: Bethlehem Steel	1 span – 30.8 m (101-ft. 0 6/10-in.)	
6) Sutherland Line Bridge[47]	Former right-of-way Sutherland Line, now part of Kettle Creek Conservation Authority	Unknown	1 span – length unknown	Not viewed or photographed.

[47] Information for the Sutherland Line Bridge is primarily taken from website HistoricBridges.org. The bridge site was not visited to confirm the information. A steel through truss structure is shown on a Google 2019 on a former alignment of Sutherland Line, now closed.

4.3.1 Comparative Conclusion

Built in 1900, Meeks Bridge is the oldest surviving steel through truss bridge in the County of Elgin and the oldest example of a double-intersection Warren truss bridge in the County. Furthermore, Meeks Bridge is the oldest surviving county-owned, double-intersection Warren truss bridge and the oldest example of its type in the Township of Southwold.

The surviving steel through truss bridges in the County are, for the most part, single span structures and the lengths of the single spans are generally comparable, ranging from about 31 m to 34 m; however, the exception is Fulton Bridge, County No. B-23, which has a span of roughly 48.8 m. Therefore, within the County of Elgin, Fulton Bridge is the longest, single span example of the steel through truss structures while Meeks Bridge is the second longest single span example.

It is concluded Meeks Bridge is the oldest surviving steel through truss bridge found in the County of Elgin. Of the six (6) single span through truss bridges, Meeks Bridge is second longest in length (38.7 m). As well, Meeks Bridge is the oldest and second longest example of a steel through truss, double-intersection Warren truss design known to survive in the County of Elgin.

5.0 CULTURAL HERITAGE RESOURCE EVALUATION

5.1 Introduction

The criteria for determining cultural heritage value or interest were set out under O.Reg. 9/06 made under the OHA, as amended in 2005. These criteria were developed to assist municipalities in the evaluation of properties considered for designation. The regulation states that:

"A property may be designated under section 29 of the Act if it meets one or more of the following criteria for determining whether it is of cultural heritage value or interest:

1. *The property has design value or physical value because it,*
   i. is a rare, unique, representative or early example of a style, type, expression, material or construction method,
   ii. displays a high degree of craftsmanship or artistic merit,
   or
   iii. demonstrates a high degree of technical or scientific achievement.
2. *The property has historical value or associative value because it,*
   i. has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community,
   ii. yields, or has the potential to yield , information that contributes to an understanding of a community or culture, or

iii. demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community.

3. The property has contextual value because it,
i. is important in defining, maintaining, or supporting the character of an area,
ii. is physically, functionally, visually or historically linked to its surroundings, or
iii. is a landmark."

5.2 Evaluation

The evaluation criteria set out under O.Reg. 9/06 was applied to Meeks Bridge.

5.2.1 Design Value or Physical Value

Design or Physical Value	
i. Rare, unique, representative or early example of a style, type, expression, material or construction method.	**Yes**
ii. Displays a high degree of craftsmanship or artistic merit.	**Yes**
iii. Demonstrates a high degree of technical or scientific achievement	**No**

i. Representative of a style, type, expression, material or construction method

Steel truss bridges began to appear on Ontario roads in the late 1800s and grew more popular in use after 1900. Dating to 1900, Meeks Bridge is classified as a single span, steel through truss, double-intersection Warren truss with verticals. It has riveted connections. Although the double-intersection Warren truss is described as an uncommon truss configuration and considered to be to have been rarely built, a number of examples were built in the County of Elgin in the first part of the early 20th century of which six (6) examples still remain and five (5) are still in use as road bridges. Throughout the rest of the province, steel through truss, double-intersection Warren truss bridges appears to have been rarely built. Examples of early 20th century steel through truss bridges are now a diminished cultural heritage resource in Ontario due to changing traffic needs and public safety concerns.

Therefore, Meeks Bridge is considered to be an increasingly rare survivor in the province of as an example of early 20th century steel through truss and it is one of a seven (7) known surviving examples of this bridge type in the County of Elgin, all dating from 1900 to 1930. It is one of six (6) known surviving examples of a double-intersection Warren truss structure in the County of Elgin dating from the first part of the 20th century. The bridge has undergone little modification, retains its original lattice railing and clearly exhibits it original design character. Its materials, steel and concrete, would be considered to be common materials when built.

It is concluded, Meeks Bridge, built in 1900, is the oldest example of a steel through truss and the oldest example of a double-intersection Warren Truss found in the County of Elgin.

With a span of 38.7 m, it is the second longest single span of a steel through truss bridge and of a double-intersection Warren truss located within the County.

ii. Displays a high degree of craftsmanship or artistic merit

Meeks Bridge is a well-designed and visually attractive structure in its environment. Its longevity, 119 years, attests to the quality of the craftsmanship and its materials. The truss uses built-up steel sections, such as channels, angles, plates and lattice that contribute to the overall lightness of the structure. This impression is reinforced as the abutments blend into the landscape and the dark form of the truss floats above the water uninterrupted by intermediate piers. The parallel chords and simple arrangement of the diagonals further enhance the appearance.

Therefore, Meeks Bridge is considered to display a high degree or craftsmanship.

iii. Demonstrates a high degree of technical or scientific achievement

Although, the bridge is considered to be an example of a uncommon type of steel through truss structure from the early 1900s, no aspects of technical or scientific achievement were identified for Meeks Bridge.

5.2.2 Historical Value or Associative Value

Historical or Associative Value	
i. Has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community	**Yes**
ii. Yields, or has the potential to yield, information that contributes to an understanding of a community or culture	**No**
iii. Demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community	**Yes**

i. Direct associations with a theme

Meeks Bridge is associated with the historical theme of the settlement and the evolution of the Township of Southwold and the County of Elgin road network. Built in 1900, the bridge structure is a rare survivor and considered to be an illustrative and an important physical reminder of early road development in the township and county. A bridge structure probably spanned Kettle Creek at this location soon after Sparta Line was opened in the early 1800s. Historically, Sparta Line and the bridge over Kettle Creek provided a transportation link to Union Road, an important county road in the mid 19th century between Fingal and Port Stanley harbor.

Bridges at this Kettle Creek crossing have been under county jurisdiction since 1886. As the oldest surviving example (119 years) of a steel through truss bridge in the County and the

Township of Southwold, Meeks Bridge is a physical / tangible reminder of the history of the community, township and county.

ii. Understanding of a community[48] or culture

The subject bridge does not have any known attributes that would contribute to an understanding of a community or culture.

iii. Designer/Builder

The engineering department of the County of Elgin under County Engineer James A. Bell undertook the design and prepared the contract documents for the steel superstructure of the Meeks Bridge in 1900. The Dominion Bridge Company, Lachine, Quebec, Company Limited fabricated the steel truss superstructure. G.A. Ponsford, a local contractor, built the bridge foundation.

James A. Bell is closely associated with the County of Elgin serving as its engineer for a span of 45 years (1882 to 1927). Bell had an illustrious career and is considered a well-known and influential professional engineer who undertook numerous projects throughout the County of Elgin and assignments in the City of St. Thomas, and more broadly, throughout Southwestern Ontario. Bell is noted for his contribution to bridge building, road improvements, municipal water systems and drainage projects in the late 19th and early 20th century. He was an active member in the engineering profession in Ontario and took a leadership role in the professional organizations at a provincial and national level and is considered to be an engineer/builder of significance to the County of Elgin and Southwestern Ontario. Mr. Bell was a member of the Canadian Society for Civil Engineers, the Association of Ontario Land Surveyors and the Association of Professional Engineers. In recognition of his contribution to railway engineering, he was inducted into the North America Railway Hall of Fame in 2006.

The Dominion Bridge Company was a well-known and prolific bridge building company both provincially and nationally. It flourished in the latter part of the 1890s and throughout most of the early 20th century. A company specialization from its beginnings onwards was in steel bridge construction and making steel for the fabrication of buildings and bridges and other structures. The superstructure of Meeks Bridge would be considered a typical bridge project of this important Canadian company from the turn of the 20th century.

The Carnegie Steel Company was located in Pittsburg, Pennsylvania and in operation from 1892 to 1901 when the United Steel Company purchased it. It continued to operate under the Carnegie name for a number of years in the early 20th century.

[48] Community in this context is viewed as a group of people who share common interests, language, religion, race, etc., rather than a group of people who live in one particular area.

It is concluded Meeks Bridge demonstrates or reflects the work of an important local, regional and provincial engineer from the late 19th and early 20th century, namely, James A. Bell.

5.2.3 Contextual Value

Contextual Value	
i. Is important in defining, maintaining, or supporting the character of an area.	**Yes**
ii. Is physically, functionally, visually or historically linked to its surroundings.	**Yes**
iii. Is a landmark.	**No**

i. Character

The landscape at the subject bridge is rural in nature characterized by the heavily vegetated and naturalized creek banks of the Kettle Creek set in a rural agricultural landscape. The single span, steel through truss, double-intersection Warren truss, structure and the associated one lane roadway over the bridge crossing contributes to the environment. The T-junction on Sparta Line at the north end of the bridge heightens the presence of the bridge in the environment.

It is concluded Meeks Bridge is important in maintaining the rural character of the area. The bridge is a pleasingly attractive structure that fits well within its rural environment that includes Kettle Creek.

ii. Linkages

Meeks Bridge was built at its present location over the Kettle Creek in 1900 to replace an earlier 19th century bridge structure.

It is concluded Meeks Bridge is physically, functionally, historically and visually linked to its surroundings.

iii. Landmark

The subject structure is a distinctive visual form in its immediate landscape and on Kettle Creek. The T-junction on Sparta Line CR 27 at the north end of the bridge heightens its presence in the environment.

It would be considered to be a familiar local landmark in its immediate area and to local residents.

5.3 Summary of Cultural Heritage Value

It is determined through the application of the *Criteria for Determining Cultural Heritage Value under O.Reg. 9/06* that Meeks Bridge is of cultural heritage value for design/physical and contextual reasons.

5.3.1 Statement of Cultural Heritage Value

In 1900, the County of Elgin undertook the design of the current Meeks Bridge, County No. B-24, to replace an earlier 19th century bridge structure known as the Zavitz Bridge located on Sparta Line CR 27 at Kettle Creek. Meeks Bridge and its location is illustrative of and a physical / tangible reminder of the road network development in the Township of Southwold and the County of Elgin in the 19th century and in the early 20th century.

The County of Elgin assumed the Zavtiz Bridge, the location of Meeks Bridge on Kettle Creek, in 1886. County Engineer James A. Bell was responsible for the design and construction of the current Meeks Bridge, a steel through truss, to replace an earlier structure on Sparta Line over Kettle Creek. Bell had an illustrious career and was an important member of the engineering profession in the late 19th and early 20th century. The original truss bridge is a surviving representative example of his road bridgework from the turn of the 20th century. The Dominion Bridge Company of Lachine, Quebec fabricated the superstructure of Meeks Bridge and it would be considered a typical bridge project from the turn of the 20th century for this important company.

Built in 1900, Meeks Bridge is the earliest surviving example 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.

Meeks Bridge continues to fulfill its function as a road bridge in the community. It is a well-known structure locally and contributes to the ambience of the character and setting of its rural environment.

5.3.2 Description of Heritage Attributes

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

- 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 chords and diagonals;
- built up sections of the truss that include channels, angles, plates and lattice members;
- steel floor beams and stringers;
- riveted connections;
- two (2) maker‘s plaques, one on the northwest end post, which is complete and one on the southeast end post, which is broken;
- the various examples of “Carnegie” marking(s) 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.

Heritage attributes under the historical value criteria for Meeks Bridge include:

- its historical linkage to its surroundings;
- its association with the County Engineer James A. Bell;
- its association with the Dominion Bridge Company Ltd, Lachine, Quebec;
- the association of the bridge at this location over Kettle Creek on Sparta Line since the 1830s/1840s;
- its longevity and age at 119 years, built in 1900 to replace an earlier 19th century bridge structure known as the Zavitz Bridge, Meeks Bridge; and
- its name association with the Meek family, 19th century settlers in Southwold township and adjacent landowners.

Heritage attributes under the contextual value criteria for Meeks Bridge include:

- its rural environment on Kettle Creek;
- the importance of Meeks Bridge in maintaining the rural environment as characterized by its one-lane steel and double-intersection Warren truss structure;
- its pleasingly attractive structure that fits well within its rural environment,
- its physical, functional, visual linkages to its surroundings; and
- its distinctive visual form in its immediate landscape as a familiar local landmark in its immediate area and to local residents.

6.0 CONCLUSIONS

An undertaking should not adversely affect cultural heritage resources of proven cultural heritage value or interest. This CHER has determined through the application of the “Criteria for Determining Cultural Heritage Value or Interest” under O.Reg. 9/06 that Meeks Bridge, County No. B-24, Sparta Line CR 27, Township of Southwold in the County of Elgin is of cultural heritage value or interest due to its design or physical value, historical or associative value and contextual value ***(see Section 5.3.1 Statement of Cultural Heritage Value and 5.3.2 Heritage Attributes***). Therefore, it is worthy of consideration for listing or

designation under Part IV of the OHA and inclusion on a municipal heritage register as described under Section 27 (1) of the OHA.

Listing and designation under the OHA is the responsibility of the Township of Southwold. The Township has confirmed Meeks Bridge has not been listed or designated under the OHA at this time.
The County of Elgin is planning to replace Meeks Bridge, County No. B-24, with a modular panel bridge. The County indicates it will undertake a formal Schedule 'B' MCEA study.

Part B - Cultural Heritage Assessment and Part C - Heritage Assessment of the completed *Municipal Heritage Bridges Cultural, Heritage and Archeological Resources Assessment Checklist* (revised April 11, 2014) ***(Appendix C)*** indicate a CHER and an HIA are required for the Meeks Bridge replacement project. This report satisfies the County of Elgin's requirement for a CHER.

The Elgin County OP (Consolidated February 2015), Section E2, Cultural Heritage Resources states, *The County will conserve the cultural heritage resources within the County by requiring a Cultural Heritage Impact Assessment by a qualified person for development proposals that includes or are adjacent to protected heritage properties*.

Ideally, adhering to accepted principles of conservation practice, Meeks Bridge should be preserved *in situ* given its demonstrated cultural heritage value or interest. The following recommendations are provided for Meeks Bridge.

- Since the Meeks Bridge meets one or more criteria under O.Reg. 9.06 of the OHA, it is recommended the Township of Southwold consider protecting Meeks Bridge by listing or designating it under the OHA as a cultural heritage resource of value or interest and including it on its municipal heritage register.

- It is recommended the County of Elgin undertake a Cultural Heritage Impact Assessment (HIA) report for Meeks Bridge as indicated as a requirement of the completed *Municipal Heritage Bridges Cultural, Heritage and Archeological Resources Assessment Checklist* (revised April 11, 2014) ***(Appendix C)***. Considering its cultural heritage value and interest under O.Reg. 9/06 of the OHA, an HIA will provide mitigation measures to ameliorate the proposed Meeks Bridge replacement. A mitigation recommendation of the HIA may be the completion of a Cultural Heritage Documentation Report (CHDR) prior to any change to the structure or site.

- The County of Elgin should retain a copy or copies of the completed CHER for its own record and shall provide a copy or copies in digital or hard copy format to the Township of Southwold, the Elgin County Archives and to the Elgin County Library (Port Stanley Branch).

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Persons Consulted

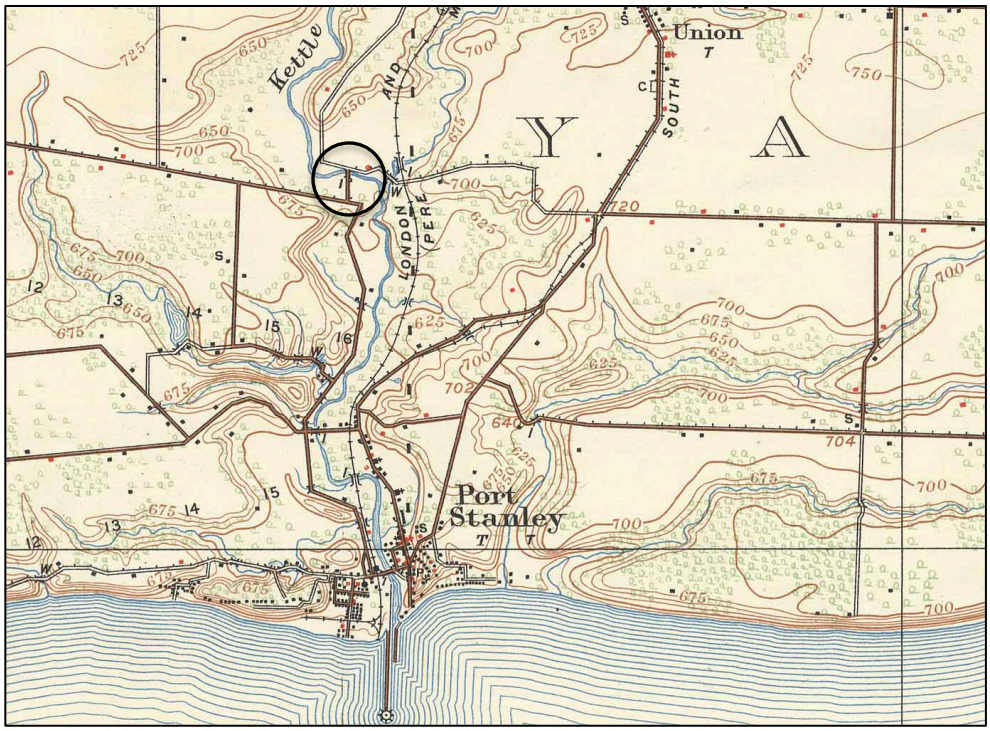
Brian Lima, Director of Engineering Services, County of Elgin.

Lisa Higgs, Chief Administrative Officer, Township of Southwold.

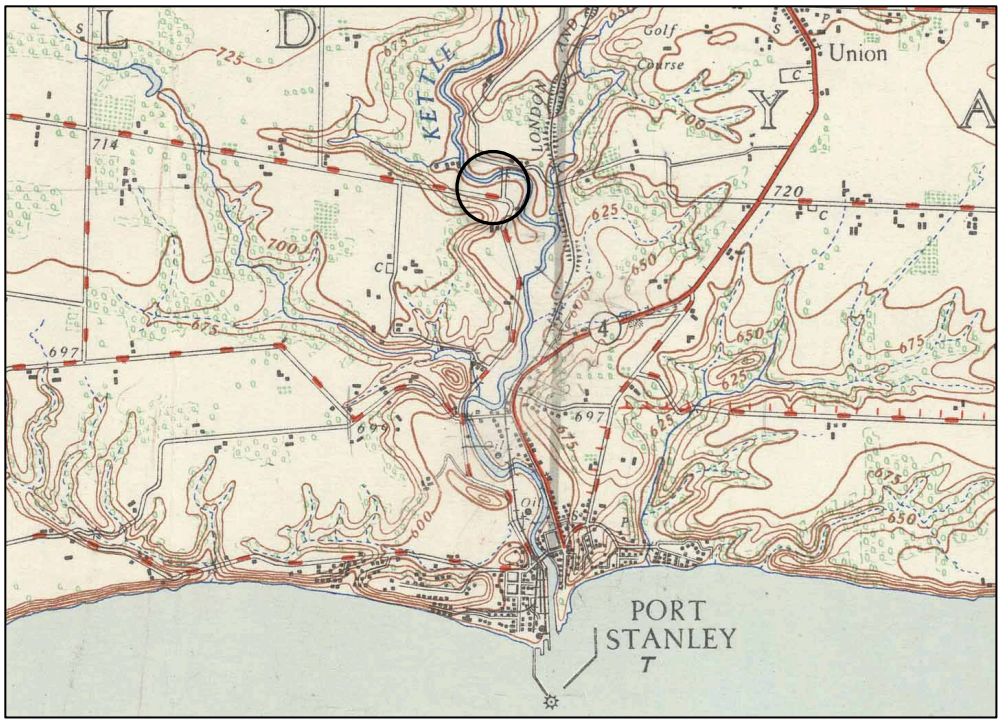
APPENDIX A:
Historical Maps, Photographs and Drawing

This section of Tremaine's map (1864) depicts the current Sparta Line CR 27 alignment at Lot 23, Concession 16, Range 1, at Kettle Creek in Southwold Township [Tremaine's Map of the County of Elgin. Toronto: George C. Tremaine, 1864].

This Southwold Township map shows the location of the road and bridge crossing of Kettle Creek in 1877 at Lot 16, Range 1, North of Union Road [*Illustrated Historical Atlas of the County of Elgin*, 1877].

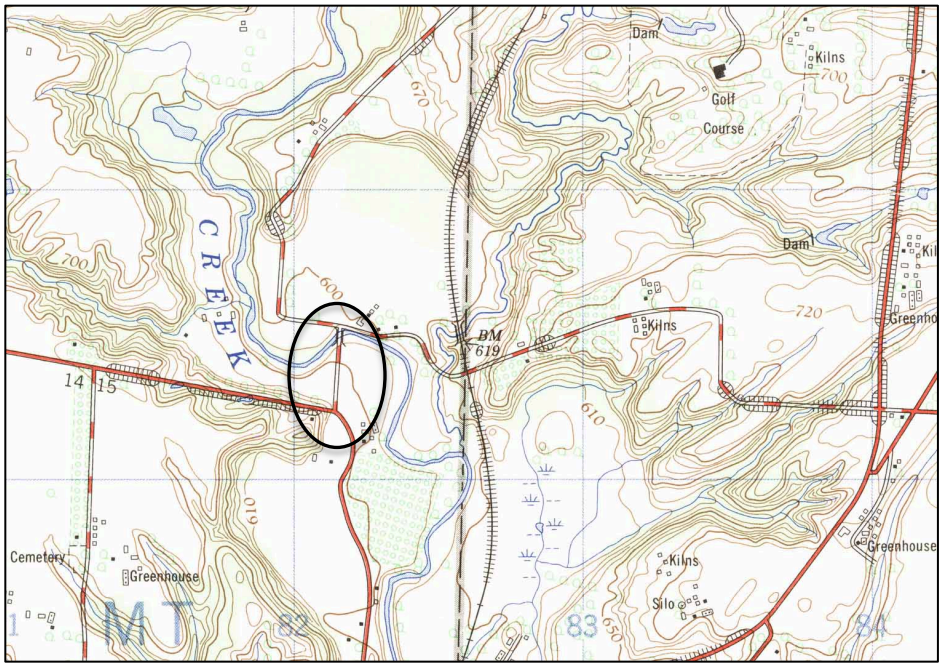


The circle marks the location of a steel (I) bridge structure known as the Zavitiz Bridge, now Meeks Bridge, on current Sparta Line CR 27 at the crossing of Kettle Creek [NTS 41 I/11, 1909].

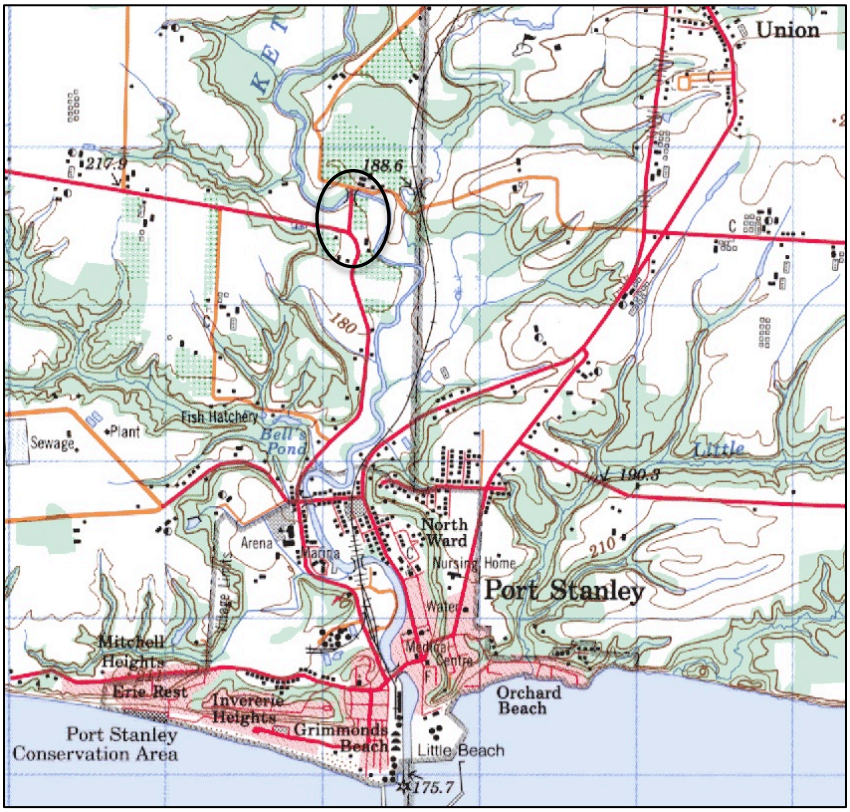


The circle marks the location Meeks Bridge on current Sparta Line CR 27 at the crossing of Kettle Creek [NTS 41 I/11, 1948].

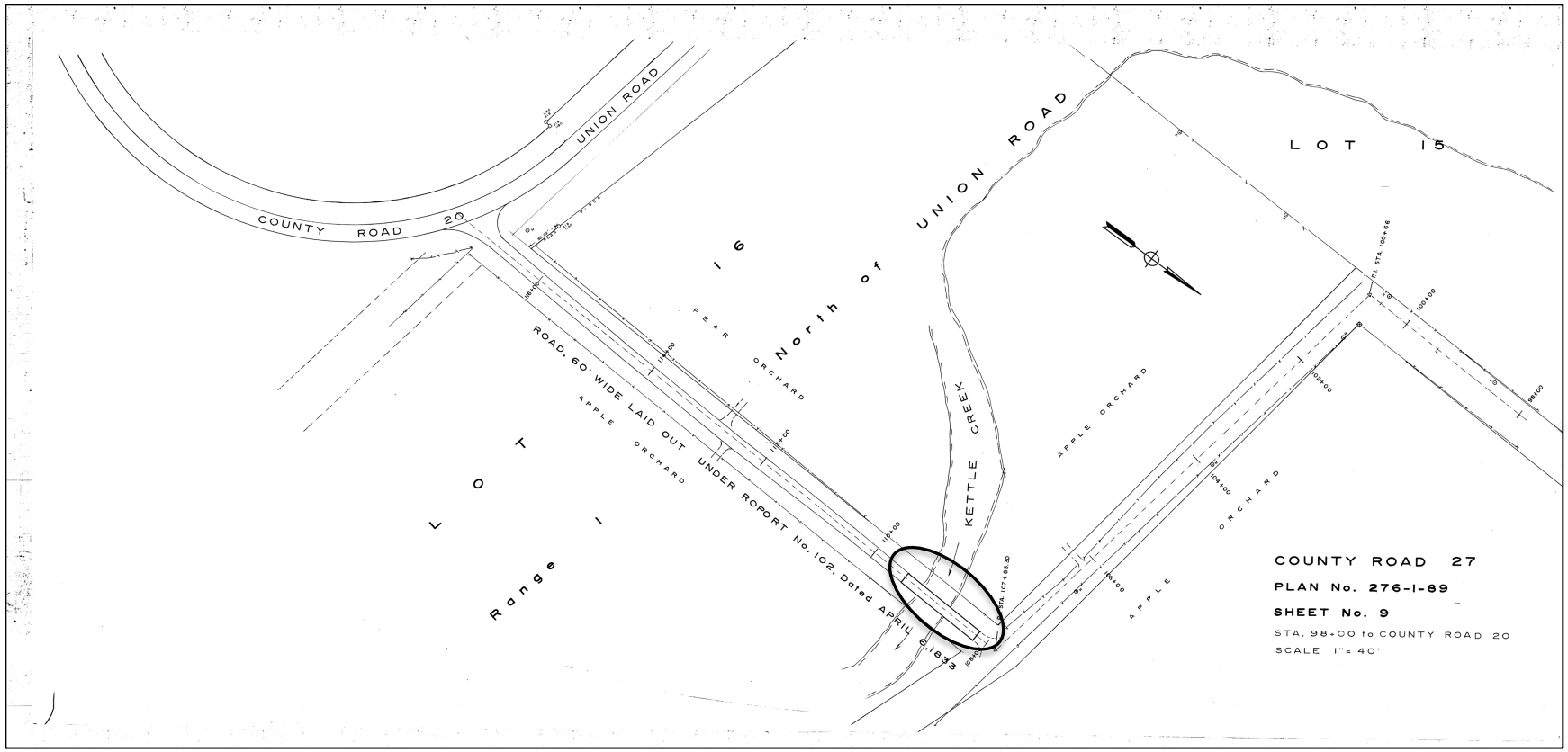
The circle on the aerial photographs (1954) above show the location of Meeks Bridge over Kettle Creek [UoT Digital Aerial Photographs, Southern Ontario 1954 - West Index, #426.811].



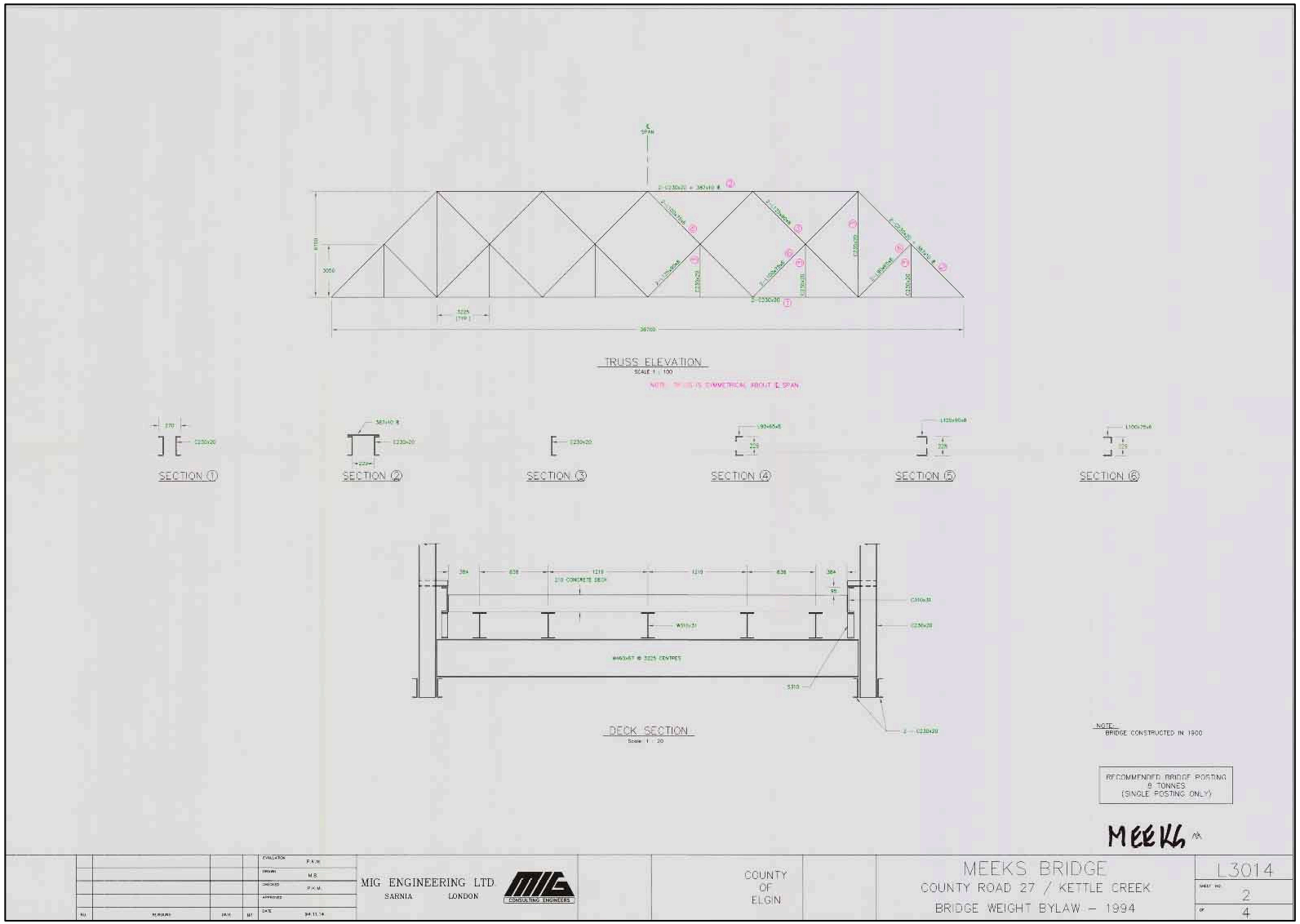
The circle marks the location Meeks Bridge on current Sparta Line CR 27 at the crossing of Kettle Creek [NTS 41 I/11c, 1971].



The circle marks the location Meeks Bridge on current Sparta Line CR 27 at the crossing of Kettle Creek [NTS 41 I/11, 1994].

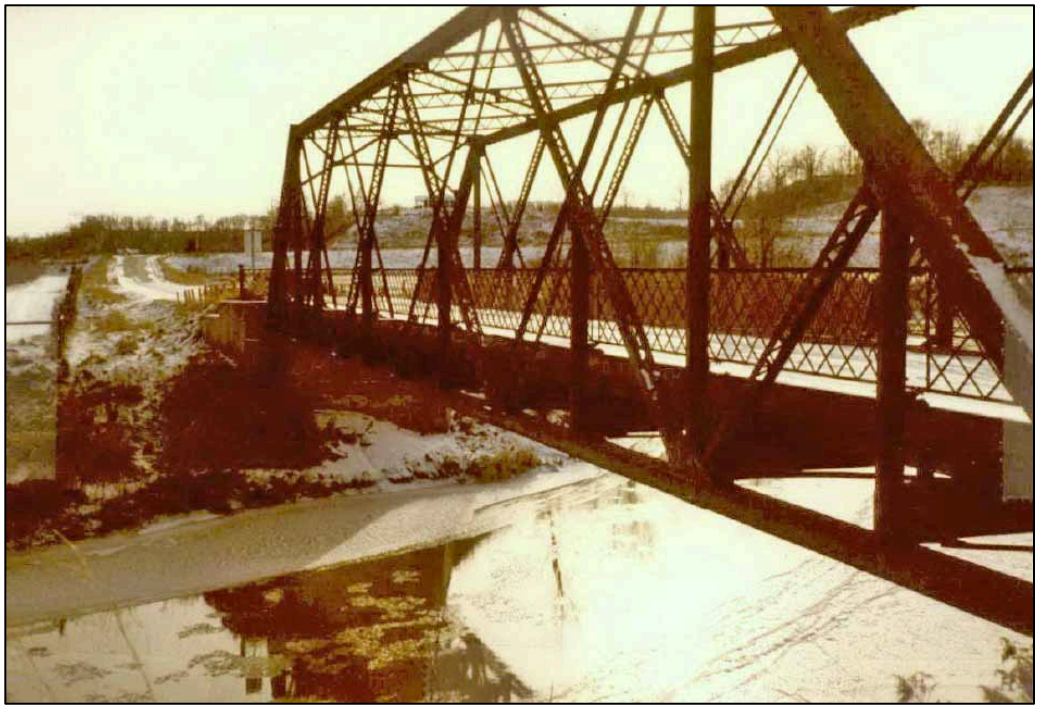


County Road 27, Plan No. 276-1-89, Sheet No. 9, [Elgin County, 1989].



Meeks Bridge, County Road 27 / Kettle Creek, Bridge Weight Bylaw – 1994, L3014, Sheet No. 2 of 4 [MIG Engineering Ltd., 1994].

View north to Meeks Bridge on Sparta Line CR 27 showing a weight limit of 18 tonnes. Notice the lack of vegetation on Kettle Creek at the bridge [Elgin County, Meeks Bridge Inspection Report, December 1983].



View southwest to the east elevation of Meeks Bridge on Sparta Line CR 27. Notice the lack of vegetation on Kettle Creek at the bridge [Elgin County, Meeks Bridge Inspection Report, December 1983].

View of southeast end post and broken maker's plaque n 1983 [As Adapted, [Elgin County, Meeks Bridge Inspection Report, December 1983].

View of the eat elevation of Meeks Bridge [Elgin County, Meeks Bridge Inspection Report, 1986].

APPENDIX B:
Municipal Heritage Bridges
Cultural, Heritage and Archeological
Resources Assessment Checklist

Municipal Heritage Bridges
Cultural, Heritage and Archaeological Resources Assessment Checklist
Revised April 11, 2014

This checklist was prepared in March 2013 by the Municipal Engineers Association to assist with determining the requirements to comply with the Municipal Class Environmental Assessment. View all 4 parts of the module on Structures Over 40 Years at www.municipalclassea.ca to assist with completing the checklist.

Project Name:	**Meeks Bridge, County No. B-24**
Location:	**Sparta Line County Road 27**
Municipality:	**Township of Southwold, County of Elgin**
Project Engineer:	**County of Elgin**
Checklist completed by:	**Richard Unterman, MA, Unterman McPhail Associates**
Date:	**August 2019**

NOTE: Complete all sections of Checklist. Both Cultural Heritage and Archaeological Sections must be satisfied before proceeding.

PART A - MUNICIPAL CLASS EA ACTIVITY SELECTION

Description	Yes	No
Will the proposed project involve or result in construction of new water crossings? This includes ferry docks.	☐ Schedule B or C	☐ Next
Will the proposed project involve or result in construction of new grade separation?	☐ Schedule B or C	☐ Next
Will the proposed project involve or result in construction of new underpasses or overpasses for pedestrian recreational or agricultural use?	☐ Schedule B or C	☐ Next
Will the proposed project involve or result in construction of new interchanges between any two roadways, including a grade separation and ramps to connect the two roadways?	☐ Schedule B or C	☐ Next

Description	Yes	No
Will the proposed project involve or result in reconstruction of a water crossing where the structure is less than 40 years old and the reconstructed facility will be for the same purpose, use, capacity and at the same location? (Capacity refers to either hydraulic or road capacity.) This includes ferry docks.	☐ Schedule A+	☐ Next
Will the proposed project involve or result in reconstruction of a water crossing, where the reconstructed facility will not be for the same purpose, use, capacity or at the same location? (Capacity refers to either hydraulic or road capacity). This includes ferry docks.	☐ Schedule B or C	☐ Next
Will the proposed project involve or result in 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?	☐ Next	☐ Assess Archaeological Resources

PART B - CULTURAL HERITAGE ASSESSMENT

Description	Yes	No
Does the proposed project involve a bridge construction in or after 1956?	☐ Next	☐ Prepare CHER Undertake HIA
Does the project involve one of these four bridge types?	☐ Rigid frame Next ☐ Precast with Concrete Deck Next ☐ Culvert or Simple Span Next ☐ Steel Bean/ Concrete Deck Next	☐ Prepare CHER Undertake HIA

Description	Yes	No
Does the bridge or study area contain a parcel of land that is subject of a covenant or agreement between the owner of the property and a conservation body or level of government?	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain a parcel of land that is listed on a register or inventory of heritage properties maintained by the municipality?	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain a parcel of land that is designated under Part IV of the Ontario Heritage Act?	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain a parcel of land that is subject to a notice of intention to designate issued by a municipality?	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain a parcel of land that is located within a designated Heritage Conservation District?	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain a parcel of land that is subject to a Heritage Conservation District study area by-law?	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain a parcel of land that is included in the Ministry of Tourism, Culture and Sport's list of provincial heritage properties?	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain a parcel of land that is part of a National Historic Site?	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain a parcel of land that is part of a United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site?	☐ Prepare CHER Undertake HIA	☐ Next

Description	Yes	No
Does the bridge or study area contain a parcel of land that is designated under the Heritage Railway Station Protection Act?	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain a parcel of land that is identified as a Federal Heritage Building by the Federal Heritage Building Review Office (FHBRO)	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain a parcel of land that is the subject of a municipal, provincial or federal commemorative or interpretive plaque that speaks to the Historical significance of the bridge?	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain a parcel of land that is in a Canadian Heritage River watershed?	☐ Prepare CHER Undertake HIA	☐ Next
Will the project impact any structures or sites (not bridges) that are over forty years old, or are important to defining the character of the area or that are considered a landmark in the local community?	☐ Prepare CHER Undertake HIA	☐ Next
Is the bridge or study area adjacent to a known burial site and/or cemetery?	☐ Prepare CHER Undertake HIA	☐ Next
Is the bridge considered a landmark or have a special association with a community, person or historical event in the local community?	☐ Prepare CHER Undertake HIA	☐ Next
Does the bridge or study area contain or is it part of a cultural heritage landscape?	☐ Prepare Cher Undertake HIA	☐ Assess Archaeological Resources

PART C - HERITAGE ASSESSMENT

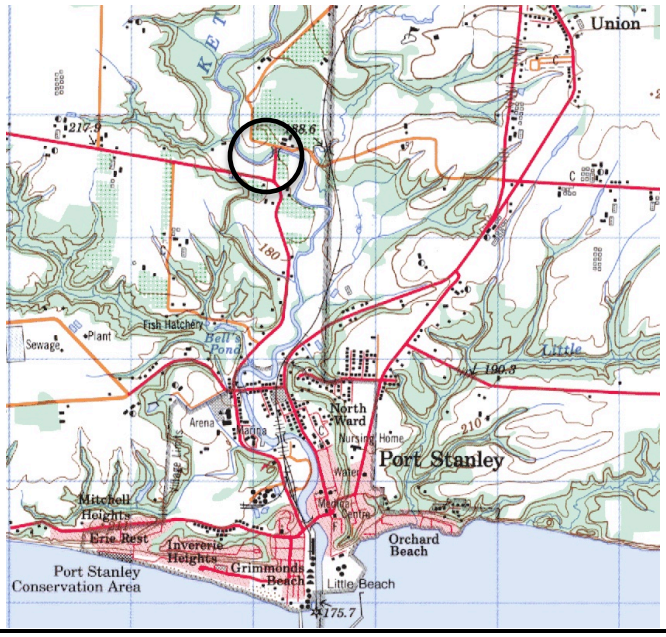
Description	Yes	No
Does the Cultural Heritage Evaluation Report identify any Heritage Features on the project?	☐ Undertake HIA	☐ Part D - Archaeological Resources
Does the Heritage Impact Assessment determine that the proposed project will impact any of the Heritage Features that have been identified?	☐ Schedule B or C	☐ Part D - Archaeological Resources

PART D - ARCHAEOLOGICAL RESOURCES ASSESSMENT

Description	Yes	No
Will any activity, related to the project, result in land impacts/significant ground disturbance?	☐ Next	☐ Schedule A - proceed
Have all areas, to be impacted by ground disturbing activities, been subjected to recent extensive and intensive disturbances and to depths greater than the depths of the proposed activities?	☐ Schedule A - proceed	☐ Next
Has an archaeological assessment previously been carried out that includes all of the areas to be impacted by this project?	☐ Next	☐ Archaeological Assessment
Does the report on that previous archaeological assessment recommend that no further archaeological assessment is required within the limits of the project for which that assessment was undertaken, and has a letter been issued by the Ministry of Tourism, Culture and Sport stating that the report has been entered into the Ontario Public Register of Archaeological Reports?	☐ Schedule A - proceed	☐ Obtain satisfaction letter - proceed

**** Study Notes ****
Elgin County is proposing to replace the superstructure of the subject bridge. the Checklist indicates the completion of a CHER and HIA are required. .

APPENDIX C:
Bridge Survey Form
Meeks Bridge
County No. B-24
Sparta Line CR 27

BRIDGE NAME: Meeks Bridge	Recorder: Unterman McPhail Associates	Ref. No. **B-24**
ROAD: Sparta Line County Road 27	Map: 40 I/11, Port Stanley, 1994	Date:
Lot: 16 Con: Range 1, North of Union Road (Geographic Township of Southwold)	
Municipality: Township of Southwold		
County / R.M.: Elgin County		
1:50:000 Map Ref.:		
Military Grid Ref.:		
Air Photo Ref.:		
Description: The bridge is located 0.25 km north of County Road 20.		

BRIDGE ENVIRONMENT & USES

Water/Road/Rail/Other Crossing:
The bridge carries County Road 27 over Kettle Creek.

Surrounding Land-Uses & Landscape: The bridge is set in a rural agricultural environment, Sparta Line CR 27 is a two lane paved road that leads north from Union Road to the Kettle Creek crossing. At the north side of the bridge there is a T-junction and Sparta Line CR 27 continues to the west and Robert's Line to the east. There is a stop sign on Robert's Line at Sparta Line CR 27 and a yield sign on Sparta Line CR 27 at the T-junction. Kettle Creek flows in an easterly direction under the bridge. Its banks are steep and heavily vegetated at the bridge crossing. There is a concrete retaining wall on the north side of the creek just east of the bridge crossing. A barn at 41658 Robert's Line and a house at 41614 Robert's line are situated on the north side of the road to the east of the bridge crossing.

Bridge Uses: Vehicular traffic.

DESIGN

Materials: Steel, manufactured by Carnegie

Construction Techniques: Through truss, double-intersection Warren truss with verticals at end hips, rivet connected

Decorative Features: Maker's plate – Dominion Bridge Company, Lachine, Quebec.

Landscape Quality: Sparta Line CR 27 appears to be frequently travelled road and the bridge would be considered to be a local landmark due to its prominent location over Kettle Creek at the T-junction. It is more visible when travelling north on the road to the bridge then from the east and west approach due to heavy vegetation that obscures a clear view of the bridge.

State of Preservation: Recent inspection reports indicate the bridge should be replaced.

Other Comments: HistoricBridges.org describes the Meek Bridge as an excellent example of a double-intersection Warren truss configuration, a generally uncommon truss configuration that is more common in Ontario than other places. The bridge is relatively unaltered. It retains its original lattice railings.

DIMENSIONS	
Carriageway Width: 4.4 m (14-ft. 5 ^{2}/10 –in.)	Longest Span: 38.7 m (126-ft. 11 ½ -in.)
No. of Lanes: One	Shortest Span: 38.7 m (126-ft. 11 ½ -in.)
Sidewalks: N/A	Overall Length: 38.70 m (126-ft. 11 ½ -in.)
Capacity: Posted 8 tonnes	Overall Width: 4.9 m (16-ft. 1-in.)
No. of Spans: One	Clearance: 3.4 m/ 4.3 m /3.4m

HISTORY
Date Built: 1900
Engineer/Designer: Elgin County, County Engineer James A. Bell; superstructure Dominion Bridge Co. Ltd., Lachine, Quebec; Bridge fabricator: Carnegie Steel
Construction Firm: G. A. Ponsford, concrete work
Drawings/Specifications: No original drawings; 1994 MIG Engineering Ltd.
Photos: 1980s to 1990s inspection report photo from Elgin County files.
Historical Association: The bridge is named after Meeks family who owned property adjacent to the bridge crossing. The bridge was built in 1900 to replace an early wood structure. A bridge has stood at this crossing of Kettle Creek since the c1830s when Sparta Line was opened.
Previous Bridges: Yes
Other Comments: 1929: new concrete floor and steel joist; Repainted 1946; 1978: concrete maintenance; 1985: repainted

PROPERTY RIGHTS & RESPONSIBILITIES	
Owner: County of Elgin	Maintenance: County of Elgin

PLANNED UNDERTAKING
Bridge Replacement

GENERAL COMMENTS

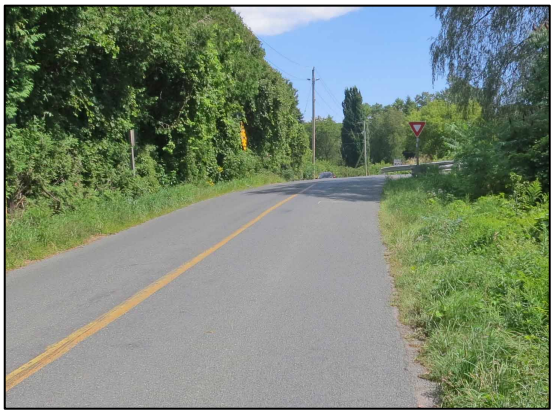
PHOTOGRAPHS

View west on Robert's Line to Sparta Line CR 27 at north end of Meeks Bridge

View east on Robert's line from Meeks Bridge.

House located at 41614 Robert's Line to the west of Meeks Bridge.

Barn located at 41658 Robert's Line beside the house and just west of Meeks Bridge.



View east on Sparta Line CR 27 to the junction with Robert's Line at the north end of the Meeks Bridge.

View west on Sparta Line CR 27 from the north end of Meeks Bridge.

PHOTOGRAPHS

View south on Sparta Line CR 27 from Meeks Bridge.

View east on Kettle Creek from Meeks Bridge with a concrete retaiing wall on the north bank.

View west on Kettle Creek from Meeks Bridge.

South bridge abutment. Note the 2-ft. (0.61 m) of conrete added in 1908 to raise the bridge.

North bridge abutment.

East elevation of Meeks Bridge.

PHOTOGRAPHS

Oblique view to the south of the east elevation of Meeks Bridge.

View to the northeast to the west elevation of Meeks Bridge.

Oblique view to the south of the west elevation of Meeks Bridge.

View to north of the steel north to south deck stringers and east to west steel floor beams.

View of the south end of Meeks Bridge.

View of the north end of Meeks Bridge.

PHOTOGRAPHS

View of the original lattice railing on the east side of Meeks Bridge.

View of the original lattice railing on the west side of Meeks Bridge.

Detail of end post on the southeast bridge corner for the lattice railing. Similarly designed end posts are on all fother corners.

Broken make's plaque on the southeast end post.

Maker's plaque on the northwestt end post, "Dominion Bricge Co. Ltd., Lachine P.Q."

Bridge fabricator mark of "Carnegie" on the side of an end port. One of several similar marks found on the truss structure.

APPENDIX D:
County of Elgin
Official Plan
E2 - Cultural Heritage

E2 CULTURAL HERITAGE RESOURCES

E2.1.1 Objectives

The objective of this Plan is to

- encourage the identification, of cultural heritage resources and to protect, conserve and enhance them and to strive to have all new *development* occur in a manner that respects the County's rich cultural heritage.
- raise the public's awareness that cultural heritage resources are important to the County of Elgin and to its local municipalities and should be protected for future generations.

E2.1.2 Policies

It is the intent of this Plan that the County's *significant built heritage resources* and *significant cultural landscapes* be identified, *conserved* and *enhanced* and that all new *development* occur in a manner that respects the County's rich cultural heritage. The cultural heritage resources of the County generally include:

a) *built heritage resources*;

b) *cultural heritage landscapes;* and,

c) *archaeological resources*.

Local Official Plans shall include policies that are intended to implement this policy, including requiring a heritage impact assessment or conservation plan and/or cultural heritage impact assessment prior to *development* on lands on or adjacent to cultural heritage resources. A heritage impact assessment should outline the context of the proposal, any potential impacts the proposal may have on the heritage resource, and any mitigative measures required to avoid or lessen negative impact on the *heritage resource*.

Local municipalities are encouraged to establish Municipal Heritage Committees pursuant to the Ontario Heritage Act.

It is a policy of this Plan to support the use of local municipal Community Improvement Plans under the Planning Act to promote and support *cultural heritage resources*.

The County encourages the identification and conservation of built heritage resources of cultural heritage value or interest, under Part IV of the Ontario Heritage Act, as per Ontario Regulation 9/06, and heritage conservation districts under Part V of the Ontario Heritage Act. The County also encourages local municipalities to identify and conserve cultural heritage landscapes under Part IV and V of the Ontario Heritage Act.
The County will conserve the cultural heritage resources within the County by requiring a Cultural Heritage Impact Assessment by a qualified person for *development* proposals that include or are adjacent to protected heritage properties.

E2.1 ARCHAEOLOGICAL RESOURCES

The County recognizes that there are *archaeological resources* of pre-contact and early historic habitation as well as *areas of archaeological potential* within the County, that can be adversely affected by any future *development* and redevelopment.

The County and/or local municipalities shall therefore require archaeological assessments and the preservation or excavation of *significant archaeological resources* in accordance with Provincial requirements. Archaeological assessment reports by licensed archaeologists are to be in compliance with guidelines set out by the Ministry of Tourism, Culture, and Sports, as well as licensing requirements referenced under the Ontario Heritage Act.

The appropriate First Nations shall be provided notification with regard to the identification of burial sites and *significant archaeological resources* relating to the activities of their ancestors. If the County initiates the preparation of an archaeological master plan, the appropriate First Nations shall be notified and invited to participate in the process.

Local Councils may conserve the integrity of *archaeological resources* by adopting zoning by-laws under Section 34 of the Planning Act, to prohibit land uses on sites where an identified *significant* archaeological resource or an area of archaeological potential exists.

HERITAGE IMPACT ASSESSMENT
MEEKS BRIDGE REPLACEMENT

FORMER TOWNSHIP OF SOUTHWOLD, COUNTY OF ELGIN
PART OF LOT 6, RANGE 1 NORTH OF UNION ROAD
FORMER DEREHAM TOWNSHIP, COUNTY OF OXFORD
TOWNSHIP OF SOUTHWOLD, ELGIN COUNTY, ONTARIO

FINAL REPORT

Prepared for:

CIMA+
400-3027 Harvester Road
Burlington, ON L7N 3G7

ASI File: 19CH-206

August 2020 (Revised September 2020)

ASI Providing Archaeological & Cultural Heritage Services
528 Bathurst Street Toronto, ONTARIO M5S 2P9
416-966-1069 F 416-966-9723 asiheritage.ca

HERITAGE IMPACT ASSESSMENT
MEEKS BRIDGE REPLACEMENT

FORMER TOWNSHIP OF SOUTHWOLD, COUNTY OF ELGIN
PART OF LOT 6, RANGE 1 NORTH OF UNION ROAD
FORMER DEREHAM TOWNSHIP, COUNTY OF OXFORD
TOWNSHIP OF SOUTHWOLD, ELGIN COUNTY, ONTARIO

EXECUTIVE SUMMARY

ASI was contracted by CIMA+ to conduct a Heritage Impact Assessment (HIA) for Meeks Bridge as part of the Meeks Bridge Replacement project under the County of Elgin Schedule 'B' Municipal Class Environmental Assessment. The study area is located in part of Lot 16, Range 1 north of Union Road on Sparta Line (County Road 27) in the Township of Southwold. This HIA is structured to evaluate the potential impacts of the project alternatives on the identified cultural heritage attributes of the subject bridge and to propose suitable mitigation measures in accordance with the County of Elgin's *Official Plan* (County of Elgin 2015).

Meeks Bridge, County No. B-24, is a single span, steel double-intersection Warren truss (Double Warren) with verticals. The bridge has been in use as a crossing over Kettle Creek since 1900, and is part of the county road network. A Cultural Heritage Evaluation Report (CHER) completed for the subject bridge (Unterman McPhail Associates 2019) determined that the structure retains cultural heritage value following the application of O. Reg. 9/06 of the *Ontario Heritage Act*. In particular, the structure was found to retain physical and design value as the earliest surviving example of a double-intersection Warren through truss with riveted connections in the County of Elgin, historical value due to its association with County Engineer James A. Bell, the Dominion Bridge Company, and the Meeks Family, and contextual value through its association with Kettle Creek and the surrounding area. Given that the subject bridge meets O. Reg. 9/06, the CHER recommended that a HIA be conducted to determine potential impacts to the cultural heritage attributes with the preferred alternative and establish mitigation measures. The HIA satisfies this recommendation.

Given the identified cultural heritage value of Meeks Bridge and the preferred option being carried forward as part of the Environmental Assessment involving the complete removal of the subject bridge and replacement with an existing modular bridge (Alternative 3- Replace the Bridge), the following recommendations and mitigation measures should be considered and implemented:

1. Where feasible, the preferred alternative should be selected to ensure the fewest direct and permanent impacts to the identified heritage attributes of the subject bridge. 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.

The historical and contextual associations of the subject bridge as a crossing over Kettle Creek would be maintained in a sympathetically designed replacement structure.

2. According to available documentation, the replacement bridge is anticipated to be an Acrow modular truss bridge with geometric truss design, open sight lines, scale and massing that is comparable to the 1900 Double Intersection Warren Truss 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 and should be carried forward to detailed design.

3. According to available documentation, 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 identified in Section 2.2.

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

    a. The bridge and setting should be professionally documented. The CHER (Unterman McPhail Associates 2019) and this HIA completed for the Meeks Bridge is sufficient documentation;
    b. 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
    c. 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. This report should be filed with heritage staff at the County of Elgin and with the Ministry of Heritage, Sport, Tourism and Culture Industries for review.

PROJECT PERSONNEL

Senior Project Manager:	Annie Veilleux, MA, CAHP Senior Cultural Heritage Specialist | Manager - Cultural Heritage Division
Project Administration:	Katrina Thach, Hon. BA Archaeologist | Project Coordinator - Environmental Assessment Division
Project Manager:	John Sleath, MA Cultural Heritage Specialist | Project Manager - Cultural Heritage Division
Field Review:	John Sleath
Report Production:	John Sleath
	Meredith Stewart, MA, MSc CAHP Intern Cultural Heritage Assistant - Cultural Heritage Division
Graphics Production:	Andrew Clish, BES Senior Archaeologist - Planning Assessment Division
Report Reviewer(s):	John Sleath
	Annie Veilleux

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1.0 INTRODUCTION

ASI was contracted by CIMA+ to conduct a Heritage Impact Assessment (HIA) for Meeks Bridge (County No. B-24) as part of the Meeks Bridge Replacement project under the County of Elgin Schedule 'B' Municipal Class Environmental Assessment (EA). The study area is located in part of Lot 16, Range 1 north of Union Road on Sparta Line (County Road 27) in the Township of Southwold (Figure 1). This HIA is structured to evaluate the potential impacts of the project alternatives on the identified cultural heritage attributes of the subject bridge and to propose suitable mitigation measures in accordance with the County of Elgin's *Official Plan* (County of Elgin 2015).

Meeks Bridge, County No. B-24, is a single span, steel double-intersection Warren truss (Double Warren) with verticals with an overall length of 38.7 m and an overall width of 4.9 m (Figure 2). The bridge has been in use as a crossing over Kettle Creek since 1900, and is part of the county road network. A Cultural Heritage Evaluation Report (CHER) completed for the subject bridge determined that the structure retains cultural heritage value following the application of O. Reg. 9/06 of the *Ontario Heritage Act* (OHA) (Unterman McPhail Associates 2019). In particular, the structure was found to retain physical and design value as the earliest surviving example of a double-intersection Warren through truss with riveted connections in the County of Elgin, historical value due to its association with County Engineer James A. Bell, the Dominion Bridge Company, and the Meeks Family, and contextual value though its association with Kettle Creek and the surrounding area. The subject bridge is not designated under Part IV of the *Ontario Heritage Act* or municipally listed by the Township of Southwold or the County of Elgin.

Based on the deterioration of structural elements, non-compliant barrier systems, and the recommendation that the subject bridge be replaced in 6-10 years (County of Elgin 2019), the Class EA process for the Meeks Bridge is required to identify a short and/or long-term plan for the structure. At the time of this report, the preferred option being carried forward as part of the EA is the complete replacement of the subject bridge. Given that the subject bridge meets O. Reg. 9/06, the CHER recommended that a HIA be conducted to determine potential impacts to the cultural heritage attributes of the structure in the preferred alternative and establish mitigation measures. The HIA satisfies this recommendation.

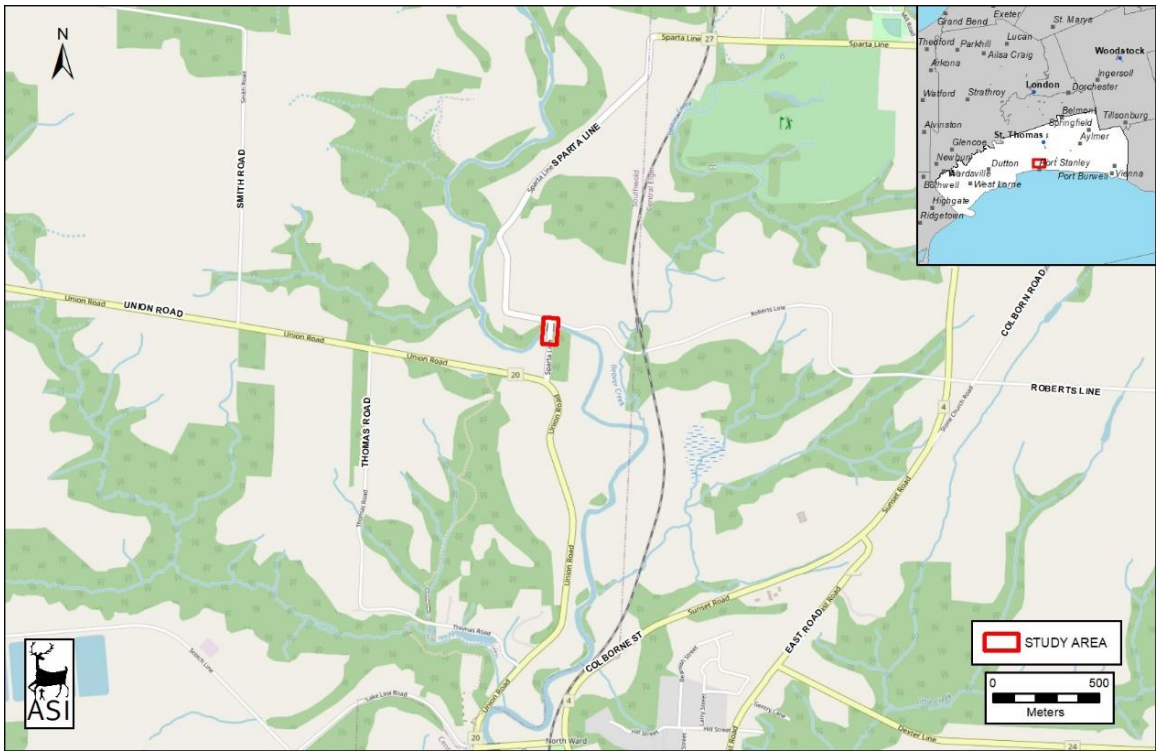

Figure 1: Location of the study area (outlined in red).
Source: ©OpenStreetMap and contributors, Creative Commons-Share Alike License (CC-BY-SA ESRI Street Maps)

Figure 2: Meeks Bridge looking southwest from Roberts Line (ASI 2020)

The site visit and project management for this assessment was conducted by John Sleath, Cultural Heritage Specialist and Project Manager, and the research and analysis was completed by Meredith Stewart, Cultural Heritage Assistant, all under the senior project direction of Annie Veilleux, Senior Cultural Heritage Specialist and Manager of the Cultural Heritage Division, all of ASI. The present HIA follows the Ministry of Heritage, Sport, Tourism and Culture Industries *Ontario Heritage Toolkit* (MHSTCI 2006) and the *Standards and Guidelines for the Conservation of Historic Places in Canada* (Parks Canada 2010). Research was completed to investigate and document the property and to measure the impact of the proposed development on the existing cultural heritage resource.

The scope of a HIA is provided by the MHSTCI's *Ontario Heritage Tool Kit.* An HIA is a useful tool to help identify cultural heritage value and provide guidance in supporting environmental assessment work. As part of a HIA, proposed site alterations and project alternatives are analysed to identify impacts of the undertaking on the heritage resource and its heritage attributes. The impact of the proposed development on the cultural heritage resource is assessed, with attention paid to identifying potential negative impacts, which may include, but not limited to:

- Destruction of any, or part of any, significant heritage attributes or features;
- Alteration that is not sympathetic, or is incompatible, with the historic fabric and appearance;
- Shadows created that alter the appearance of a heritage attribute or change the viability of an associated natural feature or plantings, such as a garden;
- Isolation of a heritage attribute from its surrounding environment, context or a significant relationship;
- Direct or indirect obstruction of significant views or vistas within, from, or of built and natural features;
- A change in land use (such as rezoning a church to a multi-unit residence) where the change in use negates the property's cultural heritage value;
- Land disturbances such as a change in grade that alters soils, and drainage patterns that adversely affect a cultural heritage resource, including archaeological resources.

Where negative impacts of the development on the cultural heritage resource and/or attributes are identified, mitigative or avoidance measures or alternative development or site alteration approaches are considered. Conservation options are outlined in the *Ontario Heritage Bridge Guidelines* (OHBG)(Ministry of Culture and Ministry of Transportation, Ontario (MTO) 2008), which is regarded as current best practice for conserving heritage bridges in Ontario. While intended for use in the assessment of provincially-owned structures and not directly applicable to the municipal context, the OHBG ensures that heritage concerns and appropriate mitigation options are considered.

Unterman McPhail Associates' *Cultural Heritage Evaluation Report: Meeks Bridge, County Road No. B-24* (Unterman McPhail Associates 2019), concluded that the subject bridge has cultural heritage value as it meets the criteria outlined in O. Reg. 9/06 of the OHA, and that a resource-specific HIA would be required. The present report satisfies this requirement.

1.1 Description of Property

Meeks Bridge is located approximately 0.25 km north of Union Road (County Road 20) and carries one lane of north and southbound Sparta Line (County Road 27) vehicular traffic over Kettle Creek (Figure 1). The subject bridge is a single span, steel double-intersection Warren truss (Double Warren) with verticals with an overall length of 38.7 m and an overall width of 4.9 m, and was constructed in 1900 (Figure 2). Historically, the study area is located in part of Lot 6, Range 1 north of Union Road in the former Township of Southwold, now in the County of Elgin.

Sparta Line, a two-lane paved roadway with a centre line featuring gravel shoulders and deep grassy ditches, is part of the local county road network. South of Kettle Creek, Sparta Line intersects with Union Road. Approaching the creek, Sparta Line narrows to a single lane, crossing over Kettle Creek, then curves westward north of the waterway. A roadway, known as Roberts Line, branches eastward from Sparta Line north of Kettle Creek. A stop sign is located on Sparta Line where it meets Roberts Line, forming a T-intersection.

The area surrounding Meeks Bridge and Sparta Line are predominantly agricultural use. A contemporary residence and agricultural structures are located northeast of Meeks Bridge, on Roberts Line. Another contemporary residence has been constructed south of Kettle Creek on the northwest corner of Sparta Line and Union Road.

Kettle Creek generally runs north-south through the County of Elgin, and empties into Lake Erie at Port Stanley. A majority of Kettle Creek's watershed is in agricultural use. Where Meeks Bridge carries Sparta Line (County Road 27) over Kettle Creek the waterway runs in an eastward direction. The banks of Kettle Creek feature dense vegetation.

Meeks Bridge is currently owned and maintained by the County of Elgin.

1.1.1 Adjacent Cultural Heritage Resources

There are no previously identified cultural heritage resources adjacent to Meeks Bridge in the Township of Southwold.

2.0 STATEMENT OF CULTURAL HERITAGE VALUE

The following Statement of Cultural Heritage Value is taken from the *Cultural Heritage Evaluation Report: Meeks Bridge, County Road No. B-24* (Unterman McPhail Associates 2019).

2.1 Cultural Heritage Value or Interest

In 1900, the County of Elgin undertook the design of the current Meeks Bridge, County No. B-24, to replace an earlier 19th century bridge structure known as the Zavitz Bridge located on Sparta Line CR 27 at Kettle Creek. Meeks Bridge and its location is illustrative of and a physical/tangible reminder of the road network development in the Township of Southwold and the County of Elgin in the 19th century and in the early 20th century.

The County of Elgin assumed the Zavitz Bridge, the location of Meeks Bridge on Kettle Creek, in 1886. County Engineer James A. Bell was responsible for the design and construction of the current Meeks Bridge, a steel through truss, to replace an earlier structure on Sparta Line over Kettle Creek. Bell had an illustrious career and was an important member of the engineering profession in the late 19th and early 20th century. The original truss bridge is a surviving representative example of his road bridgework from the turn of the 20th century. The Dominion Bridge Company of Lachine, Quebec fabricated the superstructure of Meeks Bridge and it would be considered a typical bridge project from the turn of the 20th century for this important company.

Built in 1900, Meeks Bridge is the earliest surviving example 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-intersections, 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.

Meeks Bridge continues to fulfill its function as a road bridge in the community. It is a well-known structure locally and contributes to the ambience of the character and setting of its rural environment.

2.2 Heritage Attributes

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

- *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 chords and diagonals;*
- *Built up sections of the truss that include channels, angles, plates and lattice members;*
- *Steel floor beams and stringers;*
- *Riveted connections;*
- *Two (2) maker's plaques, one on the northwest end post, which is complete and one on the southeast end post, which is broken;*
- *The various examples of "Carnegie" marking(s) on the steel components, in particular the end post and the vertical at the hip of the end posts;*
- *Lattice railing and decorative metal end posts with pyramidal caps; and*
- *Concrete deck.*

Heritage attributes under the historical value criteria for Meeks Bridge include:

- *Its historical linkage to its surroundings;*
- *Its association with the County Engineer James A Bell;*
- *Its association with the Dominion Bridge Company Ltd, Lachine, Quebec;*
- *The association of the bridge at this location over Kettle Creek on Sparta Line since the 1830s/1840s;*
- *Its longevity and age at 119 years, built in 1900 to replace an earlier 19th century bridge structure known as the Zavitz Bridge, Meeks Bridge; and*
- *Its name association with the Meek family, 19th century settlers in Southwold township and adjacent landowners.*

Heritage attributes under the contextual value criteria for Meeks Bridge include:

- *Its rural environment on Kettle Creek;*
- *The importance of Meeks Bridge in maintaining the rural environment as characterized by its one-lane steel and double-intersection Warren truss structure; its pleasingly attractive structure that fits will within its rural environment;*
- *Its physical, functional, visual linkages to its surroundings; and*
- *Its distinctive visual form in its immediate landscape as a familiar local landmark in its immediate area and to local residents.*

Figure 3: Location of the subject bridge

(ESRI Digital Globe 2018)

3.0 ASSESSMENT OF EXISTING CONDITIONS

A field review was undertaken by John Sleath, ASI, on 31 March 2020 to conduct photographic documentation of the bridge crossing and to collect data relevant for completing an impact assessment of the structure. Results of the field review were used to describe the existing conditions of the bridge crossing. This section provides a general description of the bridge crossing and immediate vicinity. The location of the subject bridge is provided in Figure 3, and a general arrangement drawings of the structure completed in 1994 is included in Appendix B.

The following description of the subject bridge was completed during preparation of the CHER in 2019 (Unterman McPhail Associates 2019). The CHER was reviewed prior to fieldwork and the description provided below is consistent with what was observed during the field review completed by ASI in March 2020. While not noted in either the CHER or the 2019 OSIM (County of Elgin 2019), the subject bridge appears to lack vehicular barrier at deck level, but does include a steel lattice barrier with decorated cast iron posts.

Section 4.0 of the CHER (Unterman McPhail Associates 2019:16–18) provides the following built heritage resource description:

> *The following description of Meeks Bridge is based on a structure drawing (1994), inspection reports (2014 and 2019) and a site visit (August 2019). For the purposed of this report, Meeks Bridge runs in a north to south direction. Metric measurements are used in the description of the bridge to maintain consistency with the 1994 design drawing. Imperial equivalents, which would have been used for the original design, are provided in brackets.*
>
> *The single span Meeks Bridge, County No. B-24, over Kettle Creek in the Township of Southwold is classified as a through steel truss, double-intersection Warren truss. The abutments are constructed of cast-in-place concrete. The steel truss was fabricated in 1900 and the connections are rivetted.*
>
> *Substructure*
>
> *The substructure comprises cast-in-place reinforced concrete abutments on the north and south creek banks. The two original abutments were raised 2-ft. (0.61 m) in 1908.*
>
> *Truss*
>
> *The superstructure is a double-intersection Warren truss design. From the elevation views, this truss configuration appears to be two offset Warren Trusses superimposed on each other forming a repeating "X" shape. The total length of the steel trusses and structure is 38.7 m (126-ft 11 6/10-in). The total height is 6100 mm (20-ft. 1/5-in.). The east and west trusses each comprise 12 panels and have hip vertical members that meet the top (upper) of each end post.*
>
> *The truss members above the deck are built up of structural steel sections that include channels, angels, plates, and lattice members. The resulting appearance is much lighter*

and airier than a truss using rolled steel shapes. The steel members of the truss are marked in several locations with "Carnegie" and are riveted in place. The two trusses are ties together at the top with transverse and diagonal bracing. The portal frame is formed of transverse ties and diagonal stiffeners that form a diamond pattern. The posted clearance on both ends of the bridge portal is 4.33 m at the centre and 3.0 m at the sides.

There are two (2) makers' plaques, "Dominion Steel Co. Ltd, Lachine, P.Q.", installed on the bridge. One plaque is located on the northwest end post and one, which is broken in half, is on the southeast end post.

Deck

Original transverse steel floor beams run east to west and are located at the base of each of the truss panel points. The floor beams support five (5) north to south steel deck stringers. Bracing extends diagonally between the truss panel points. The overall width of the deck set on the deck stringers is 4.40 m (14-ft.5 2/10-in.) and the wearing surface of the deck is tarmac over concrete.

Original lattice railings run along the east and west sides of the structure. The lattice railing contribute to the visual appreciation of the bridge by creating a defined geometric art and a complexity of form. Additionally, the decorative end posts with pyramidal caps add visual appeal to the overall composition of the bridge.

Modifications

The subject bridge has undergone few modifications to its original design intent and materials and retains its original lattice railings with decorative end posts. The makers' plaque on the southeast end post has been broken. Known structural and replacement work on Meeks Bridge includes, but is not limited to:

- *In 1908, concrete abutments were raised 2-ft (0.61 m).*
- *In 1997, a new cable rail was installed on the bridge in 1997.*
- *In 1999, a new railing and post installed on the southeast corner.*

Meeks Bridge is currently owned and maintained by the County of Elgin and is subject to a load limit of 8 tonnes. Inspections undertaken in April 2019 noted structural deterioration of numerous elements and recommended the repair to the corner of a truss within 1-5 years and the complete replacement of the structure in 6-10 years (County of Elgin 2019). The bridge inspection made the following comments and recommended the following work:

- Deck plates rattle when traffic crosses it;
- Trusses (top chord, bottom chord, and vertical) rusting;
- Beams (floor beams, stringers) rusting;
- Underside bracing has fallen off on numerous panels, remainder is badly rusted. Monitor, (recommended work less than 1 year); and

- Concrete deck is spalling patches on 30% of surface, joint on south side need to be fixed (recommended work in 1-5 years).

Plate 1: South portal of the subject bridge, looking north.

Plate 2: North portal of the subject bridge, looking south.

Plate 3: Oblique view of west elevation, looking southeast.

Plate 4: Oblique view of the east elevation, looking northwest.

Plate 5: East elevation of the subject bridge, looking west.

Plate 6: East face of south abutment, looking west.

Plate 7: Detail of the bearing on southeast corner of the structure, looking west.

Plate 8: North abutment, looking northwest.

Plate 9: Deck soffit and floor beams, looking north towards the north abutment.

Plate 10: Damaged bracing supporting floor beams in the north portion of the structure, looking southwest

Plate 11: Representative gusset plate with riveted connections to truss diagonals on the east elevation, looking west.

Plate 12: Representative metal lattice railing at deck level.

Plate 13: South elevation, looking north. Note the small covered entrance and porch at left.

Plate 14: Detail of components in end post on the northwest corner of the bridge, looking northwest.

Plate 15: Detail of railing post on southeast corner.

Plate 16: Dominion Bridge Co. marking on northwest end post.

Plate 17: Roberts Line to the north and east of the subject bridge, with he bridge at far right, looking east.

Plate 18: County Road 27/Sparta Line south of the subject bridge, looking south.

Plate 19: Kettle Creek looking east from the subject bridge.

Plate 20: Kettle Creek, looking southwest from the subject bridge.

4.0 DESCRIPTION AND PURPOSE OF PROPOSED ACTIVITY

Inspections undertaken in April 2019 noted structural deterioration of numerous elements and recommended the repair to the corner of a truss within 1-5 years and the complete replacement of the structure in 6-10 years (County of Elgin 2019).

Based on the deterioration of structural elements, non-compliant barrier systems, and the recommendation that the subject bridge be replaced in 6-10 years (County of Elgin 2019), the Class EA process for the Meeks Bridge is required to identify a short and/or long-term plan for the structure. The following four options were evaluated as part of the EA of the subject bridge (CIMA+ 2020):

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.

Following the evaluation of these four options during the course of the EA, Alternative 3- Replace the Bridge, was selected as the preferred alternative by the County of Elgin. The following summary analysis

and evaluation of alternatives is included in Public Information Centre (PIC) display boards for presentation to the public and stakeholders in the future:

- 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.
- Alternatives 1 and 4 do not address the problem and opportunity statement.
- 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 extents of the initial rehabilitation works.
- 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.

Therefore, replacement of Meeks Bridge has been identified as the preferred alternative (CIMA+ 2020:19).

The preferred design alternative for Alternative 3- Replace the Bridge, involves the removal of the existing 1900 Double-Intersection Warren Truss superstructure and the replacement with an existing Acrow[1] modular panel bridge that is currently being used as a temporary bridge in Port Bruce approximately 17 km east of Meeks Bridge. The bridge was installed in Port Bruce as a temporary crossing over Catfish Creek in Port Bruce following the unexpected collapse of the Imperial Street Bridge in February 2018.

Due to the modular design of the proposed replacement bridge, several configuration options were also considered for the replacement superstructure, including the overall length of the structure (modular panels are 10 feet in length) and the width of the structure. The length options and width sub-options for the replacement of the existing bridge with the modular Port Bruce bridge include the following (CIMA+ 2020:20):

Span Length Options:

1. 130 feet (39.6 m) span
2. 140 feet (42.5 m) span

[1] Note: Acrow is a company that specializes in the construction of modular truss bridges, and does note specifically denote the truss configuration. Information on the company and their bridges can be found at <https://acrow.com/solutions/permanent-bridges/vehicular-bridges/>

Bridge Width Sub-Options:

a) 1 traffic lane and additional space for pedestrians
b) 2 traffic lanes (3.5 m) including buffer but no pedestrian space
c) 2 traffic lanes (3.75 m) including buffer but no pedestrian space
d) 2 traffic lanes (3.75 m) including buffer and additional space for pedestrians.

The preferred length and width for the proposed modular panel replacement bridge was determined to be a 140 foot (42.5 m) span length (Option 2) with a width of 3.5 m carrying two lanes of traffic with no pedestrian space (Sub-Option b). The increased length of the replacement bridge was determined to be preferred as it would allow for the retention of the existing cast-in-place concrete abutments with minor modifications, while the width was selected to increase the existing capacity from one lane to two lanes. Adding sidewalks to the replacement bridge was not determined to be necessary as there is little pedestrian activity in the area (CIMA+ 2020:21). Functional design and general arrangement drawings of the proposed replacement structure are included in Appendix A.

The modular panel replacement bridge superstructure will be supported on two concrete caissons at each end of the bridge. A concrete beam will tie together the two pairs of caissons. On top of each caisson is the bridge bearing on which will sit the steel frame of the Acrow modular bridge. The steel deck will have an epoxy wearing surface. Photographs of the proposed replacement bridge as it was installed in Port Bruce are provided as an example of the truss configuration, however the length, width, and number of lanes carried will be different when it is installed at the subject crossing (Figure 4 and Figure 5). A representative example of an Acrow truss bridge that carries a roadway over an unknown riverine crossing provided on the Acrow website is included in Figure 7 (https://acrow.com/solutions/permanent-bridges/vehicular-bridges/).

According to available documentation, the existing cast in-place concrete abutments of the 1900 Meeks Bridge are anticipated to be retained at the subject crossing with minor modifications to accommodate the replacement superstructure. The caisson substructure that will support the replacement superstructure are anticipated to be located to the south of the existing south abutment and to the north of the existing north abutment. Modifications to both the north and south abutments are anticipated to include minor concrete removals at the top of the abutment to ensure the replacement bridge can be installed to match the existing road elevation to reduce impacts related to grading and soil infill in the general area. Following replacement, the modular panel bridge at this crossing will increase the vehicular capacity of the crossing, with two lanes of vehicular County Road 27/Sparta Line traffic over Kettle Creek.

Figure 4: Modular panel bridge in Port Bruce that is anticipated to replace the Meeks Bridge, shown carrying traffic in Port Bruce (Broadley, August 20, et al. 2018)

Figure 5: Modular panel bridge in Port Bruce that is anticipated to replace the Meeks Bridge, shown carrying traffic in Port Bruce (Broadley, August 15, et al. 2018)

Figure 6: Modular panel bridge in Port Bruce that is anticipated to replace the Meeks Bridge (Photo courtesy of CIMA+)

Figure 7: Example of an Acrow truss bridge carrying a roadway in a riverine setting (Image retrieved from Acrow Corporation of America 2020).

5.0 IMPACT ASSESSMENT AND ALTERNATIVES CONSIDERED

The preferred alternative under consideration including the complete removal and replacement of the superstructure and minor modifications to the substructure of the subject bridge will result in impacts to the heritage attributes identified in the CHER and outlined in Section 2.0.

The following table presents the results of ASI's impact assessment of the proposed undertaking, based on the *Ontario Heritage Bridge Guidelines* (Ministry of Culture and Ministry of Transportation, Ontario (MTO) 2008) Conservation Options. The Conservation Options are also considered appropriate project alternatives for the proposed undertaking. It considers possible direct adverse impacts, indirect adverse impacts, positive impacts, and the viability of this option in relation to the overall EA.

Table 1: OHBG Impact Assessment of the Meeks Bridge.

Conservation Options (OHBG, 2008)	Analysis	Viable Option
1) Retention of existing bridge with no major modifications undertaken	This option would result in the lowest degree of intervention and fewest impacts to the subject bridge. However, this is not considered a viable option as it would not address the main problem/opportunity of the EA project. The retention of the bridge with no major modifications would not address the significant structural deterioration noted in the OSIM, would not allow for the removal of the load restrictions on the structure, would not permit the installation of a code-compliant vehicular barrier, and would not permit widening the structure to carry two lanes of vehicular traffic. Further, retention with no major modifications would not ensure the retention of the structure as a safe crossing. As such, this is not considered a viable option. This conservation option was under consideration in the EA as Alternative 1-Do Nothing and was eliminated from consideration.	No
2) Retention of existing bridge and restoration of missing or deteriorated elements where physical or documentary evidence (e.g. photographs or drawings) can be used for their design	This option would result in a lesser degree of intervention and fewer impacts to the subject bridge. However, this option is not considered viable as it would not result in code-compliant barrier installation and would not permit two lanes of vehicular travel, and therefore would not address the transportation goals of the EA. This alternative was under consideration in the EA as Option 2- Rehabilitate the Bridge, but was eliminated from consideration.	No

Conservation Options (OHBG, 2008)	Analysis	Viable Option
3) Retention of existing bridge with sympathetic modification	This option would result in a lesser degree of intervention and fewer impacts to the subject bridge. Sympathetic modifications to the existing bridge including the repair of deteriorated elements in the superstructure and substructure and installation of a code-compliant vehicular barrier would enable its retention. These repairs and modifications are considered necessary to ensure the continued use of the structure as a watercourse crossing and would ensure the retention and long-term preservation of the structure. However, this option would not permit two lanes of vehicular travel, and could lead to issues with hydraulic capacity of the crossing if modifications reduced the existing clearance of the structure, and therefore would not address the transportation goals of the EA. Further, the high costs and potential environmental impacts associated with rehabilitation were evaluated and determined to be prohibitive. This alternative was under consideration in the EA as Option 2- Rehabilitate the Bridge, but was eliminated from consideration.	No
4) Retention of existing bridge with sympathetically-designed new structure in proximity	This option is not considered viable as it would not address the underlying structural deficiencies in the subject bridge and would not ensure the preservation of the existing bridge crossing.	No

Conservation Options (OHBG, 2008)	Analysis	Viable Option
5) Retention of existing bridge no longer in use for vehicle purposes but adapted for pedestrian walkways, cycle paths, scenic viewing etc.	This option is not considered viable as this crossing is required to carry vehicular traffic to service the residences and farms in the immediate area. The subject bridge is not believed to carry significant pedestrian or cycling traffic to its rural agricultural setting. Further, this option would involve the retention of the existing bridge without rehabilitation, which is not viable as it would not ensure the continued safe function of the existing bridge crossing. This conservation option was not considered in the EA.	No
6) Retention of bridge as heritage monument for viewing purposes only	This option would involve the retention of the existing bridge without rehabilitation, which is not viable as it would not ensure the preservation of the existing bridge crossing. Further, continued structural deterioration without rehabilitation would result in the eventual failure of the structure with impacts to public safety and impacts to the Kettle Creek drainage patterns and wildlife. This conservation option was not considered in the EA.	No

Conservation Options (OHBG, 2008)	Analysis	Viable Option
7) Relocation of bridge to appropriate new site for continued use or adaptive re-use	Relocation of the subject bridge is not considered to be a viable option due to the poor structural condition of the steel truss superstructure. Many of the existing steel components in the superstructure would require rehabilitation or replacement prior to disassembly to enable relocation, which is considered infeasible from an environmental perspective as rehabilitation would disturb the existing lead-based paint and release it into the river. Environmental remediation measures to mitigate the release of this hazardous paint and the added expense of rehabilitation prior to disassembly is considered to be cost-prohibitive. In addition, the County of Elgin confirmed that there is no suitable crossing available for adaptive re-use and that they do not possess suitable storage facilities to protect the structure for future use (CIMA+ email communication, 30 September 2020). This option was determined to be infeasible and is not being carried over to detailed design.	No
8) Bridge removal and replacement with a sympathetically designed structure:	Direct impacts to the cultural heritage values of the Meeks Bridge are expected through the complete removal of the Double Warren Truss superstructure. All cultural heritage attributes related to the subject bridge identified in the CHER and outlined in Section 2.2 would be removed. The contextual associations of the subject bridge as a crossing over Kettle Creek would be maintained in a sympathetically designed replacement structure. Further, the replacement of the subject bridge would allow for an increased width to carry two lanes of vehicular traffic and ensure a code-compliant barrier. This option is considered viable and is under consideration as part of this EA as Alternative 3- Replace the Bridge. In Alternative 3, only the superstructure of the subject bridge will be removed. The existing cast-in-place concrete abutments will be retained and slightly modified in the proposed replacement structure.	Yes

Conservation Options (OHBG, 2008)	Analysis	Viable Option
a) Where possible, salvage elements/ members of heritage bridge for incorporation into new structure or for future conservation work or displays	Direct impacts to the cultural heritage values of the Meeks Bridge are expected through the complete removal of the bridge. The use of salvage elements in a replacement structure or for future conservation works or displays is a viable option. Where possible, salvaged steel truss members should be retained for incorporation into the new structure or associated landscaping to reduce impacts to the identified heritage attributes outlined in Section 2.2. If incorporation of salvage elements in the replacement structure is deemed to be infeasible, salvaged elements should be retained for inclusion in future conservation work or commemorative displays, where feasible.	Yes

Conservation Options (OHBG, 2008)	Analysis	Viable Option
b) Replacement/removal of existing bridge with full recording and documentation of the heritage bridge	Direct impacts to the cultural heritage values of the Meek Bridge are expected through the complete removal of the bridge. Full recording with an appropriate commemoration strategy would ensure proper documentation for archival purposes. If removal of the subject bridge is chosen, physical heritage attributes, including structural members, should be salvaged for incorporation into future structures at other bridge crossings, conservation work, or displays, where feasible. Replacement of the existing bridge is considered viable and is under consideration as part of this EA as Alternative 3- Replace the Bridge. Removal of the bridge without replacement is not considered viable, although it was under consideration as part of this EA as Alternative 4- Remove Existing Bridge and Retire Road. However removal without replacement is considered to be the most impactful to the identified cultural heritage value of the crossing as it would remove all heritage attributes outlined in Section 2.2 and would eliminate the historical and contextual association of the bridge location as a crossing over Kettle Creek. Further, removal of the bridge without replacement would not address the goals of the EA, and so it was eliminated from consideration.	Yes

The proposed potential options for the rehabilitation, replacement, or removal of the subject bridge are anticipated to have a range of potential impacts to the identified heritage attributes described in Section 2.2.

Alternative 1- Do Nothing is not considered a viable option as it would not address the main problem/opportunity of the EA project. Retention of the bridge with no major modifications would not address the significant structural deterioration noted in the OSIM, would not allow for the removal of the load restrictions on the structure, would not permit the installation of a code-compliant vehicular barrier, and would not permit widening the structure to carry two lanes of vehicular traffic. The Do-Nothing option would not ensure the retention of the structure as a safe crossing and it would not ensure the preservation of the cultural heritage resource. As such, this is not considered a viable option and was eliminated from consideration as part of the EA.

Alternative 2- Rehabilitate the Bridge would result in sympathetic modifications to the existing bridge including the repair of deteriorated elements in the superstructure and substructure and installation of a code-compliant vehicular barrier would enable its retention. These rehabilitations and modifications are considered necessary to ensure the continued use of the structure as a watercourse crossing and would ensure the retention and long-term preservation of the identified heritage attributes of the structure. As such, retention of the bridge following repair is considered to be the least impactful and most preferred options from a heritage perspective. Rehabilitating the bridge was under consideration in the EA as Alternative 2, however it was eliminated from consideration as this option would not permit two lanes of vehicular travel and could result in reduced hydraulic capacity if the repaired elements were to extend below the existing deck and reduce the clearance over the watercourse. Further, the associated high cost of rehabilitation and the potential for increased environmental impacts from the removal of lead paint on the steel members added to this justification. These constraints would make the rehabilitation of the structure unviable as they would not address the transportation goals of the EA and introduce further hydraulic, environmental, and financial concerns.

Alternative 3- Replace the Bridge would result in direct impacts to the cultural heritage value of the Meeks Bridge through the complete removal of the Double Warren truss superstructure. All cultural heritage attributes related to the subject bridge identified in Section 2.2 would be removed. The contextual associations of the subject bridge as a crossing over Kettle Creek would be maintained in a sympathetically designed replacement structure. Further, the replacement of the subject bridge would allow for an increased width to carry two lanes of vehicular traffic and ensure a code-compliant barrier.

Alternative 3 is considered viable and is was selected as the preferred option as part of this EA. In Alternative 3, only the superstructure of the subject bridge will be removed. The existing cast-in-place concrete abutments will be retained and slightly modified in the proposed replacement structure. Where feasible, the identified heritage attributes associated with the superstructure of the bridge should be removed and retained for use in a replacement or repair of a similar structure at another crossing, or for use in commemorative or interpretive installations. Where feasible, salvaged steel truss members should be retained for incorporation into the new structure or associated landscaping to reduce impacts to the identified heritage attributes outlined in Section 2.2.

The replacement bridge is anticipated to be an Acrow modular truss structure with a 140 foot (42.5 m) span length (Option 2) with a width of 3.5 m carrying two lanes of traffic with no pedestrian space (Sub-Option b). The increased length of the replacement bridge was determined to be preferred as it would allow for the retention of the existing cast-in-place concrete abutments with minor modifications, while the width was selected to increase the existing capacity from one lane to two lanes. While not comparable in configuration to the 1900 Double Warren truss, the modular Acrow truss bridge that is anticipated to replace the structure is similar in several respects: the simple geometric design of the structural members are evocative of the Double Warren truss; the open configuration will continue to provide visibility to Kettle Creek; and the scale and massing of the structure is anticipated to be similar to motorists crossing the creek as well as to motorists on Roberts Line (See Figure 7 for a representative example of an Acrow road bridge in a riverine setting). According to available documentation, the existing cast in-place concrete abutments of the 1900 Meeks Bridge are anticipated to be retained at the subject crossing with minor modifications to accommodate the replacement superstructure. Modifications to both the north and south abutments are anticipated to include minor concrete

removals at the top of the abutment to ensure the replacement bridge can be installed to match the existing road elevation to reduce impacts related to grading and soil infill in the general area.

Alternative 4- Remove Existing Bridge and Retire Road is considered to be the most impactful option and therefore the least preferred option from the heritage perspective. Removal of the bridge without replacement would remove all identified heritage attributes outlined in Section 2.2 and would eliminate the historical and contextual associations of the area as an historical bridging point over Kettle Creek. Further, the closure of Sparta Line at this crossing would require the construction of vehicle turn-arounds near the bridge approaches and would negatively impact Sparta Line, an historically-surveyed roadway. This option is considered unviable and was eliminated from consideration for this project.

6.0 PROJECT CONSULTATION

A number of resources were consulted to confirm heritage status of Meeks Bridge since the completion of the CHER in 2019 and to request additional information[2]. These resources include:

- Historic Bridges: Halimand County, Ontario (Holth 2020);
- The *Ontario Heritage Act Register* (Ontario Heritage Trust n.d.);
- The inventory of Ontario Heritage Trust easements (Ontario Heritage Trust n.d.);
- *Ontario Heritage Plaque Database* (Ontario Heritage Trust n.d.);
- *Ontario's Historical Plaques* website (Brown 2019);
- Database of known cemeteries/burial sites curated by the Ontario Genealogical Society (Ontario Genealogical Society n.d.);
- *Canada's Historic Places* website (Parks Canada n.d.);
- *Directory of Federal Heritage Designations* (Parks Canada n.d.);
- Canadian Heritage River System (Canadian Heritage Rivers Board and Technical Planning Committee n.d.); and,
- United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Sites (UNESCO World Heritage Centre n.d.);

The following stakeholders were contacted with inquiries regarding a possible change in the heritage status (Table 2).

Table 2: Results of Stakeholder Consultation

Contact	Organization	Date(s) of Communications	Description of Information Received
Heather James	Planner for Township of Southwold	4 June 2020	Response received. Confirmed there are no heritage designations or recognitions assigned to the subject bridge.
Paul Van Vaerenbergh	Roads Superintendent for Township of Southwold	5 June 2020	Response received. Confirmed there are no heritage designations or recognitions assigned to the subject bridge.

[2] Reviewed 3 June 2020

Table 2: Results of Stakeholder Consultation

Contact	Organization	Date(s) of Communications	Description of Information Received
N/A	County of Elgin	4 June 2020	Response was outstanding at the time of report submission.
Registrar - Ministry of Heritage, Tourism, Sport and Culture Industries	Ministry of Heritage, Tourism, Sport and Culture Industries	4 and 10 June 2020	Response confirmed that the subject bridge is not designated, but was found to retain cultural heritage evaluation in the 2019 CHER (Unterman McPhail Associates 2019).
Kevin De Mille, Natural Heritage Coordinator	Ontario Heritage Trust	4 June 2020	Response received. Confirmed that there are no designations or recognitions assigned to the bridge by the Trust.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The CHER (Unterman McPhail Associates 2019) determined that the Meeks Bridge retains cultural heritage value following the application of O. Reg. 9/06 of the *Ontario Heritage Act* (Section 2.0). In particular, the structure was found to retain physical and design value as the earliest surviving example of a double-intersection Warren through truss with riveted connections in the County of Elgin, historical value due to its association with County Engineer James A. Bell, the Dominion Bridge Company, and the Meeks Family, and contextual value though its association with Kettle Creek and the surrounding area.

Where feasible, consideration should be given to rehabilitating and retaining the subject bridge in situ to maintain the physical, historical, and contextual associations of the subject bridge as a crossing of Kettle Creek. Retention and sympathetic rehabilitation with allowances made for inclusion of modern materials to meet current design and safety codes is the preferred option from a heritage perspective as it would retain the heritage attributes identified in Section 2.2 and retain the historical and contextual value of the subject crossing. Rehabilitation would require the replacement of deteriorated structural members, and would be considered to be permanent and irreversible impacts. However, these repairs are considered necessary to ensure the continued use of the structure as a watercourse crossing and will ensure the retention and long-term preservation of the structure. Following the evaluation of project alternatives, rehabilitation of the subject bridge was determined to be infeasible and was removed from consideration (CIMA+ 2020).

At the time of this report, the preferred option being carried forward as part of the Environmental Assessment was Alternative 3: Replace the Bridge. The analysis of OHBG Conservation Options (Section 5.0, Table 1) determined that Conservation Options 8a and 8b were viable given the identified heritage value of the bridge and the scope of the Environment Assessment. Where feasible, the preferred alternative should be selected to result in the minimum impacts to the heritage resource as possible while still achieving the scope of the EA as identified in the in Section 3.0.

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.

According to available documentation, 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 identified in Section 2.2.

7.1 Mitigation Measures and Recommendations

Given the identified cultural heritage value of the Meeks Bridge and the preferred option being carried forward as part of the Environmental Assessment involving the removal of the 1900 Double Warren truss superstructure and replacement with a modular Acrow truss bridge (Alternative 3- Replace the Bridge), the following recommendations and mitigation measures should be considered and implemented:

1. Where feasible, the preferred alternative should be selected to ensure the fewest direct and permanent impacts to the identified heritage attributes of the subject bridge. 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. The historical and contextual associations of the subject bridge as a crossing over Kettle Creek would be maintained in a sympathetically designed replacement structure.

2. According to available documentation, the replacement bridge is anticipated to be an Acrow modular truss bridge with geometric truss design, open sight lines, scale and massing that is comparable to the 1900 Double Intersection Warren Truss 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 and should be carried forward to detailed design.

3. According to available documentation, 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 identified in Section 2.2.

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

    a. The bridge and setting should be professionally documented. The CHER (Unterman McPhail Associates 2019) and this HIA completed for the Meeks Bridge is sufficient documentation;
    b. 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
    c. 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. This report should be filed with heritage staff at the County of Elgin and with the Ministry of Heritage, Sport, Tourism and Culture Industries for review.

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APPENDIX A: PRELIMINARY DESIGN DRAWINGS OF THE PROPOSED REPLACEMENT STRUCTURE

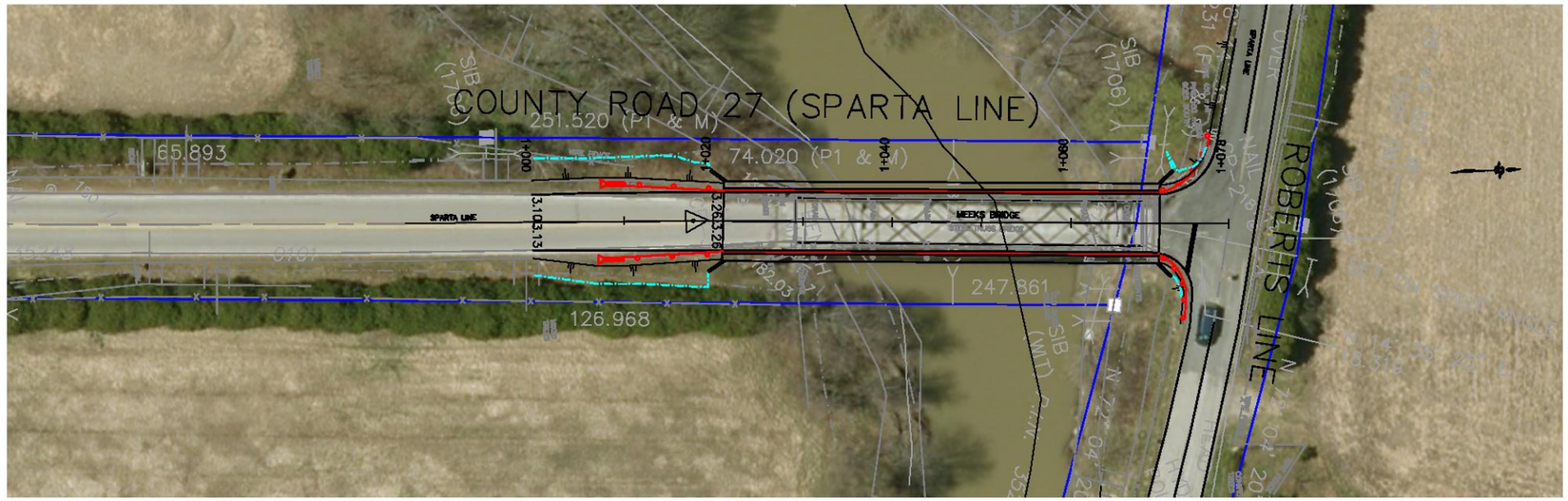

Figure 8: Proposed Replacement Meeks Bridge Functional Design (Provided by CIMA+).

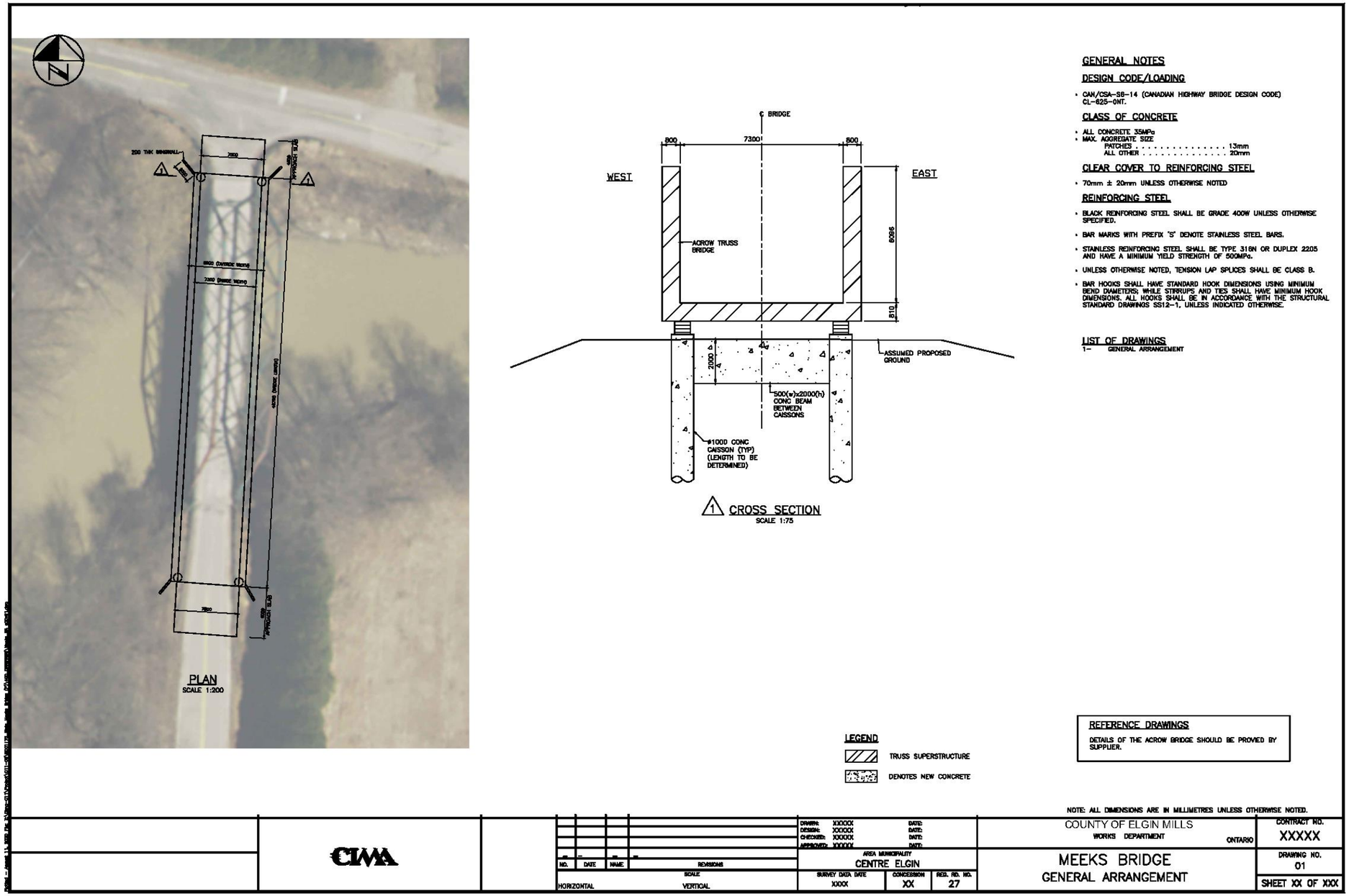

Figure 9: Proposed Replacement Meeks Bridge General Arrangement (Provided by CIMA+).

APPENDIX B: STRUCTURAL DRAWING OF THE SUBJECT BRIDGE

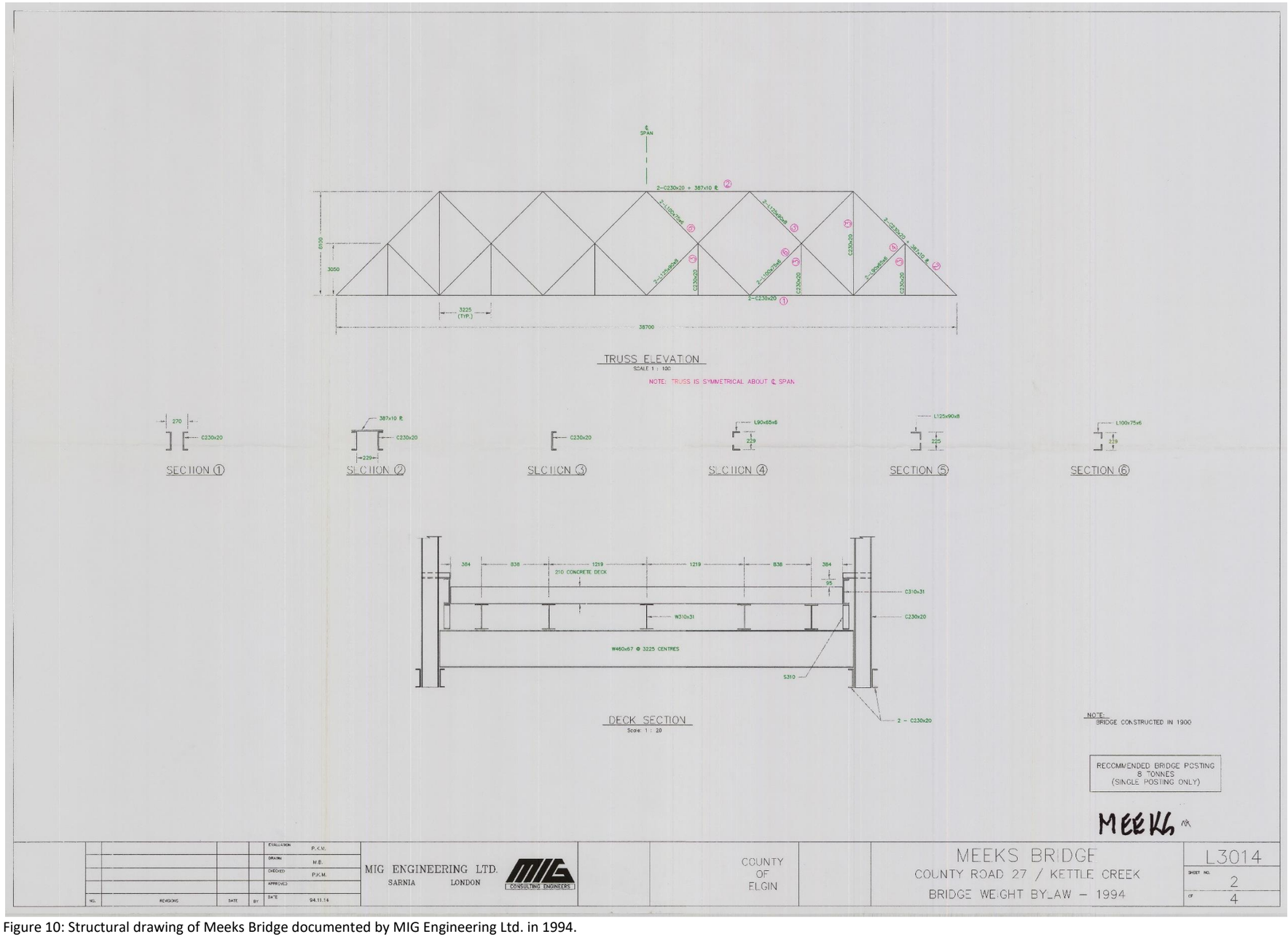

Figure 10: Structural drawing of Meeks Bridge documented by MIG Engineering Ltd. in 1994.

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