

Basic Impact Analysis

Hamlet Swing and Fixed Bridges
Trent Severn Waterway
1641 Muskoka District Road 49
Hamlet, Ontario



July 2018

Environmental Impact Assessment Version Control

This section serves to control the development and distribution of revisions to the Environmental Assessment.

Version Number	Amendment Number	Date	Brief Description of Change
1	0	2018-07-06	Original Prepared by Wood Environment
2	1	2018-07-19	Updated Mitigation, Section 8

8.0 MITIGATION MEASURES

General

1. Inform the Departmental Representative and PCA's Environmental Authority (EA) (Environmental Officer, TSW in Peterborough) regarding any changes to project plans and/or scheduling. Any changes not assessed under this Basic Impact Assessment (BIA) will require approval from PCA and may require further mitigation measures.
2. Contractor is required to submit an Environmental Management Plan (EMP) to the Department Representative and Parks Canada that outlines all the measures to be implemented by the contractor on the project site to eliminate or reduce environmental effects and address mitigation measures outlined in this BIA. In order to allow for the timely commencement of project activities, the EMP can be submitted as separate components as project details become available. The EMP, or its components, will be submitted in writing prior to implementation of project activities and must be accepted by Parks Canada and the Departmental Representative.
3. It is recommended that an environmental professional(s) (EP) prepare the EMP or its component plans incorporating guidance found in PCA's Environmental Standards and Guidelines - Ontario Waterways (2017). The EMP will detail frequency of monitoring and list high-risk construction activities where an environmental professional must be onsite. Monitoring and testing should be adaptable to changing site conditions and will capture any event/incident for the length and scope of that event.
4. The contractor is to ensure that all on-site personnel are aware of, and comply with the prescribed mitigation measures within this BIA and any measures outlined within subsequent amendments to this BIA.
5. Should conditions at the work site indicate that there are negative impacts to fish, fish habitat, wildlife, cultural or visitor experience resources, all works shall cease until the problem has been corrected and PCA's ES staff have been consulted/notified. PCA has the right to require that work be altered or ceased immediately.
6. As per the Historic Canal Regulations (HCR) applicable to lands administered by the Trent Severn Waterway National Historic Site of Canada, a permit signed by PCA's Ontario Waterways Director will be required to authorize the project work prior to commencement.
7. Inform the Environmental Officer, Trent-Severn Waterway, of any changes to Project plans and/or scheduling. Any changes not assessed under this Basic Impact Analysis will require approval from PCA and may require further mitigation measures.

8. The PCA Environmental Officer, Trent-Severn Waterway will outline all the following mitigation measures in a construction start-up meeting with the Contractor, to ensure awareness and understanding of these measures.
9. Where a work or a portion of the work that is being constructed or maintained in navigable water causes debris or other material to accumulate on the bed or surface of such water, the Contractor shall immediately remove the debris or other material to the satisfaction of the Departmental Representative.
10. Areas for staging or storage shall be identified in the Contractor's EMP.
11. Navigation shall not be impeded during the navigation season.
12. The existing Bridge Operators House is not available for use for storage or staging, by the Contractor, at any time during this Contract.

Equipment and Site Condition

13. Maintain equipment and machinery to avoid leakage of fuels and liquids. Ensure measures are in place to minimize impacts of accidental spills.
14. All materials and equipment used for the purpose of site preparation and project completion shall be operated and stored in a manner that prevents any deleterious substance (e.g. petroleum productions, debris etc.) from entering the water.
15. Any stockpiled materials, or concrete debris shall be stored and stabilized a safe distance away from any watercourse, drainage course or swales to prevent erosion and subsequent entry into the TSW or removed from the site, in accordance with all federal, municipal and provincial regulations.
16. Store all oils, lubricants, fuels and chemicals in secure areas on impermeable pads.
17. Vehicle and equipment re-fueling and/or maintenance shall be conducted on a permeable pad to allow full containment of spill, off of slopes and away from the water at a recommended distance of 30 m if possible. If not possible, fueling sites shall be as per the EMP and mitigations to prevent substances from entering the watercourse applied.
18. A designated re-fueling depot will minimize the potential for extensive impacts at the site due to accidental releases of substances; proper spill management equipment shall be in place for fueling.
19. Drip trays shall be placed under all fuel-powered equipment. Drip trays shall be sized appropriately to encompass the outer perimeter of the equipment/machinery, providing adequate spacing for refueling activities.

20. There shall be no discharge of chemicals and cleaning agents in or near aquatic habitats; all such substances shall be disposed of at a facility licensed to receive them.
21. Spill control and emergency plans will be in place prior to initiation of construction; an emergency spill kit shall be kept on-site and employed immediately should a spill occur. The contractor shall ensure that adequate additional spill clean-up resources are available.
22. Spill kit will be maintained on site and the contractor will ensure that adequate additional resources are available.
23. In the event of a spill, PCA and the Ontario Spill Action Centre (1-800-268-6060) shall be notified immediately. Remediation will be conducted immediately to contain and clean up in accordance with federal and provincial regulatory requirements AND to the satisfaction of PCA. Documentation of remediation, testing and results will be provided to PCA.
24. Operate machinery from stable location.
25. Only the working end of machinery shall directly enter the water. Any part of a machine or equipment entering the water shall be free of fluid leaks and externally degreased to prevent any deleterious material from entering the water. Complete the in-water activity as quickly as possible to minimize the time equipment is in the water. Do not leave equipment in water during breaks in work activity. Any part of a vehicle and/or equipment entering the water shall be free of fluid leaks and externally degreased to prevent any deleterious substance from entering the water.
26. Use biodegradable hydraulic fluids for machinery that will be working in or around the water.
27. No tools, equipment, temporary structures or parts thereof, used or maintained for the purpose of this project, shall be permitted to remain at the site after completion of the project.
28. All wood is to be treated with wood preservative in accordance with the Project Specifications and shall meet provincial and federal guidelines. Creosote- treated and/or pentachlorophenol-treated wood will not be used.
29. When working with treated wood, adherence to all respective regulations and good housekeeping shall be followed. This shall include prefabrication to the desired specifications, therefore eliminating the need for cutting and field application of treatment.
30. Disposal of treated wood shall be done in a legal manner at a licensed facility.

Water Quality

31. Ontario Drinking Water Quality Guidelines cannot be exceeded (beyond parameters that currently exist) due to project activities.
32. Ensure that sediment settling basins are of adequate size to compensate for excess sediment run-off and erosion (i.e. storm water run-off, misdirected drainage).
33. Only washed and clean material free of fine particulate matter shall be placed in or near water where it has been previously planned and authorized.
34. Accumulated snow that may be contaminated with salt should be disposed of only at approved dumpsites or designated areas.
35. Snow containing salt or sand should never be dumped in, or allowed to melt and run off into watercourses.
36. All bridge and machinery components shall be painted in the shop. If application of paint is required on site, an adequate containment system shall be used to confine and capture paint, and paint overspray where wind conditions permit.

Fish and Fish Habitat

37. Activities shall be scheduled to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. In-water works shall be restricted to the OMNRF recommended timing window. All in-water and near-water works shall be conducted June 1 through March 14; therefore, no in-water work will be allowed March 15 through May 31. This timing window must be identified in the construction schedule and EMP. Should work be required beyond this date, additional mitigation measures may be required based on site specific characteristics. Work beyond March 15th must be approved by PCA prior to work occurring, and may not be granted if site conditions do not allow it.
38. Maintain fish passage at all times. Turbidity curtains shall not be deployed fully across the watercourse to serve as a barrier to fish migration.
39. Perform an initial sweep of the work area to drive fish out prior to completely closing off turbidity curtains surrounding the work area. Turbidity curtains shall be deployed in a manner – e.g. moved in a direction from close to shore/structures outward – which prevents the entrapment of fish inside the curtain.
40. All debris on the river bed (including unused aggregate/concrete rubble) shall be completely removed and area restored to original state upon completion of work.

41. If necessary, fish shall be removed from the work area prior to complete dewatering and released alive into the river

- PCA's EA shall be advised 24 hours prior to fish rescue.
- Minimize the length of time fish are out of the water.
- Use appropriate equipment to remove any stranded fish in the dewatered area. As water levels drop in the work area monitor the deeper pool areas where fish are congregating. If safe to do so, seine nets or dip nets can be operated by field staff to remove the fish.
- Contact PCA EA staff should there be any issues with fish removal.
- Any fish found within the dewatered cofferdam areas will be documented by species, counted and removed and placed downstream if found in the downstream cofferdam and upstream if found upstream.
- Round Gobies (*Neogobius melanostomus*) or other invasive species found during dewatering activities shall be euthanized humanely and not returned to the water system; this shall be reported to PCA.

42. Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life will form the baseline for water and streambed quality (see <http://cegg-rcqe.ccme.ca/en/index.html#void>).

43. Activities causing turbidity or release of sediment will comply with the CCME Guidelines on Total Particulate Matter (see <http://cegg-rcqe.ccme.ca/download/en/217>).

44. The proponent is advised to abide by those mitigation measures and best management practices outlined within Fisheries and Oceans Canada's (DFO's) online guidance materials: Measures to Avoid Causing Harm to Fish and Fish Habitat (<http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesures-eng.html>).

45. Monitor water quality for unacceptable suspended sediment levels during in water activities. Monitoring shall include the full scope and breadth of any incident.

46. Ensure that there is a fish screen that complies with DFO Freshwater Intake End-of-Pipe Fish Screen Guideline when pumping in fish-bearing water to prevent impingement or entrainment of fish.

47. Should flooding occur on the site, fish salvages will once again be conducted by a qualified professional, as necessary.

Erosion and Sediment Control

48. Mandatory submission – and acceptance by PCA – of an Erosion and Sediment Control Plan, prepared by a QEP, as stand-alone or part of the EMP, demonstrating:

- A focus on erosion control primarily and sediment control secondary;
- Erosion and sediment controls will be tailored to the type of sediment found onsite (e.g. if clay is present, additional controls are necessary).
- The area to be controlled. In addition to the construction site, it is necessary to identify adjacent areas that could be negatively impacted by construction activities;
- Drainage areas and patterns based on pre-construction topography and construction design;
- The EMP will have, as a principal to reduce the amount of sediment laden water produced, a focus on separating offsite and infiltrating water into the construction site from construction activities and sediment sources.
- How clean storm run-on will be diverted around the site and away from exposed areas;
- How sediment-laden run-off will be directed to detention or retention facilities on-site. Large drainage areas can produce a significant amount of run-off, resulting in a need for large detention or retention structures;
- Channels that are designed and constructed to the necessary design discharge;
- Temporary and permanent erosion control needs for all drainage channels;
- Consideration of project schedule in selecting, designing and laying out environmental controls;
- Consideration of seasonal requirements (for longer-term projects); select and design controls and practices for controlling erosion and sedimentation including shutdown periods.
- The EMP shall provide plans and mitigation for the installation and removal of any temporary structures (i.e. cofferdams, temporary bridges, etc.).
- Trees and vegetation that are required to be removed should be clearly identified within the EMP and justification of removal should be made clear.
- The EMP shall include a replantation plan which shall outline the replacement and compensation of trees and vegetation which have been removed/impacted.
- The EMP shall include a Waste Water Management Plan, identifying methods and procedures for management, treatment and discharge of waste waters.

49. The size of particles present in the sediment is a key consideration for selecting the appropriate sediment treatment option(s):

- If the sediment consists primarily of gravel or sand, which are relatively large particles, a single treatment using a more basic technology, such as a sediment trap or sediment bag, may be adequate.

- If the sediment consists of silt and/or clay, which are relatively small particles, the effluent will most likely need a more advanced technology, such as a filter press or chemical treatment with anionic flocculent and a filtration method.
- If the sediment consists of a large spectrum of particle sizes, the water may need primary treatment to remove larger particles, followed by secondary treatment to remove finer particles.

50. Sediment control measures shall be implemented during any in-water work to control turbidity levels. Sediment/turbidity curtains, or other appropriate measures, shall be implemented prior to any in-water work that may result in sedimentation. These shall remain in place until all suspended sediments have settled.
51. All erosion and sediment control measures shall be inspected daily to ensure they are functioning properly and are maintained and/or upgraded as required to prevent entry of sediment into the water. Environmental protection measures shall be checked after each extreme weather event. If sediment and erosion control measures are not functioning properly, no further work shall occur until the sediment and/or erosion problem is addressed to the satisfaction of PCA.
52. All disturbed areas of the work site shall be stabilized immediately and re-vegetated as soon as conditions allow. All exposed areas should be covered with erosion control blankets or other measures to keep the soil in place and prevent erosion until vegetated in the spring.
53. Soils shall be protected by laying geotextile and covering with a suitable depth of gravel, >100mm to prevent crushing/compaction of existing soils; alternative methodology for soil-compaction prevention may be utilized (ex. blast mats), as reviewed and approved by PCA.
54. Sediment and erosion control measures shall be left in place until all areas of the work site have been stabilized.
55. Upon completion of the work all debris shall be completely removed and the area restored to its original state or better. Repair all damages to property due to project activities.
56. Sediment control measures and exclusion fencing must be removed in a way that prevents the escape or re-suspension of sediments.
57. A US Dot II Marine Grade turbidity curtain will be maintained in the water around all working areas where sediments can enter the watercourse.

58. Turbidity curtains should be anchored or weighted down across its length to form a continuous seal on the substrate bed, with adequate floatation at the water's surface to prevent over spills of water.
59. Turbidity curtains should not be used as a primary or secondary settling area for dewatering activities. Supplementary sediment and erosion control measures should be installed prior to construction activities and should be added upon/reinforced as necessary.
60. Fine materials such as unwashed rocks or materials that have the possibility of being suspended or transported downstream will not be used.
61. No acid-generating rock (containing sulphides) will be used.
62. In the event of a significant sedimentation or debris caused by construction activities, the contractor will take appropriate measures to contain and mitigate the problem.
63. The contractor will maintain a standby supply of pre-fabricated sediment fence barriers, or an equivalent ready-to install sediment control devices.
64. Avoid activities that could lead to erosion during excessively wet weather conditions; monitor forecasts for heavy rainfall watches & warnings.
65. Filter material will consider the grain size characteristics of concrete sediment and shall be designed around the principals of maintaining sufficient hydraulic flow and prevention of particle movement through the material.
66. Flow dissipaters and/or filter bags, or equivalent, shall be placed at water discharge points to prevent erosion and sediment release.
67. The area inside of cofferdams, if necessary, will be cleaned or alternately capped with clean rock, in order to mitigate turbidity from the former construction area as it is re-flooded.

Concrete

68. Concrete leachate is alkaline and highly toxic to fish and aquatic life. Measures must be taken to prevent the incidence of concrete or concrete leachate from entering the watercourse. Maintain complete isolation of all cast-in-place concrete and grouting from fish-bearing waters for a minimum of 48 hours if ambient air temperature is above 0°C and for a minimum of 72 hours if ambient air temperature is below 0°C or until significantly cured to allow the pH to reach neutral levels. Avoid project activity during wet weather conditions.

69. All concrete, sealants, or other compounds used for this project shall be utilized according to the appropriate Product Technical Data Sheet, stating guidelines and methods for proper use, and provided by the manufacturer of the product.
70. Ensure that all works involving the use of concrete, cement, mortars, and other Portland cement or lime-containing construction materials (concrete) will not deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse.
71. Concrete debris and dust generated as a result of various concrete work shall be removed in a way that will ensure material does not enter the waterway. All debris including unused aggregate/concrete rubble shall be completely removed and area restored to original state upon completion of work.
72. An adequate containment system (e.g., tarpaulins, plywood, or other type of protective shrouding) shall be installed to receive any debris produced by sawing, chipping, etc.
73. Concrete debris shall be placed into an enclosed container daily, or more frequently if required, in order to ensure that no debris escape or remain at the site.
74. Any concrete wash water shall be directed to a collection and treated to effectively remove all suspended solids, dissipate velocity and prevent deleterious substances from entering the watercourse.
75. At the discharge point into the watercourse, pH will be maintained between 6.5 and 9.0. Water with pH > 9 cannot be released directly back into the watercourse, but must be treated prior to release. Water with a pH \geq 12.5 is considered toxic and treated as a hazardous waste under Ontario Regulation 347 of the Environmental Protection Act and wastewater in this condition must be removed from the site.
76. In the event of sedimentation or turbidity caused by construction activity, contractor shall stop all work and install additional sediment barriers as necessary to ensure watercourse is protected.
77. Additional Environmental Mitigation Measures for Placement of Tremie Concrete or concrete pours when forms are not isolated from moving water:
- Ensure forms are tight and no flow is occurring;
 - Isolate area with curtain or impermeable material specified for concrete particulates;
 - Ensure that fish exclusion procedures are followed and fish are not trapped within the turbidity curtain during placement;
 - Isolated area should be the minimum size required to complete task;

- Turbidity curtain shall be left in place until the pH is less than or equal to baseline conditions.
- For tremie pours, CO2 system must be installed and operating along the entire length of the isolated area; the tank shall be used to release carbon dioxide gas into an affected area to neutralize pH levels. Ensure sufficiently sized tanks for the concrete volumes used;
- Workers shall be trained in the use of the system;
- Use of neutralizing acids is not permitted;
- pH monitoring conducted inside and outside the containment area, and downstream while the activity is taking place. Monitoring locations and frequency shall be outlined within the EMP
- Use Anti-washout Admixture to decrease the percentage of concrete fines released to the water column;
- Use grout bags where possible to further contain the concrete; stop placement of concrete if fish kill is observed and contact Parks Canada.

78. In the event of a release of concrete or grout, PCA and the Ontario Spill Action Centre (1-800-268-6060) shall be notified; remediation will be conducted immediately contain and clean up in accordance with federal and provincial regulatory requirements AND to the satisfaction of PCA. Documentation of remediation, testing and results will be provided to Parks Canada.

79. Wash equipment away from water and provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment. Wash-out locations will be identified within the EMP.

80. Completely isolate all work from the watercourse and any water that enters the watercourse or storm water system.

81. Use sealers, form release and stripping agents that are non-toxic, biodegradable, and have zero or low volatile organic compounds (VOCs). Maximum VOC level to be 250 grams per litre (g/L) based on Environmental Protection Agency (EPA) test method 24 and biodegradability as described by EPA as having a half-life of 28 days or less based on ASTM D5684/OECD 301B.

82. The Contractor shall provide an appropriate area on the job site where concrete trucks can be safely washed.

83. All tools, pumps, pipes, hoses, and trucks used for finishing, placing, or transporting fresh concrete will be washed off to prevent contamination of the watercourse.

84. Concrete wash water shall be directed to a collection basin or managed in accordance with General – Waste Management Schedule 8 of the *Environmental Protection Act, 1990*, to effectively remove all suspended solids, dissipate velocity, and prevent deleterious substances from entering the watercourse.
85. Unused admixtures and additive materials shall **not** be disposed of in sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
86. Due to the proximity of the work site to water, calcium chloride shall not be used to suppress concrete dust.

Dewatering and Pumping Activities

87. Dewatering shall be conducted in accordance with the Water Resources Act and Ontario Regulation 387/04 as well as the Freshwater Intake End-of-Pipe Fish Screen Guideline (DFO 1995).
88. Typically, submersible pumps are used for dewatering and they should be placed in the low point of the work site. If there is high turbidity, consider pre-filtering water that goes to the pump by placing it in a perforated drum with clear stone around the outside or other similarly designed approach.
89. Discharged water should be filtered by means of an appropriately designed sediment basin, anionic flocculation or by physical means such as a filter press.
90. Discharge of pumped water must be a manner that does not cause additional erosion.
91. Dewatering, demolition and construction is staged such that clean is pumped back to the system and turbid water is managed through a waste water system.

Vegetation

92. Tree removal and planting shall be conducted in accordance with the District Municipality of Muskoka's By-Law No. 88-29 for the Planting, Care, and Removal of Trees on District Roads (Appendix G). Post and wire fence to be installed on the north side of Muskoka District Road 49, west of the water, should be placed at the perimeter of Staging Area A (shown on Design Drawing No. B-04) allowing for standard tree protection fencing (hoarding) around the trees that will not be removed, as per the International Society of Arborist guidelines.
93. Phase vegetation removal to reflect construction activity; grubbing should not be conducted unnecessarily early in the schedule, and/or over an area that is larger than realistically required, to be properly mitigated with Erosion and Sediment controls

94. Where feasible, stumps will be ground down, rather than completely removed by grubbing in attempts to preserve these features. If grinding of stumps is not feasible, this will be identified in the EMP and require acceptance by PCA.
95. If large tree roots are extracted, they should be retained for post-construction restoration.
96. Where it is necessary to remove mature vegetation at any time of year, an inventory of species to be removed, coupled with a replanting plan using native species shall be submitted to PCA staff for approval.
97. Trees, shrubs and vegetation which are to remain throughout construction should be properly identified and delineated.
98. Where practical, the branches of the large trees should be trimmed back as the first option rather than cutting the entire tree.
99. Should any vegetation require chipping/mulching, the after product will be stored onsite for the duration of the project to supplement erosion and sediment control methods where required.
100. Minimize clearing as much as possible to maintain riparian vegetative cover and windbreaks, where possible maintain vegetated buffer at shoreline and minimize clearing near water bodies. If buffers cannot be maintained, avoid grubbing of vegetation root mass in proximity to shorelines and stream banks.
101. Clear vegetation from unstable or erodible banks by hand, and where possible, avoid the use of heavy machinery. If machinery must be used, operate machinery on land and in a manner that minimizes disturbance to the banks of the water body.
102. Only cut trees using tools designed for tree cutting activities (e.g. chainsaw, brush saw).
103. Grubbing should not be conducted unless a suitable planting plan and Erosion and Sediment Controls are in place.
104. Prune limbs close to the tree trunk. For a clean cut, make a shallow undercut first, then follow with the top cut. This prevents the limb from peeling bark off the tree as it falls. Do not use an axe for pruning.
105. If over half of a tree needs pruning, in most circumstances it will be best to cut it down instead of pruning. Cut trees off at ground level and do not leave pointed stumps.
106. Delineate areas to be avoided with flagging tape or temporary fences.
107. In disturbed areas not designated for sodding, native species are to be used for tree planting and/or ground cover with mulch to prevent erosion and to help seeds germinate.

108. Root systems of trees identified to remain should be properly delineated and fenced off, so as to protect the root systems from being crushed and impacted by machinery.
109. In the event that the installation of root-protectant fencing is not possible and/or ideal, alternative measures, as approved by PCA, must then be implemented. Such measures must provide a sufficient amount of soil compaction prevention with regards to the highest level of activity to occur within the immediate area of protection.
110. Brush and mulch piles, which may attract snakes, will not be stored on site, or shall be isolated with exclusion fencing (i.e. sediment fencing).
111. A 10m buffer is planned between laydown areas and shoreline. Riparian vegetation removal will be minimized to the extent possible. Trees, shrubs and vegetation which are to remain shall be identified, delineated and protected

Wildlife

112. The EMP must demonstrate procedures for avoiding disturbance/harm to wildlife and nesting birds.
113. Pre-stressing and a visual sweep for wildlife of the work area should be completed by a qualified personnel at the start of every work day, to ensure that there are no wildlife within the work area.
114. If recommended by a qualified person and approved by PCA, exclusion zones or “no go” areas will be established to protect areas with known residences (e.g., hibernacula, dens, nests).
115. If recommended by a qualified person and approved by PCA, conduct “Pre-stressing” activities within a few days prior to the onset of site preparation (vegetation clearing and grubbing) to encourage wildlife to move away from a site.
116. Field information regarding incidental encounters with wildlife (non-SAR wildlife) shall be compiled and reported on a daily basis. For incidental encounters, the following information should be recorded:
 - Locations, dates and time of day where the species were encountered;
 - Names of species encountered;
 - Photographs of the species, if taken;
 - Condition of animal
117. If injured/dead wildlife are encountered report to PCA immediately. PCA may require retrieval and storage on ice of carcass for laboratory testing.

118. All vehicles and equipment used by project personnel will follow any construction zone speed limits to reduce the risk of hitting wildlife, as enforced by the site supervisor.
119. Work areas will be kept clean and free of potential hazards to wildlife such as wire, cable, tubing, plastic, antifreeze or other materials that wildlife may eat or become entangled in.
120. Waste will be stored, handled, and transported in accordance with the Waste Management Plan, including storage of all solid waste in sealed, bear-proof containers.
121. Feeding of wildlife is prohibited.
122. Migratory birds, their nests and eggs are protected under the Migratory Birds Convention Act (1994). Project works or activities are potentially disruptive activities to birds and should be avoided during breeding times. No vegetation shall be removed from April 1st to August 31st to protect nesting birds.. If this is not feasible, then the site must be inspected by a certified biologist prior to clearing, to check for the presence of nests and other wildlife (particularly snakes and turtles).

Species at Risk

123. The EMP must detail procedures (e.g. exclusion fencing) for preventing turtle entry/nesting within disturbed project gravels/soils during all stages of project activity.
124. Species at risk training shall be provided to all employees before they begin work on site (materials can be part of the Environmental Protection Plan). Employees must be able to identify potential species at risk and know the proper procedures to follow when they encounter a species at risk.
125. If a Species at Risk is observed or suspected on or near the worksite (this includes snakes, turtles and/or eggs), the species must not be harmed or harassed. If the species does not leave or cannot leave the site, the contractor must immediately stop the works and contact PCA's EA staff on how to proceed. Additional measures to avoid impacts may be required before work can restart. Stand back and allow the animal to leave the site.
126. Prior to the commencement of bridge work a nest survey should be conducted by a qualified biologist to ensure protected bird species are not directly impacted by the removal of the bridge and to determine the potential need for compensation during the subsequent breeding seasons if the bridge is not available for use by bird SAR for nesting purposes. Deterrent mitigations to prevent further nesting activity throughout the life of project activities in affected areas must be included in the EMP.
127. The active breeding/nesting season for Barn Swallow is generally considered to begin May 1st. This species has an affinity for previous nesting sites and will often return to these

sites the following spring. If the bridge is still in place in May, with respect to nesting bird exclusion strategy:

- carry out nest “sweeps” twice daily, to ensure that no bird nest building activity is occurring in the work area, with any observations of nests or nest building activity immediately reported to PCA.
 - Use commercially available “bird scare tape” or “flash tape”, suspended from the lower outer edges of the bridge, to discourage access and potential nesting.
128. For each Barn Swallow nests that is located on the bridge at the time of removal, if any, a replacement substitute nest cup should be installed in a suitable location (as specified by OMNRF guidelines) on or near the new bridge. Implementation of this mitigation measure, and the appropriate timing and party responsible for implementation, will be at PCA’s discretion through consultation with ECCC and the OMNRF, as needed.
129. Minimize the disturbed area; clearly mark the work space.
130. Park on roads or disturbed area only.
131. Temporary reptile exclusion fencing, such as polythene/ woven geotextile secured with timber stakes, or material of a similar nature/function, should be installed to prevent turtles from entering the construction area. Exclusion fencing should also be installed completely around stockpiled material (wood chips, gravel, earth, etc.) to prevent turtle nesting in the project area. Fencing shall not have mesh or netted backing. Refer to OMNRF’s Species at Risk Branch Best Practices Technical Note: Reptile and Amphibian Exclusion Fencing (Appendix H).
132. If a turtle is found within the limits of the fencing it should be left alone to leave the area if possible. If found in the project area, turtles may need to be relocated prior to commencing work (with permits required from Ontario Ministry of Natural Resources and Forestry (OMNRF) for relocation). Contact PCA for guidance
133. Synthetic plastic Erosion Control Blankets/Mats should not be utilized, particularly during nesting season, as they pose as an entrapment hazard to turtles. Fibre-based bio-degradable Erosion Control Blankets/Mats are only to be utilized.

Invasive Species

134. To reduce the risk of introducing invasive species, all equipment must be thoroughly cleaned prior to coming to the site. Any machinery that appears to have not been cleaned will not be permitted on site. For additional information or guidance on how to properly clean equipment, see the Clean Equipment Protocol for Industry developed by the Ontario Invasive Plant Council and found here: http://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf

135. Any equipment or vehicles which are to be used in water, should be thoroughly cleaned before and after use of any visible mud, vegetation, mussels, etc.:
- Vessels/equipment should be drained of standing water.
 - Vessels/equipment should ideally be cleaned with hot water (> 50 °C) at high pressure water (> 250 psi).
 - Vessels/equipment should be dried for 2 – 7 days in sunlight before transported between waterbodies.
 - Cleaning of vessels/equipment should be conducted away from waterbodies at a recommended distance of at least 30 m from the shoreline.
136. Mud, dirt and vegetation should be cleaned from clothing and footwear prior to entering the work site, and prior to leaving the work site.
137. Should an invasive species be encountered (or at least suspected), a photo and report of the specimen should be sent to PCA's EA staff.
138. Cleared and grubbed material shall be stockpiled in separate locations from growing medium stockpiles. Where noxious or undesirable weeds are found on site, grubbed materials shall not be used as a constituent of, or as a growing medium.
139. Soil stockpiles shall be inspected monthly for growth of noxious or invasive species. If invasive plant species are found in stockpiles, soil shall be disposed of and not reused.
140. Use weed-free material for erosion control and stabilization and weed-free seed and confirm that seed mix to be used for re-vegetation purposes does not (potentially) contain invasive plants.
141. Seed purchased commercially should have a label that states the following:
- Species;
 - Purity: Most seed should be no less than 75 % pure and preferably over 85 % pure. The rest is inert matter or other seed;
 - Weed seed content: The tag should state NO invasive plants are present. Only certified weed-free seed should be used; and
 - Germination of desired seed: Germination generally should not be less than 50 % for most species, although some shrubs and forbs will have lower percentages.
142. Move only weed/contaminate-free materials into non-infested areas. Moving materials from one infested location to another within a particular zone may not cause contamination, but moving materials from infested to non-infested areas could lead to the introduction and spread of invasive plants.

143. If removal of invasive species occurs, individuals will be disposed of appropriately, offsite to ensure no further propagation.

Cultural Resources and Archaeology

144. Before any on-site mobilisation/construction work commences, PCA staff will clearly delineate any archaeologically sensitive areas and photo-document this activity for PCA records. These areas will be deemed no-go zones for staging, vehicular traffic and machinery.
145. Vehicular access routes and staging areas will be restricted to present-day roadways, parking lots, exposed bedrock areas and significantly disturbed areas. If this is not possible, the use of protective covering is required. All protective measures employed must be removed following construction and the area restored to a pre-construction state. Excavation is not permitted outside of cleared/reviewed areas.
146. If archaeological, cultural resources, or character-defining elements (e.g. structural features or artifact concentrations) are encountered or damaged during construction activities, work will cease in the immediate area and the PCA PM shall be informed. The PM should then contact PCA's Terrestrial Archaeology section for advice and assessment of significance, and if necessary, any further mitigation measures. Ensure that all exposed underwater cultural materials are kept submerged and/or wet while waiting direction.

Air Quality and Noise

147. Work shall be carried out in compliance with the Environmental Protection Act, 1990 and applicable air emission regulations and by-laws.
148. All on-site vehicles are expected to have a Drive Clean Emissions Report in compliance with O. Reg. 361/98: Motor Vehicles under the Environmental Protection Act, R.S.O. 1990, c. E.19. EA Officers may stop a vehicle if they believe the vehicle is emitting excessive exhaust smoke or suspect that emission control equipment has been tampered with or removed.
149. Use well-maintained heavy equipment and machinery, preferably fitted with fully functional emission control systems/muffler/exhaust baffles, engine covers, etc. In addition, employ timing and location of construction activities to reduce or minimize the effect of noise on nearby residents, recreational users, and wildlife.
150. Machines shall not be left to unnecessarily idle in order to avoid emissions.
151. Releases of dust shall be suppressed using water mist or other appropriate methods of control during construction. Calcium chloride shall not be used as a dust suppressant due to the proximity of the work site to water.

152. Adhere to local and municipal noise by-laws.
153. Notify residents of planned activities that may cause disturbance and schedule them to avoid sensitive time periods.
154. Minimize the noise levels from construction activities by using proper muffling devices, in addition to appropriate timing and location of these activities to reduce or minimize the effect of noise on nearby residents, recreational users, and wildlife.
155. Monitor and mitigate public complaints by keeping a record of complaints and addressing any issues raised by the public.

Waste Disposal

156. Recyclable material and waste shall be removed from the site, in accordance with all federal, provincial and municipal regulations, to disposal facilities licensed to receive them.
157. Waste containers should be sealed or lined to prevent leakage of liquid wastes.
158. Waste generated will be disposed according to regulations (i.e., O. Reg. 102/94 and O. Reg. 558/00, R.R.O. 1990, 347).

Floods, Extreme or Inclement Weather, and Ice Formation

159. Undertake construction under normal weather conditions, to the extent possible, and design the project worksite to withstand variable weather conditions.
160. Apply wet weather restrictions on construction activities to reduce surface run-off from exposed work areas and to minimize the risk of inundation.
161. The work area shall be stabilized against the impacts of high flow/heavy rainfall events at the end of each workday.
162. Work shall be suspended and the work area stabilized when there is a high probability of a rainfall event.

Site Restoration

163. Upon completion of work there shall be a final clean-up of the site. No tools, temporary structures (with the exception of ESC measures), or parts thereof, used or maintained for the purpose of this Project shall be permitted to remain at the site or enter the water after completion of the Project.
164. Immediately following completion of work, and prior to removal of ESC measures, all disturbed surfaces and shorelines shall be stabilized and re-vegetated. Where required, site-appropriate native species are to be used for tree planting and/or ground cover.

165. Topsoil shall be placed in accordance with the depth specified in the Contract Specifications (i.e., minimum depth of 100 mm) and as approved by the Departmental Representative after settlement and consolidation.
166. In the vicinity of trees, shrubs, and obstacles, topsoil should be spread manually.
167. If there is insufficient time (i.e., less than four weeks) in the growing season remaining for the seeds to germinate, or to be at risk of germinating and damaged by frost, the site shall be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.



Parks Canada Basic Impact Analysis Template

Instructions for this form are available (see the [Guidance and Tools section](#) of the Parks Canada Impact Assessment intranet site or request from Parks Canada impact assessment staff).

1.0 PROJECT TITLE & LOCATION

Repair/Upgrade-Replacement of Hamlet Swing and Fixed Bridges
Site B – Hamlet Swing and Fixed Bridges
Trent Severn Waterway,
1641 Muskoka District Road 49
Hamlet, Ontario

2.0 PROPONENT INFORMATION

Parks Canada Agency
Ontario Waterways
P.O. Box 567, 2155 Ashburnham Drive
Peterborough, ON K9J 6Z6

3.0 PROPOSED PROJECT DATES (yyyy-mm-dd)

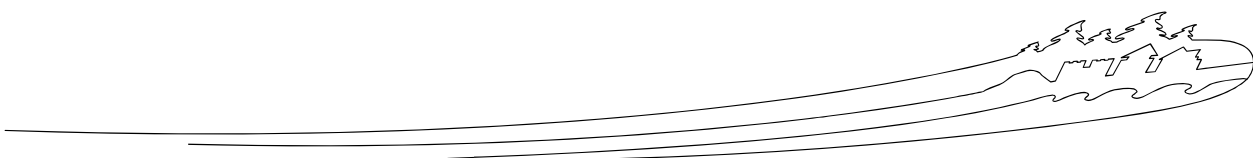
Site visit for collection of terrestrial baseline data: 2016-05-13
Site visit for collection of aquatic baseline data: 2016-10-07 (completed by Arcadis)
Final construction documents “Issued for Construction”: 2018-07
Start of preparatory site and non-site works that do not interfere with normal navigational season may begin prior to: Summer 2018
Earliest start of work affecting cessation of vehicular traffic and, at most, intermittent interruption of marine traffic: 2018-08-28
Planned completion: 2019-07-03

4.0 INTERNAL PROJECT FILE

Public Services and Procurement Canada Project Number: R.073593.110 (Site B)
Parks Canada Agency Project Number: 30025845
Environmental Assessment Project Number: TSW-2016-013 (I)

5.0 PROJECT DESCRIPTION

The design for the Hamlet Swing Bridge and Fixed Bridge has been developed based on the guidelines that both bridges will be replaced with the objective of achieving time-to-first-repair of 35 years, with no major changes to the appearance or the connection to the landscape (Parsons 2017a).





5.1 Background and Rationale

The Trent-Severn Waterway meanders 386 kilometres (km) across central Ontario, linking the Bay of Quinte with Georgian Bay. Not only does it span a wide and varied geographic area, it also covers a sweep of history, from pre-colonization through its developmental role in the lumbering and agriculture of the region, to its recreational use today (ACE Spirit 2004).

At the Upper Severn River end of the Trent-Severn Waterway, the Hamlet Swing Bridge and Fixed Bridge (Hamlet Bridges) join to allow vehicular passage over the waterway (Appendix A – Figure 1). Owned and operated by Parks Canada Agency (PCA), the 60 m equal arm swing span on the west end (Bridge #57) is supported by two through-trusses (Warren trusses), constructed circa 1922, and the 31 m fixed span on the east end (Bridge #58) is supported by two through-trusses (Pratt trusses), originally built in 1905 for use at another location and moved to the current location in 1915 (Parsons 2017b, 2018b; PWGSC 2015). The Hamlet Bridges crossing was finished around 1922 (Parsons 2018b). The bridges are comprised of a 5.5 m wide, nail-laminated timber deck with timber running boards, made of Eastern Hemlock (K. Carney, personal communication, May 13, 2016), as the wearing surface and allows passage of a single lane of traffic, in a 4.88 m wide lane, without a designated pedestrian walkway. The deck is supported by steel stringers and steel floor beams which in turn connect to the bottom panel points of the two side trusses. There are timber curbs on each side of the bridges (Parsons 2017b; PWGSC 2015).

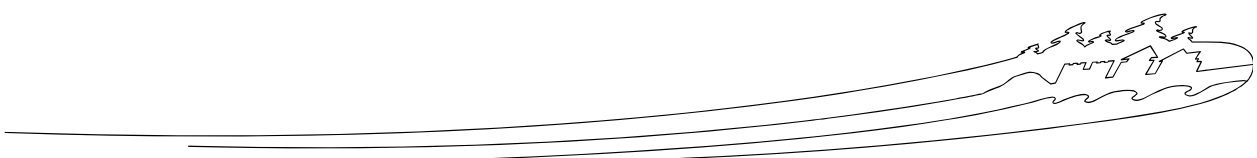
The original drawings indicate that the bridge system has four concrete sub-structures; an east abutment, a west abutment, an east pier (between the fixed and swing spans), and a pivot pier (supporting the swing bridge). The pivot pier, comprised of the center pivot pier and two elongated rest piers, is a wood cribbing structure topped with concrete blocks and cast concrete. The swing bridge pivots about a center pintle with balance wheels. Castor wheels support the east end of the bridge on rest plates while two hydraulic cylinders support the west end. The fixed bridge has sliding bearings (roller nests) at the east pier and fixed bearings at the west abutment (PWGSC 2015).

A complete understanding of the current condition of the bridges was gained through visual inspection, supplemented by the results of Non-Destructive Testing (NDT), underwater inspection, condition surveys, geotechnical investigations, and structural evaluations (Parsons 2017a). The results of these studies suggest that various components of the Hamlet Bridges have insufficient capacity as per the current Canadian Highway Bridge Design Code (CHBDC) S6-14, and some components are sub-standard as per the current CHBDC requirements (Parsons 2017a).

In the past, due to previous funding restrictions, only minor repairs have been completed to address component failures. In 2011, Delcan was retained to complete a Comprehensive Detailed Inspection and Structural Evaluation Report on these bridges—the report was completed in March 2012. In March 2013, the fixed bridge was impacted by a transport truck. Delcan inspected the damage and provided a report (PWGSC 2015); details relating to the existing condition of the two bridges, documented in Delcan's 2012 report and summarized by PWGSC (2015), are included in the sub-sections below.

5.1.1 Swing Span

- The structural steel coating system is in very poor condition throughout the structure, with extensive areas of cracked and flaking coatings typically noted, permitting light to very severe corrosion to develop on the trusses, bracing, floor system, and pivot steel members.

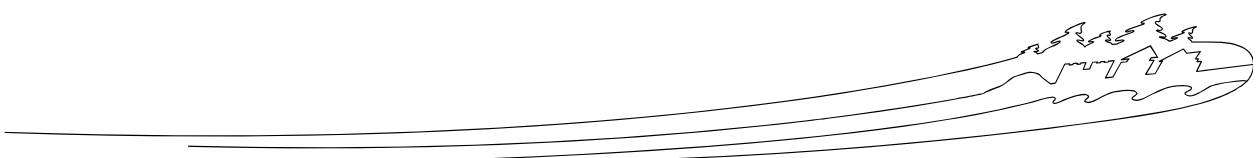




- The sides of the pivot pier have several large areas of severe scaling at the top and very severe erosion along the length of the pier at the waterline.
- Numerous narrow to wide transverse cracks, large spalls, and large areas of severe scaling are typical in the top of the concrete pier cap. Large areas of severe and very severe scaling and spalled concrete were observed in the sides of the concrete pier cap at numerous locations and in numerous concrete blocks.
- The existing traffic barrier system does not meet current CHBDC crash-tested requirements or applicable provincial standards.
- The balance wheel rail is in poor condition with moderate corrosion and section loss, undermining of the rail support pier, and impressions. The rail was observed to deflect under loads from the balance wheels during operation.
- The bridge is not provided with a standby power or auxiliary means of operating the bridge in the event of power outage.
- The conventional relay logic control is outdated with obsolete relays and devices and provides limited functionality and questionable reliability, and should be replaced with a modern programmable logic controller (PLC).
 - The bridge electrical system was installed in the 1960's. The control system has since been upgraded to a PLC system (PWGSC 2015).
- The bridge control station provides very limited indication of bridge status for the operator, as span position and individual traffic gate position indication lights have not been included in the control station. Additionally, no system failure indication lights have been provided, and the station is not provided with a keyed "on-off" switch or means of de-energizing the control station when the bridge is unmanned.
- The operator control station is the only means to start and stop the hydraulic system, which causes a safety hazard for maintenance personnel when testing the hydraulic system as it can only be stopped remotely from where maintenance would be performed and relies on positive lines of communications between the bridge operator and maintenance personnel. A means of operating and emergency stopping all hydraulic drives locally for the safety of maintenance personnel should be installed.
- The bridge is not provided with any fender navigation lights for channel marking as per Coast Guard requirements.
- Traffic gates are not provided with hand crank limit switches, which prevent electrical operation of the gates when the hand crank handle is inserted.
- The limit switch support steel plates are heavily corroded and should be replaced.
- No safety limit switches were provided from the east locking pin to prevent operation of the bridge when the pin is extended.

5.1.2 Fixed Span

- The bottom chord eye-bars at the east bearings of the north and south trusses are exhibiting extreme section loss (>90%), with only approximately 1/16th of the original cross sections remaining. Wire rope ties have been added as a temporary fix.
- The top of the east abutment wall has tilted west towards the river, and the top of the southeast wingwall has tilted towards the south.





- Traffic barrier systems do not meet current CHBDC crash-tested requirements or current provincial standards.
- Approximately 50% of the coating system has typically flaked off from the lower truss connections, with light to medium corrosion developing.
- Extensive areas of coating failure and light to very severe corrosion are visible on the majority of the floor beams.
- The steel cable and timber post guide rails on the north and south sides of the east approach are in poor condition.

5.2 Regulatory Context

Wood Environment & Infrastructure Solutions, a Division of Wood Canada Limited (Wood; formerly Amec Foster Wheeler) was retained by Public Services and Procurement Canada (PSPC) on behalf of PCA to undertake the Basic Impact Assessment (BIA) for the Repair/Upgrade-Replacement of the Hamlet Bridges, in Hamlet, Ontario. This BIA has been completed to meet the requirements of Section 67 of the *Canadian Environmental Assessment Act, 2012* (CEAA) for projects on federal land.

5.3 Scope of the Assessment

The scope of the assessment includes:

- Key Project components and activities (as listed in Section 5.5);
- Potential accidents and malfunctions with an impact on the environment that could result during Project implementation; and
- Potential environmental concerns and Valued Components (VCs) associated with the key Project components and activities.

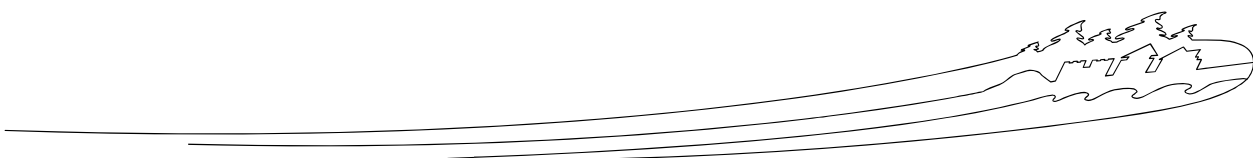
5.4 Project Location

The Hamlet Bridges are located at 1641 Muskoka District Road 49, Hamlet, Ontario, in south-central Ontario on the border of Simcoe County (on the western / swing bridge side) and the District Municipality of Muskoka (on the eastern / fixed bridge side). The site is approximately 7 km north of Hawkins Corners and allows for vehicular crossing over the Upper Severn River / Trent-Severn Waterway (Appendix A – Figure 1). The local Project site is defined as the area directly affected by the proposed Project and includes lands owned by PCA as well as some privately-owned lands.

5.5 Project Components and Activities

Project activities include the **replacement** of the following structures:

- the swing bridge in its entirety (including all mechanical and electrical equipment);
- the fixed bridge in its entirety;
- both bridge approaches;
- the approach slab, traffic signal and warning gates, and railings;
- the existing transportation and safety signage and signalization;
- the existing control house (including the foundations, all utilities, and associated septic tank);





- both east and west abutments (including their footings, ballast walls, and wingwalls);
- the existing signs, railings, and water, rain, and flow gauges on the rest pier;
- a small portion at the top of the pivot pier; and
- the east pier (Parsons 2017a, 2017c, 2017d).

Other structures and components that are expected to be **rehabilitated** include:

- the center pivot pier, which will have the perimeter and top resurfaced and will be raised by 614 mm (while maintaining the existing shape); and
- the elongated rest piers, which will be resurfaced and strengthened with sheet piles (Parsons 2018a)

The Project design and general improvements are described in the following sub-sections.

5.5.1 Site Access, Staging, and Mobilization

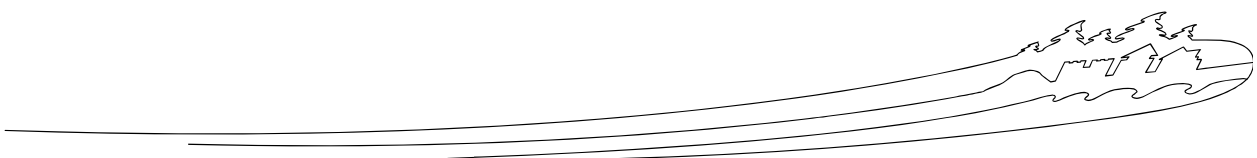
Site access will make use of the existing roads and Upper Severn River (if necessary) and will not require the construction of additional access roads. Ground disturbance impacts from equipment will be limited to the work area immediately adjacent to the Hamlet Bridges. The majority of materials, equipment, machinery, and tools will be delivered to the work site by motorized vehicle. In some instances, for safety reasons or ease of transportation, large items may be delivered to the work site via barge.

Staging areas will be determined by the Contractor and created as necessary for the storage of materials and equipment. To the extent possible, staging areas will remain on PCA land adjacent to the Upper Severn River. The Contractor will be responsible for making arrangements for land use beyond the boundaries of PCA-owned land. The Contractor will also be responsible for abiding by all rules and legislation associated with the use of non-federal lands, including but not limited to, the acquisition of necessary permits, as applicable.

The staging areas will be set up in properly contained areas set back at the maximum available on-site distance from the water's edge (recommended 30 m minimum). A site trailer and equipment storage trailer will be installed on site, as needed. To avoid excessive accumulation on site, when feasible, material and equipment will be stored off site at a designated work yard and transported to the site as needed. Equipment required for the work will be typical construction equipment (backhoe, crane, jackhammers, air compressor, gas generator, hand tools, tandem axle dump trucks for material delivery, grader, drum rollers/rubber tire rollers for asphalt, etc.).

5.5.2 Temporary Traffic Detour and Waterway Navigation

To minimize impacts to transportation, work on the bridges have been planned in co-ordination with the waterway navigation season and minimum navigation requirements, such that no interruption in in-water navigation occurs. However, closure of the Hamlet Bridges is expected to result in negative impacts to local residents and passing commuters due to the necessary detour (approximately 20 km in length) to the Trent-Severn Waterway crossing on Highway 11. Work has been designed and planned so that the minimal duration of closures is required.





A traffic control plan, as per the Ontario Traffic Manual, Book 7 has been completed (Parson 2017c) and will be pre-approved by the Departmental Representative and coordinated with the appropriate counties, municipalities, and authorities having jurisdiction (PWGSC 2015). No temporary means of crossing the Upper Severn River at this location, for vehicles or pedestrians, will be provided during the construction period.

5.5.3 Bridge Approach Construction

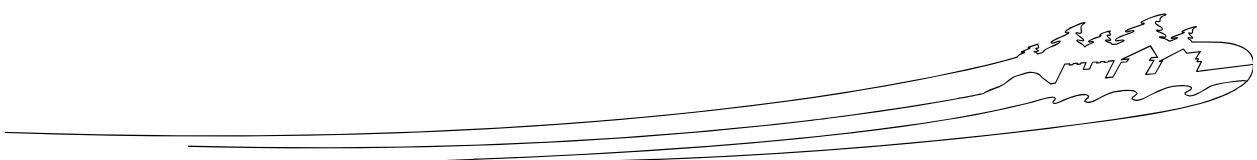
The existing approach section of Muskoka District Road 49, on either side of the Hamlet Bridges, is a single multi-directional lane of variable lane and shoulder width, with a cable guide rail on each side (Parsons 2017b). Project activities at the approach will include removal of the following: signs (to be salvaged), the cable guide rail, five trees on the south side of the road and one tree on the north side of the road (west of the bridge), the traffic signals and swing gates and arms (on both sides; to be salvages), and the full depth of asphalt from the swing bridge west to Peninsula Point Road and from the fixed bridge east to Hartley Road / Canning Road (Parsons 2018a). The new approach section, on both sides, will have a traffic signal and swing gate and will be a two-lane road 7.00 m wide, narrowing to 3.00 m at the bridge, with 0.50 m of paved shoulder, and varying width of unpaved shoulder. The maximum embankment grade will be 2:1 with each embankment protected by a steel beam guide rail, meeting the standards of OPSD 912.130 (Parsons 2017a, 2017b, 2018). The profile of the roadways will be raised due to the need of raising the swing bridge center pivot pier to reduce the risk of flooding the operating equipment (PCA 2017a). The swing bridge profile will be kept at 0% grade and the fixed bridge profile at -1.25%. Both approaches will be adjusted accordingly and will slope down away from the bridge structure (Parsons 2018b).

5.5.4 Swing Bridge Superstructure Replacement

Once the temporary detour and traffic control plan have been implemented and environmental control measures are in place, Project activities associated with the swing bridge will begin. The first activity will be the installation of an appropriate containment system (e.g., custom-built platforms, shrouding, enclosures and/or liners) to confine and capture dust and debris including abrasive media, paint chips, coating material, paint and/or paint overspray.

The objective of the swing bridge superstructure replacement is to improve, upgrade, and/or strengthen the bridge such that it is CHBDC-compliant and Transportation Association of Canada-compliant. The Swing Bridge will be replaced with Warren trusses with double vertical arrangement at the center of the span, above the pivot pier similar to the existing bridge (Parsons 2017d, 2017e, 2018b). The existing truss height, width, and the number of panels will be maintained (Parsons 2018b). The bridge deck clear width (for both bridges) will be 4.0 m including, on both sides, a uniform 0.5 m shoulder, a timber curb, and a steel lattice railing. The existing nail-laminated timber deck with running boards will be replaced by a similar laminated timber deck with running boards, made from pressure-treated hemlock. The design will meet full CHBDC guidelines for the design of bridges on low volume roads (Parsons 2017b, 2017d).

The existing swing bridge superstructure will be disassembled piece by piece for removal (PCA, personal communication, February 21, 2018); as such, temporary laydown of bridge parts on site will not be necessary. This methodology will require the maintenance of the containment system to confine and capture any material and/or debris that could potentially become detached and enter the water or





surrounding environment while the swing bridge superstructure and its component parts are being disassembled/removed (PWGSC 2015).

Any waste generated in association with the replacement of the swing bridge superstructure, or any of its component parts, will be disposed of in accordance with applicable laws and regulations, including those governing the disposal of lead-based paint (PWGSC 2015).

5.5.5 Rehabilitation/Replacement of Existing Electrical Swing Bridge Components

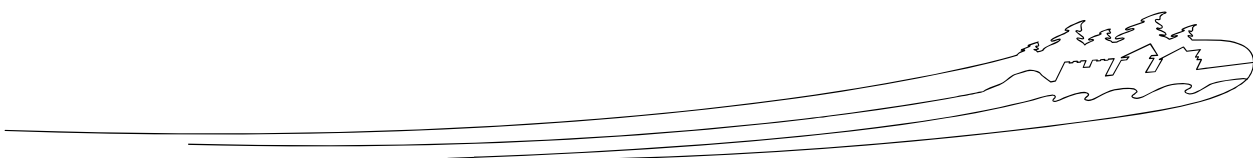
The Hamlet swing bridge was initially manually operated and modified to be electrically operated, then modified again in 2008 to be hydraulically operated. Project work will include replacement of the electrical and mechanical components (Parsons 2017c). Upon completion, all electrical systems will be in accordance with the CHBDC and the Canadian Electrical Code and will include an inspection and commissioning program.

The existing submarine cables are routed between the lower level of the control house and the bridge pivot pier, and between the pivot pier and the swing bridge's east side traffic control equipment. The proposed re-designed submarine cable installation is to be provided with mechanical protection as well as the capability to be easily replaced in the event of a failure. The proposed installation involves running the cables through reinforced fiberglass conduits which would lay on the bottom of the channel with a Uraduct over them for stability and protection (Parsons 2017a). The electrical junction boxes and conduits will be located on the abutment wall (Parsons 2018a).

5.5.6 Fixed Bridge Replacement

The Fixed Bridge will be replaced in its entirety, as per the Terms of Reference, as a result of the structural condition and functional ratings being inadequate and given the age of the structure (Parsons 2017a). To retain the heritage qualities of the existing bridge, as per the feedback and preference of PSPC, PCA, and Cultural Resource Management, the fixed bridge will be replaced with a Pratt truss structure that has a total of five interior panels and two end panels (Parsons 2017a, 2017d, 2017e; PCA 2017a). The new bridge deck clear width (for both bridges) will be 4.0 m including, on both sides, a uniform 0.5 m shoulder, a timber curb, and a steel lattice railing. The truss height will be maintained; however, to increase the vertical clearance from the current sub-standard clearance, the existing end portal frames and lateral sway bracings will be replaced with beams in the proposed Fixed Bridge in order to maintain the height-to-width ratio (Parsons 2018b). The existing nail-laminated timber deck with running boards will be replaced by a similar laminated timber deck with running boards, made from pressure-treated hemlock. The existing pinned connections will be replaced with conventional connections (bolts and gusset plates) to achieve a design that is more durable (Parsons 2017d, 2017e, 2017g, 2018b).

The existing fixed bridge will be disassembled piece by piece for removal (PCA, personal communication, February 21, 2018); as such, temporary laydown of bridge parts on site will not be necessary. This methodology will require the maintenance of the containment system to confine and capture any material and/or debris that could potentially become detached and enter the water or surrounding environment while the swing bridge superstructure and its component parts are being disassembled/removed (PWGSC 2015).





5.5.7 Control House Replacement

The existing control house, along with the associated septic tank, foundations, and all utilities, will be replaced with a new control house in the same area, on the west side of the Trent-Severn Waterway. Based on the final vertical alignment of the roadway, the location and/or visual enhancements may be required to provide the bridge operator with vision of the roadway and waterway in both directions for the safe operation of the bridge (Parsons 2017a). The bridge is presently operated from a pedestal mounted operator's control station located outside the control house. The new structure will be enhanced to include both an outdoor and indoor control console (Parsons 2018a). Additionally, closed-circuit television (CCTV) will be utilized to provide the operator with complete knowledge of marine and roadway traffic. It has been recommended that the CCTV be located on the bridge moving structure to afford maximum vision for the bridge operator (Parsons 2017a).

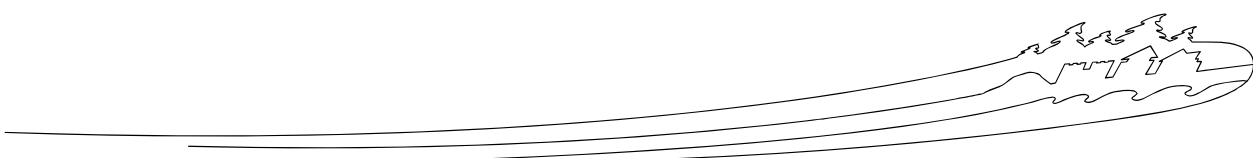
A small parking area, with precast concrete curbs and chain barricade restricting access, will be constructed on the west side of the new control room east of the new septic tank. On the south side of the parking area, a precast concrete retaining wall will be installed (Parsons 2018a).

5.5.8 Concrete Structure Repairs/Replacement

As a component of the Project activities, both east and west abutments and their respective footings, ballast walls, and wingwalls will be replaced with new reinforced concrete elements of similar configuration, but supported on micropiles due to the poor soil conditions (Parsons 2018b). The west abutment will be raised by 600 mm and the east abutment by approximately 214 mm. The new east pier will be replaced with a pier visually sympathetic to the existing and will be founded on bedrock, designed to resist a 28 tonne vessel collision load, as approved by PWGSC/PCA (Parsons 2018b). The center pivot pier will be raised by 600 mm to reduce the risk of flooding the operating equipment (PCA 2017a) and the perimeter will be resurfaced while maintaining the existing rock fill and existing shape (Parsons 2018b). The rest piers will be strengthened by encapsulating the entire pier with steel sheet piling. A new concrete slab will be cast on the top surface and sides of the rest piers below water level to cover the sheet piles (Parsons 2018b). At the base of the rest pier, existing grout bags will be replaced with a new toe rock berm which will be placed all around the perimeter (Parsons 2018a).

Replacement of wingwalls and piers will require the removal of deteriorated concrete which will involve, but may not be limited to, the use of chipping hammers and saw-cutting equipment. Concrete repair work will generally include the construction of wooden formwork, placement of reinforcing steel, and placement of concrete utilizing concrete trucks and a concrete pump truck. All concrete repairs and/or replacements will be completed in-the-dry through placement of temporary sheet pile cofferdams surrounded by a temporary turbidity barrier, and localized dewatering around each pier (Parsons 2018a). Due to the location of the abutments above the water level, dewatering around the abutments is not expected to be necessary; however, this will be assessed by the Contractor at the time of construction to ensure appropriate protection of the environment and that any resulting river constriction is not a concern (PCA, personal communication, May 30, 2018).

In-water works and near-water works will only occur within the approved in-water construction timing window as identified by the Ministry of Natural Resources and Forestry (MNRF; Steve Scholten, personal communication with PCA, 2017), for the protection of Walleye during migration, and specified in the Contract Specifications. For the Project location, all in-water works will be conducted June 1 through





March 14; therefore, no in-water work will be allowed March 15 through May 31. All concrete repairs will be carried out in accordance with the *Construction Specifications for Concrete Structures* (Ontario Provincial Standard Specification; OPSS 904).

5.5.9 Demobilization / Reinstatement of Site

All materials, debris, equipment, tools, and environmental protection measures (excluding ESC measures) will be completely removed from the site once Project activities have been completed. All required ESC measures will remain in place and will be maintained until vegetation has established on all areas disturbed by construction activities. Through implementation of a site-specific restoration plan, the site will be reinstated to pre-construction or better conditions. This will include regrading of the embankments as necessary, the placement of topsoil, hydro-seeding, and the replacement of any trees and/or shrubs damaged/removed during construction, and repair of any property damage. Upon Project completion, the temporary traffic detour will be removed, and the bridges will be opened to traffic.

5.5.10 Bridge Operation and Maintenance

The newly replaced bridges will provide mechanical, hydraulic, electrical and control equipment and wiring/piping as required for 75-year bridge life expectancy and low-maintenance, trouble-free operation as detailed in the structure-specific Operation and Maintenance Manuals (PWGSC 2015). However, the laminated timber deck has an estimated service life of 35 years and 15 years for the wearing surface (Parsons 2017a). The final structures are not expected to require special provisions or methods for operation and no major changes in operations are expected. Operation of the swing bridge will be implemented according to PCA's Best Management Practices and safe operating procedures and will not result in potential harm to the natural or human environment.

5.5.11 Bridge Decommissioning

There are currently no plans for decommissioning of the bridges. When the time comes for the bridge structures to be decommissioned, installation of an appropriate containment system will be required to prevent debris from entering the watercourse and further assessment of potential environmental impacts will be required.

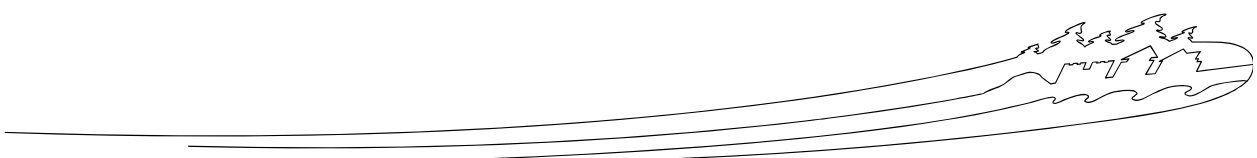
5.6 Existing Environment

A general description of the environmental conditions present at the Project site is summarized below. This information is summarized from consultations with PCA and regulatory agencies, the review of publicly available databases and reports, and an on-site meeting and high-level terrestrial site reconnaissance conducted on May 13, 2016. A photo record from May 13, 2016 is provided in Appendix B.

5.6.1 Air Quality and Noise

Air quality in the area is assumed to be good based on the large percentage of natural land cover and limited known sources of air pollution.

The Ministry of the Environment and Climate Change (MOECC) provides online access to Air Quality Health Index (AQHI) data. This tool is designed to help the public make decisions to protect their health





by limiting short-term exposure to air pollution and adjusting activity levels during increased levels of air pollution. The index is divided into 4 groups and 11 categories: Low Risk (1-3), Moderate Risk (4-6), High Risk (7-10) and Very High Risk ("10+") (MOECC 2015).

A summary of the 2015 MOECC daily AQHI categories for Barrie (the closest AQHI station, approximately 50 km southwest of the Project site) indicates Low Risk air quality on 337 days of the year and Moderate Risk air quality on the remaining days. These numbers suggest that air quality in the regional area is generally quite good.

Potential environmental effects associated with air quality and noise exposure are described in Sections 7.1 and 7.2, respectively. Mitigation measures to minimize these effects are listed in Sections 8.2 and 8.3, respectively.

5.6.2 Soil and Geology

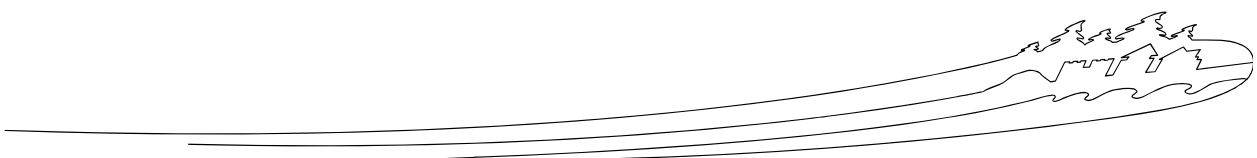
The soil type in the immediate vicinity of the Hamlet Bridges is moderately-well drained loamy sand (OMAFRA 2015; Agriculture and Agri-Food Canada 2016).

5.6.3 Fisheries and Aquatic Resources

The Hamlet Bridges Project site falls within the Severn River subwatershed, part of the Trent-Severn Waterway, within the Muskoka Watershed. The Trent-Severn Waterway is part of the National Canal system that joins Lake Ontario, at Kingston, to Georgian Bay, at Port Severn. The Severn River flows from Lake Couchiching into the Upper Severn River, then westward into the Lower Severn River, and out to Georgian Bay at Lock 45 at Port Severn. The Severn River subwatershed is 625 km² and the Severn River makes up 565 km² of its drainage area. As a whole, the watershed receives approximately 958 mm of precipitation annually. As the Trent-Severn Waterway is owned by PCA, water levels and flows through the Severn River drainage basins are managed by PCA (Muskoka Watershed Council 2010; Muskoka Watershed Council 2016).

Within Sparrow Lake, located approximately 1.8 km downstream/north of the Project site, daily water levels suggest that there is little fluctuation in water level throughout the year. Water level data from 1988 through 2008 indicates that the average daily water level ranges from a maximum of 213.005 metres above sea level (masl) down to a minimum of 212.547 masl. Over these years the maximum water level reach 213.929 masl and the minimum water level fell to 212.410 masl (PCA, personal communication, February 21, 2018). These water levels are expected to be representative of the water levels at the Project site.

Based on the 99% submission of the Project's Progress Drawings (Parsons 2018a), both bridge abutments are located above the normal water level. As such, no impacts to fish habitat are anticipated in these areas. Detailed fish habitat information is not available for the specific locations of the proposed cofferdams (i.e., around the rest pier and east pier); however, Arcadis (2017) data indicated that the habitat southeast of the pivot pier (i.e., west of the rest pier and south of the swing bridge) is dominated by pool habitat with primarily boulder substrate, fast velocity and deep water. Beyond this small zone, the bulk of the area surrounding the bridges is pool habitat with silt and boulder substrate, slow velocity and deep water (Arcadis 2017).





Arcadis (2017) has collected additional aquatic data specific to two reaches: 0-80 m upstream of the bridges and 0-100 m downstream of the bridges. As findings were very similar, for the purposes of this report the data has been summarized into one reach.

At the Hamlet Bridges the Trent-Severn Waterway is 75 m wide with a mean water depth around 5.8 m and maximum water depth around 11.0 m (Arcadis 2017). Disturbance indicators include the bridges, private docks, and boat traffic. The substrate at the site is dominated by silt and boulders, offering moderate cover for fish. Other cover features such as emergent and submergent aquatic vegetation, large woody debris, and overhanging vegetation were also present at the time of investigation (Arcadis 2017). Substrate/cover conditions are considered suboptimal representing 40-60% stable habitat with suboptimal sediment embeddedness/deposition. Water flow is typically slow to standing with no riffle features (Arcadis 2017). Both banks are stable along the 180 m reach and primarily vegetated with mature trees with the exception of open areas adjacent to private docks, the majority of which are located on the upstream west bank.

Although fish sampling data at the Hamlet Bridges Project site are not available, species that have been caught in Sparrow Lake (located approximately 1.8 km downstream/north of the Project site) and near the Hamlet Bridges are listed in Table 1 below. Overall, fish habitat at the site is considered marginal for spawning and nursery and suboptimal for adult and refuge habitat for most warmwater/coolwater fish species (Arcadis 2017). Through communications with MNRF, PCA has also confirmed that the Walleye typically migrate through the system between April 1 and May 31 (PCA, personal communication, February 21, 2018).

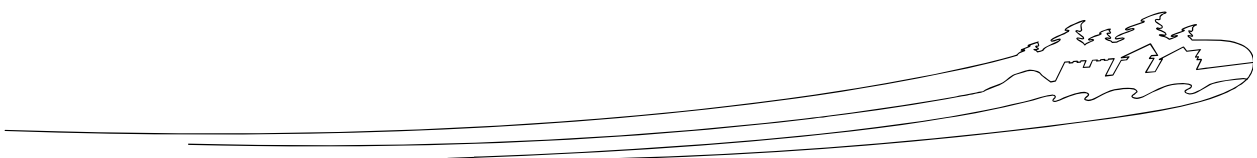
Table 1: Fish Species Recorded within Sparrow Lake and near the Hamlet Bridges

Common Name	Scientific Name	Provincial S-Rank	Source
Black Crappie	<i>Pomoxis nigromaculatus</i>	S4	1
Bluegill	<i>Lepomis macrochirus</i>	S5	3
Channel Catfish	<i>Ictalurus punctatus</i>	S4	1
Largemouth Bass	<i>Micropterus salmoides</i>	S5	1, 3
Muskellunge	<i>Esox masquinongy</i>	S4	1, 3
Northern Pike	<i>Esox lucius</i>	S5	1, 3
Rock Bass	<i>Ambloplites rupestris</i>	S5	2
Round Goby	<i>Neogobius melanostomus</i>	SNA	3
Smallmouth Bass	<i>Micropterus dolomieu</i>	S5	1, 3
Walleye	<i>Sander vitreus</i>	S5	1, 3

Source: 1. iFish Ontario 2016 2. Angler's Atlas 2016 3. Arcadis 2017

Provincial S-Rank: S4 - Considered to be common in Ontario. It denotes a species that is apparently secure, with over 80 occurrences in the province; S5 - Indicates that a species is widespread in Ontario. It is demonstrably secure in the province; SNA - A conservation status rank is not applicable because the species is not a suitable target for conservation activities.

Baseline water quality data was not collected as a component of the Project's background investigations. It is recommended that parameters such as pH, dissolved oxygen, total suspended solids, conductivity, and water temperature be collected over a number of days prior to the commencement of the Project activities.





5.6.4 Terrestrial Environment

The Project site is located within a residential neighbourhood surrounded by a densely forested landscape. There is no commercial, industrial, or agricultural land use adjacent to the site. The following sub-sections give a brief overview of the flora and fauna in the vicinity of the Project area.

5.6.4.1 Flora

The Hamlet Bridges are situated on the border of the Lake Simcoe-Rideau Ecoregion (Ecoregion 6E) and the Georgian Bay Ecoregion of Ontario (Crins et al. 2009). The site is surrounded by mixed forest with minimal development and disturbance in an approximate 1.4 km radius. This area contains most of the tree species found in the Great Lakes-St. Lawrence Forest Zone, including Eastern White Cedar (*Thuja occidentalis*), Eastern White Pine (*Pinus strobus*), Eastern Hemlock (*Tsuga canadensis*), Red Pine (*Pinus resinosa*), Balsam Fir (*Abies balsamea*), Sugar Maple (*Acer saccharum*), White Ash (*Fraxinus americana*), Yellow Birch (*Betula alleghaniensis*), Paper Birch (*Betula papyrifera*), Northern Red Oak (*Quercus rubra*), and American Basswood (*Tilia americana*).

On a watershed scale, the Project site falls within the Severn River subwatershed, part of the Trent-Severn Waterway, within the Muskoka Watershed. Within the Severn River subwatershed 56% of the land is Crown land and 14% is protected through provincial parks, crown nature reserves, or local land trusts. As of 2014, 94% of the Severn River subwatershed was natural habitat (Muskoka Watershed Council 2016).

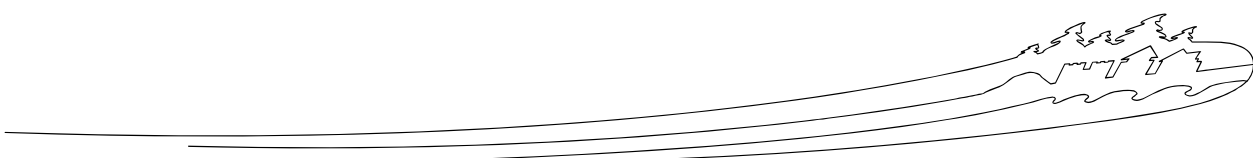
The Severn River subwatershed has been classified by Muskoka Watershed Council as having “Vulnerable” land conditions — on a scale of Not Stressed, Vulnerable, Stressed. This classification is based on the following indicators:

- Size of natural areas – areas of natural cover that are 200 ha or greater;
- Interior forest – forested area with a 100 m forested buffer surrounding it;
- Road density – a measure of the degree of fragmentation due to roads;
- Level of development – the percent of the watershed in urban or rural development;
- Shoreline density – used as an indicator of the human stress on a waterbody; and
- Shoreline buffer – the percent of unaltered lot area from the water’s edge 20 m inland (Muskoka Watershed Council 2014).

In the immediate vicinity of the Hamlet Bridges, the vegetation within the Study Area is comprised predominantly of planted trees, remnant trees from previously forested areas, and maintained lawn/grass. Tree species within the immediate vicinity of the Hamlet Bridges include Red Pine, Eastern Hemlock, White Ash, Sugar Maple, and Paper Birch. Forested areas consistent with the Great Lakes-St. Lawrence Forest Zone, described above, are located nearby (i.e., less than 100 m from the Hamlet Bridges).

5.6.4.2 Fauna

The Project site is centered on a watercourse, surrounded by dense mixed forest habitat and provides excellent habitat for a variety of fauna. The area immediately surrounding the Project site is expected to have a high level of biodiversity and significant ecological function; however, potential interactions with





species during the Project works are expected to be transient and likely to include common species, such as deer, squirrels, raccoons, skunks, and mice, although reptile species may also be observed during their active season (typically April through October). No mammals were observed during the May 13, 2016 site visit.

In the vicinity of the Hamlet Bridges, the shorelines are vegetated with mature trees with some herbaceous undergrowth and sections of mowed lawn. In most areas, the banks have a gentle grade allowing easy transition between water and land for terrestrial and semi-aquatic species including Northern Map Turtle (*Graptemys geographica*) and Snapping Turtle (*Chelydra serpentina*), which have been reported on site (K. Carney, personal communication, May 13, 2016). During the May 13, 2016 site visit, no reptile or amphibian species were recorded, and no evidence of turtle nesting was observed.

Within the two 10 km x 10 km squares encompassing the site (17PK25 and 17PK26), the *Ontario Reptile and Amphibian Atlas* (Ontario Nature 2016) reports occurrences of 25 species of reptiles and amphibians since 1998, 10 of which have a Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status and/or are federally- or provincially-listed Species at Risk (SAR) (Appendix C). These species and others may use the shoreline in this area for nesting or as a corridor to upland habitat features. It is anticipated that any fauna present on site at the time of construction will withdraw from the work area to a more secluded place with less human activity.

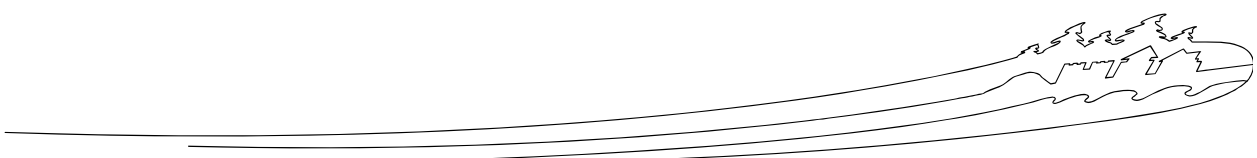
The online *Atlas of the Breeding Birds of Ontario, 2nd Edition* (Cadman et. al. 2007) was reviewed for background information on birds counted within the two 10 km x 10 km areas encompassing the Hamlet Bridges (17PK25 and 17PK26). The findings include a list of the 130 species, including 14 species which have a COSEWIC status and/or are federally- or provincially-listed SAR. This list and the associated map is included in Appendix D. During the May 13, 2016 site visit, 25 bird species were recorded in the vicinity of the Hamlet Bridges. These species are indicated by a ✓ by their name in Appendix D.

5.6.5 Species at Risk

Flora and fauna considered to be “at risk” federally are those listed under Schedules 1, 2, or 3 of the *Species at Risk Act, 2002* (SARA). Prior to their listing, species are assessed by COSEWIC and then suggested for listing as deemed appropriate by the Canadian government, the public, and the Minister of the Environment. Those species that have not been assigned a schedule or status under SARA but have a COSEWIC status are currently under consideration (Government of Canada 2009). For the purposes of this Project, as per PCA’s direction, all species with a COSEWIC status will be treated like SAR.

Similar to the federal SARA, the provincial *Endangered Species Act, 2007* (ESA) includes species listed under either Schedules 1, 2, 3, or 4, designating their risk status. Species listed under the ESA are also assessed by a committee (the Committee on the Status of Species at Risk in Ontario; COSSARO); however, any species suggested by COSSARO for listing under the ESA must be listed under the ESA within three months of COSSARO delivering an assessment report to the Minister (MNRF 2016).

Project activities located on federal lands will require compliance with SARA; however, where federal legislation or voluntary measures are deemed inadequate to protect a provincial SAR and/or its habitat, consultation with the MNRF for adherence to the ESA is recommended. Similarly, Project activities





located on private lands will require compliance with the ESA, and consultation with PCA may be necessary to ensure adequate protection of federally-listed SAR and their habitat.

To date, there have been no directed surveys for SAR within or immediately adjacent to the Hamlet Bridges Project site. Rather, general terrestrial observations were recorded during the May 13, 2016 site visit and a desktop SAR screening assessment was completed to identify the potential presence of SAR and/or habitat for SAR near the Project site. Publicly available resources, including the Species at Risk in Ontario (SARO) list, the Natural Heritage Information Centre (NHIC) database, Fisheries and Oceans Canada (DFO) mapping, and wildlife atlases were reviewed. Results of these searches provided a list of known SAR occurrences in the vicinity of the Project site.

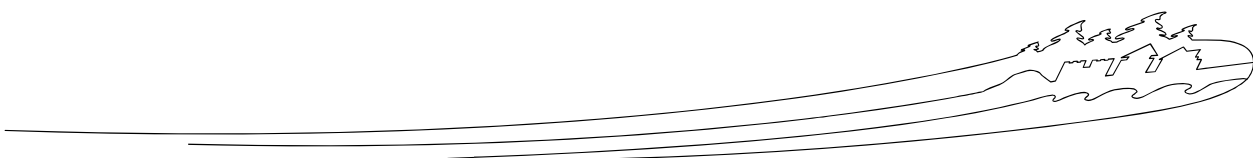
A desktop review of the MNRF's NHIC online database (MNRF 2014) was conducted for the four 1-km square areas encompassing Hamlet Bridges (17PK2659, 17PK2660, 17PK2759, and 17PK2760). Results indicate that there are recent (within 20 years) records of three reptile SAR, Snapping Turtle, Eastern Musk Turtle (*Sternotherus odoratus*), and Northern Map Turtle, and one fish SAR, Lake Sturgeon (*Acipenser fulvescens*), which was indicated by DFO aquatic SAR mapping as occurring upstream of the Project site in Grass Lake (DFO 2017). PCA has confirmed that proposed critical habitat polygons for Blanding's Turtle, as well as Eastern Whip-poor-will (*Caprimulgus vociferus*) and Golden-winged Warbler (*Vermivora chrysoptera*) are mapped over the Project site. However, as the work site does not meet the biophysical attributes for the critical habitat of these species, individuals are not expected to be present and impacts to these species are not anticipated (PCA, personal communication, February 21, 2018). Further details specific to each species and their habitat needs are included in Table 2 below.

Review of the *Ontario Reptile and Amphibian Atlas* (Ontario Nature 2016) for the two 10 km x 10 km squares encompassing the site (17PK25 and 17PK26) confirms records of ten species which have a Committee on the Status of Endangered Wildlife in Canada (COSEWIC) status and/or are federally- or provincially-listed Species at Risk (SAR).

Review of the *Atlas of Breeding Birds of Ontario 2nd Edition* (Cadman et al. 2007) for the two 10 km x 10 km squares surrounding the Hamlet Bridges (17PK25 and 17PK26) confirms records of twelve federally- and/or provincially-ranked avian SAR and two COSEWIC-ranked species that are not listed as SAR.

The preferred habitat of each SAR was compared with the physical conditions present on the Project site to make a determination of whether preferred habitat of listed SAR exists there. Based on this assessment a determination of each species' probability of occurring on the site and the probability of the species and/or its habitat being directly impacted have been assigned a rank of "Low", "Moderate" or "High" (Table 2). The following text describes the assigned ranks with respect to the probability of a species to occur on site.

Species with a High probability of occurrence are those recorded near the Project (typically within 10 km and recorded in the past 20 years) and whose preferred habitat is abundant within the Study Area. Species with High probability of occurrence would be expected to breed within or frequently use the habitats available at the Project site and would be known to have a high relative abundance within the region of the Study Area (i.e. compared to other regions in Ontario).



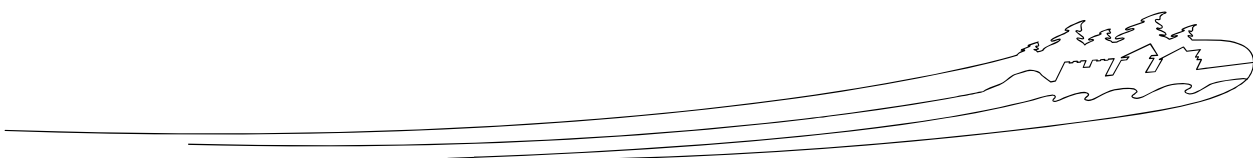


Species with a Moderate probability of occurrence are those recorded near the Project, but have limited suitable habitat at the Project site. Species with Moderate probabilities of occurrence may not occur within the Study Area frequently, but may intermittently use it for foraging, migration, or movement to other parts of their home-range.

Species with a Low probability of occurrence are those recorded near the Project and whose preferred habitat does not occur or is extremely limited at the Project site. These species may intermittently move through the Project site, but are unlikely to become permanent residents.

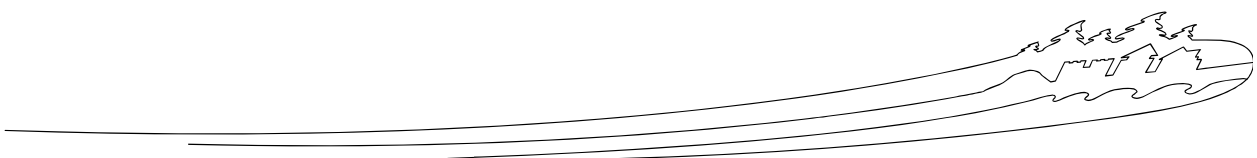
Table 2: SAR Records and Probability of Occurrence and Impacts to Species

Species Name and Status (SARA ¹ , ESA ² , S-Rank ³), and Data Source	Probability of Occurrence On Site / Probability of Impact to Species
Fish	
Lake Sturgeon <i>(Acipenser fulvescens)</i> Great Lakes/Upper St. Lawrence River populations; SARA: Threatened ESA: Threatened S-Rank: S3 Source: MNRF 2014	Low/Low – Substrate type is considered to be important to Lake Sturgeon since they feed on benthic invertebrate fauna. Adults are typically found in large rivers and lakes, 5-10 m deep, over substrates of mud, clay, sand or gravel (COSEWIC 2006a). DFO mapping suggests that Lake Sturgeon may be present in Grass Lake and immediately north of the lake into the Upper Severn River; however, there have been no reports of Lake Sturgeon near the Project site.
Turtles	
Blanding's Turtle <i>(Emydoidea blandingii)</i> Great Lakes/St. Lawrence population; SARA: Threatened ESA: Threatened S-Rank: S3 Source: Ontario Nature 2016; PCA, personal communication	Low/Low – The Great Lakes/St. Lawrence population of Blanding's Turtle are often observed using clear water, eutrophic habitats. An individual turtle may use several connected lakes, rivers, streams, marshes, or ponds and travel upwards of 6,760 m in an active season. This species nests in a variety of loose substrates including sand, organic soil, gravel, and cobblestone (COSEWIC 2005). It is possible that this species may nest in the area or simply pass through the Project area when accessing the adjacent habitat features; however, the waterway is unlikely suitable for overwintering use. Also, the MNRF does not have any records of Blanding's Turtle occurring near the site within the past 20 years.
Eastern Musk Turtle <i>(Sternotherus odoratus)</i> SARA: Special Concern ESA: Special Concern S-Rank: S3 Source: MNRF 2014; Ontario Nature 2016	Moderate/Moderate – The Eastern Musk Turtle is a highly aquatic species inhabiting littoral zones of waterways such as rivers, lakes, bays, streams, ponds, canals, and swamps with slow to no current and soft bottoms. During their active season, Eastern Musk Turtles prefer shallow water (depth < 2 m) with abundant floating and submerged vegetation. Individuals are most often found close to shore and usually do not venture onto land except to nest or to access adjacent wetlands (COSEWIC 2012a). It is possible that this species may nest in the area or simply pass through the in-water Project area when accessing the adjacent wetlands/streams. Staging areas should be set back from the river banks to avoid impacts to potential nesting habitat.



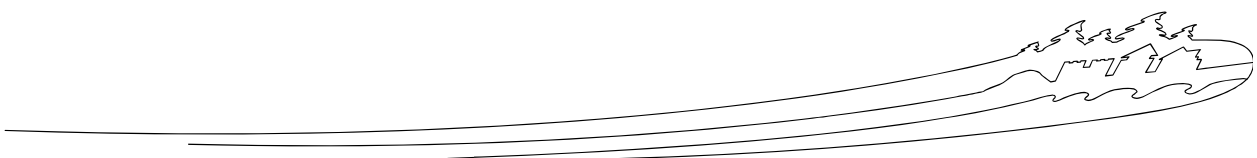


Species Name and Status (SARA ¹ , ESA ² , S-Rank ³), and Data Source	Probability of Occurrence On Site / Probability of Impact to Species
<p>Midland Painted Turtle (<i>Chrysemys picta marginata</i>)</p> <p>SARA: No Status COSEWIC: Special Concern ESA: No Status S-Rank: S4 Source: Ontario Nature 2016</p>	<p>Moderate/Moderate – Painted turtles inhabit waterbodies, such as ponds, marshes, lakes and slow-moving creeks, that have a soft bottom and provide abundant basking sites and aquatic vegetation. These turtles often bask on shorelines or on logs and rocks that protrude from the water. The midland painted turtle hibernates on the bottom of waterbodies. Females nest from late May to early July, digging their nest in loamy or sandy soil in sunny areas. Hatchlings may emerge in the fall but sometimes overwinter in the nest and emerge the following spring (Ontario Nature 2018).</p>
<p>Northern Map Turtle (<i>Graptemys geographica</i>)</p> <p>SARA: Special Concern ESA: Special Concern S-Rank: S3 Source: MNRF 2014; Ontario Nature 2016; K. Carney, personal communication, May 13, 2016</p>	<p>Moderate/Moderate – Northern Map Turtle displays a preference for shallow, soft-bottomed aquatic habitats with exposed objects for basking near natural shoreline. In winter, the turtles typically hibernate on the bottom of deep, slow-moving sections of rivers or lakes (COSEWIC 2012b). Northern Map Turtle has been reported in the Project area (K. Carney, personal communication, May 13, 2016). It is possible that this species nests in the shallows of neighbouring wetland but may come to the river for overwintering. Staging areas should be set back from the river banks to avoid impacts to potential basking/nesting habitat.</p>
<p>Snapping Turtle (<i>Chelydra serpentina</i>);</p> <p>SARA: Special Concern ESA: Special Concern S-Rank: S3 Source: MNRF 2014; Ontario Nature 2016; K. Carney, personal communication, May 13, 2016</p>	<p>Moderate/Moderate – The preferred habitat for the Snapping Turtle is characterized by slow-moving water with a soft mud bottom and dense aquatic vegetation. Females generally nest on sand and gravel banks along waterways (COSEWIC 2008a). This species has been reported in the Project area (K. Carney, personal communication, May 13, 2016). Snapping Turtles may nest in the area or simply pass through the Project site when accessing long-term habitat in the densely-vegetated neighbouring wetlands/streams. Staging areas should be set back from the river banks to avoid impacts to potential basking/nesting habitat.</p>
Snakes	
<p>Eastern Hog-nosed Snake (<i>Heterodon platirhinos</i>)</p> <p>SARA: Threatened ESA: Threatened S-Rank: S3 Source: Ontario Nature 2016</p>	<p>Moderate/Low – Five physical features have been used to define the preferred habitat of the Eastern Hog-nosed Snake: well-drained soil; a loose or sandy soil; open vegetative cover such as open woods, brushland or forest edge; proximity to water; and climatic conditions typical of the eastern deciduous forest biome (Seburn 2009). Adult Eastern Hog-nosed Snakes are very mobile for snakes and have home ranges that can exceed 100 ha (COSEWIC 2007a). This species may inhabit the neighbouring forest edge and may pass through the Project site.</p>
<p>Eastern Milksnake (<i>Lampropeltis triangulum</i>)</p> <p>SARA: Special Concern ESA: No Status S-Rank: S3 Source: Ontario Nature 2016</p>	<p>Moderate/Low – Eastern Milksnakes inhabit a wide variety of open habitat types including grasslands, rock outcrops, rocky hillsides as well as deciduous and mixed forests and edge habitats (COSEWIC 2014). This species commonly uses debris, logs, rocks and other cover objects for thermoregulation (COSEWIC 2014). This species may inhabit the neighbouring forest edge and may pass through the Project site.</p>



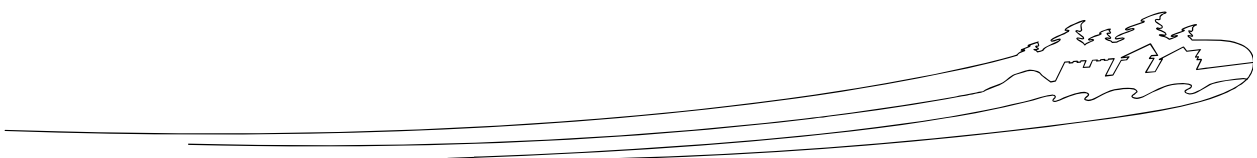


Species Name and Status (SARA ¹ , ESA ² , S-Rank ³), and Data Source	Probability of Occurrence On Site / Probability of Impact to Species
Eastern Ribbonsnake <i>(Thamnophis sauritus)</i> SARA: Special Concern ESA: Special Concern S-Rank: S3 Source: Ontario Nature 2016	Moderate/Moderate – The Eastern Ribbonsnake is semi-aquatic and most frequently found along wetland edges. Quiet, shallow water with low surrounding cover is preferred, although areas with good exposure to sunlight are also required (Smith 2002). This species may inhabit the littoral zone and shores of the Trent-Severn Waterway.
Massasauga <i>(Sistrurus catenatus)</i> (Great Lakes / St. Lawrence population) SARA: Threatened ESA: Threatened S-Rank: S3 Source: Ontario Nature 2016	Low/Low – In the Great Lakes/St. Lawrence region, this species uses a mosaic of bedrock barrens, conifer swamps, beaver meadows, fens, bogs, and shoreline habitats. Hibernation occurs in structural stability areas with access to the water table/moist substrate, access to sufficient depth below the frost line, protection from extreme temperature fluctuations, and space to adjust to changing conditions (COSEWIC 2012c). Based on mapping in the <i>Recovery Strategy for the Massasauga in Canada</i> (PCA 2015), the Project site is located near the limits of Massasauga critical habit; however, PCA has confirmed that Massasauga critical habitat is not present on site (PCA, personal communication, February 21, 2018).
Lizards	
Common Five-lined Skink <i>(Plestiodon fasciatus)</i> (Southern Shield Population) SARA: Special Concern ESA: Special Concern S-Rank: S3 Source: Ontario Nature 2016	Low/Low – The preferred habitat of the Common Five-lined Skink includes rocky outcrops, sand dunes, riparian forests, open deciduous forests, and cut-over woodlots. Rocky outcrops embedded within a matrix of coniferous and deciduous forest is also an important habitat feature, as well as exposed rock outcrops covered with loose rock of variable sizes. Skinks in the southern shield use loose rock on open rock faces as cover elements and are rarely observed outside of this cover element (COSEWIC 2007b). This species may inhabit the neighbouring forest but is unlikely to occur at the Project site as its preferred habitat is not present.
Birds	
Bald Eagle <i>(Haliaeetus leucocephalus)</i> SARA: No Status COSEWIC: Not at Risk ESA: Special Concern S-Rank: S4 Source: Cadman et al 2007	Low/Low – In Ontario, typical Bald Eagle nesting habitat is described as mature forest with scattered supercanopy trees, and adjacent large productive waterbodies (Armstrong 2014). Bald Eagle may be found nesting in the forest adjacent to Sparrow Lake and/or Grass Lake. However, this species is unlikely to forage within the Upper Severn River or inhabit the terrestrial habitat immediately adjacent to the Project site.
Barn Swallow <i>(Hirundo rustica)</i> ; SARA: Threatened ESA: Threatened S-Rank: S4B Source: Cadman et al 2007	Moderate/Low – Although Barn Swallows commonly nest on bridge structures (COSEWIC 2011a), this species has not been recently reported on site and signs of nesting activity were not observed during the May 13, 2016 visit. As the underside of the bridge could not be inspected in its entirety from the shore, prior to the removal of the bridge, a nest inspection should be conducted to ensure that Barn Swallows are not directly impacted by Project works.



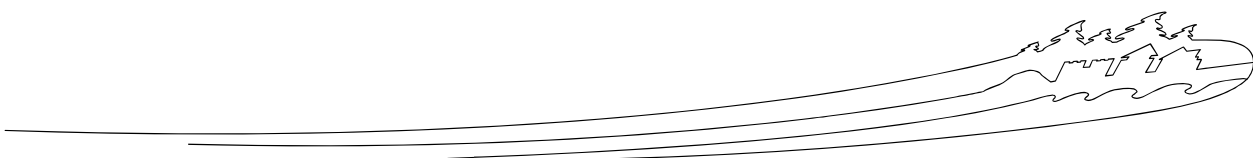


Species Name and Status (SARA ¹ , ESA ² , S-Rank ³), and Data Source	Probability of Occurrence On Site / Probability of Impact to Species
Bobolink <i>(Dolichonyx oryivorus)</i> SARA: Threatened ESA: Threatened S-Rank: S4B Source: Cadman et al 2007	Low/Low – Bobolink nest primarily in forage crops, hayfields and associated pastures are their preferred habitat. Bobolink also occur in wet prairie, graminoid peatlands and abandoned fields dominated by tall grasses, no-till cropland, small-grain fields, reed beds and irrigated fields in arid regions (COSEWIC 2010). This species is not likely to occur on site due to lack of suitable habitat.
Canada Warbler <i>(Cardellina canadensis)</i> SARA: Threatened ESA: Special Concern S-Rank: S4 Source: Cadman et al 2007	Low/Low – Canada Warbler uses a wide range of deciduous, coniferous, and mixed forests with a well-developed shrub layer, and a structurally complex forest floor (COSEWIC 2008c). It is possible that this species nests in the neighbouring forests but it would not likely be impacted by Project works.
Common Nighthawk <i>(Chordeiles minor)</i> SARA: Threatened ESA: Special Concern S-Rank: S4B Source: Cadman et al 2007	Low/Low – Common Nighthawk are ground nesters that use a variety of open habitats where ground is devoid of vegetation (COSEWIC 2007a). Based on aerial imagery, it is suspected that the neighbouring forest to the west provides suitable habitat for this species due to recent logging activity in the area. However, it is unlikely that this species would be close enough to be impacted by Project works.
Eastern Meadowlark <i>(Sturnella magna)</i> SARA: Threatened ESA: Threatened S-Rank: S4B Source: Cadman et al 2007	Low/Low – Eastern Meadowlark nests in native grasslands, pastures and savannas. It also uses a wide variety of other anthropogenic grassland habitats. As with other grassland bird species, the suitability of grassland habitat for this species involves a combination of landscape and patch characteristics (COSEWIC 2011b). This species is not likely to occur on site due to lack of suitable habitat.
Eastern Whip-poor-will <i>(Antrostomus vociferus)</i> SARA: Threatened ESA: Threatened S-Rank: S4B Source: Cadman et al 2007	Low/Low – Eastern Whip-poor-will are ground nesters that are dependent on semi-open forests or patchy forests with clearings (COSEWIC 2009a). Based on aerial imagery, it is suspected that the neighbouring forest to the west provides suitable habitat for this species due to recent logging activity in the area. However, it is unlikely that this species would be close enough to be impacted by Project works.
Eastern Wood-Pewee <i>(Contopus virens)</i> SARA: Special Concern ESA: Special Concern S-Rank: S4B Source: Cadman et al 2007; Reported during site visit on May 13, 2016	Moderate/Low – Eastern Wood-Pewee is commonly associated with the edges of deciduous and mixed forests, and most abundant in forests of intermediate age and mature stands with little understory vegetation (COSEWIC 2012c). This species was reported during the May 13, 2016 site visit; however, the preferred habitat for this species is not present on the Project site, it is unlikely that this species will be directly impacted.





Species Name and Status (SARA ¹ , ESA ² , S-Rank ³), and Data Source	Probability of Occurrence On Site / Probability of Impact to Species
Golden-winged Warbler <i>(Vermivora chrysoptera)</i> SARA: Threatened ESA: Special Concern S-Rank: S4B Source: Cadman et al 2007	Low/Low – Golden-winged Warblers are found in areas of early successional scrub surrounded by mature forests. They are found in dry uplands, swamp forests and marshes (COSEWIC 2006b). It is possible that this species is found in the successional clearings of the neighbouring forest; however, it is unlikely to be present on site and therefore no impacts to this species are expected.
Grasshopper Sparrow <i>pratensis</i> subspecies <i>(Ammodramus savannarum ssp. pratensis)</i> SARA: Special Concern ESA: Special Concern S-Rank: S4B Source: Cadman et al 2007	Low/Low – In Canada, the Eastern Grasshopper Sparrow typically breeds in large human-created grasslands (≥ 5 ha), such as pastures and hayfields, and natural prairies (COSEWIC 2013a). The closest suitable habitat is over 1 km from the Project site; as such, impacts to this species are not anticipated.
Least Bittern <i>(Ixobrychus exilis);</i> SARA: Threatened ESA: Threatened S-Rank: S4B Source: Cadman et al 2007	Low/Low – On-site conditions are not well-suited for this species. Preferred habitat includes marshes comprised of emergent species (usually cattails, <i>Typha</i> sp.) (COSEWIC 2009b). It is unlikely to be present on site and therefore no impacts to this species are expected.
Olive-sided Flycatcher <i>(Contopus cooperi)</i> SARA: Threatened ESA: Special Concern S-Rank: S4B Source: Cadman et al 2007	Low/Low – The Olive-sided Flycatcher is most often associated with open areas containing tall trees or snags for perching. Open areas may be forest openings, forest edges near natural openings (such as rivers, muskeg, bogs or swamps), or human-made openings (such as logged areas), burned forest or open to semi-open mature forest stands (COSEWIC 2007b). Suitable habitat may be present in the neighbouring forest or forest edge; however, its preferred habitat will not be impacted by Project works, and it is unlikely that this species will be directly impacted.
Red-shouldered Hawk <i>(Buteo lineatus)</i> SARA: Special Concern (Sch. 3) ESA: Not at Risk S-Rank: S4B Source: Cadman et al 2007	Low/Low – The Red-shouldered Hawk breeds in a variety of forest types. Nearby wetlands or other aquatic areas are essential. This species is area sensitive, preferring extensive forest stands consisting of mature to old-growth canopy trees with variable amounts of understory (COSEWIC 2006c). It is possible that this species nests in the neighbouring forest and may forage on small animals at the Project site; however, impacts to this species are not anticipated.
Wood Thrush <i>(Hylocichla mustelina);</i> SARA: No Status ⁵ ESA: Special Concern S-Rank: S4B Source: Cadman et al 2007; Reported during site visit on May 13, 2016	Low/Low – In Canada, the Wood Thrush nests mainly in second-growth and mature deciduous and mixed forests, with saplings and well-developed understory layers. This species prefers large forest mosaics, but may also nest in small forest fragments (COSEWIC 2012d). This species was recorded during the May 13, 2016 site visit and is likely to nest in the neighbouring forest habitat. However, it is unlikely that this species will be impacted by Project works due to its dependence on forested habitat during the breeding season.





Species Name and Status (SARA ¹ , ESA ² , S-Rank ³), and Data Source	Probability of Occurrence On Site / Probability of Impact to Species
Bats	
Eastern Small-footed Myotis (<i>Myotis leibii</i>) SARA: Not at Risk ESA: Endangered S-Rank: S2S3 Source: BCI 2018	Low/Low – While some are found in caves/mines of eastern North America, they generally roost on the ground under rocks and in crevices, as well as hollow trees, in buildings and under tree bark (MNR 2011). Suitable habitat is not expected to be present on the Project site.
Little Brown Myotis (<i>Myotis lucifugus</i>) SARA: Endangered ESA: Endangered S-Rank: S4 Source: BCI 2018	Low/Low – Roosts in tree cavity, including small spaces or crevices found in loose bark, hollow trees, and rock faces, as well as human structures such as attics, walls and bat boxes. Hibernates in caves and abandoned mines during the winter months. Typically forages over water (COSEWIC 2013b). As roosting habitats are primarily woodlands and forests, with isolated tree used very seldomly for roosting, the few trees to be removed during construction are not considered suitable habitat for bats.
Northern Myotis (<i>Myotis septentrionalis</i>) SARA: Endangered ESA: Endangered S-Rank: S3 Source: BCI 2018	Low/Low – Roosts in tree cavity, including small spaces or crevices found in loose bark, hollow trees, and rock faces, as well as human structures such as attics, walls and bat boxes. Hibernates in caves and abandoned mines during the winter months. Typically forages over water (COSEWIC 2013b). As roosting habitats are primarily woodlands and forests, with isolated tree used very seldomly for roosting, the few trees to be removed during construction are not considered suitable habitat for bats.
Tri-colored Bat (<i>Perimyotis subflavus</i>) SARA: Endangered ESA: Endangered S-Rank: S3? Source: BCI 2018	Low/Low – Within treed habitats, Tri-colored Bat primarily roosts in oak and maple tree foliage. Leaf roosts are shaped like umbrellas with a "roof" and a hollow core where bats rest. It is thought that Tri-colored Bat may prefer roost trees in more open woodlands, as opposed to deep woods. Roosts in tree cavity are used less frequently than Myotis species (BCI 2018). Suitable oak and maple woodland habitat is absent from the project site.

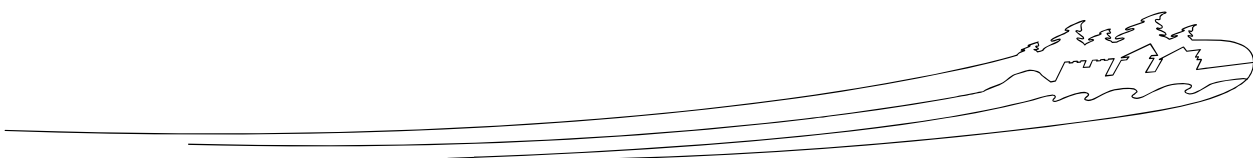
Notes: ¹ *Species at Risk Act*, 2002 Schedule 1 unless otherwise noted. COSEWIC status only provided when the species does not have a SARA status.

² *Endangered Species Act*, 2007.

³ Provincial S-Rank: S1 - Extremely rare throughout its range in the province; S2 - Rare throughout its range in the province; S3 - Uncommon or vulnerable species; S4 - Apparently Secure Species; S5 - Secure Species; SX - Extirpated; B - Breeding; N - Non-breeding; ? - Uncertainty.

5.6.6 Environmentally Significant Areas

Wetlands, woodlands, and riparian lands are essential for a healthy environment and provide many benefits to both wildlife and humans. The vegetation in wetland ecosystems filter pollutants from water, store water during floods, and release water during dry periods. Wetlands also provide both direct and indirect habitat for many wildlife species. While many bird, reptile, and amphibian species depend on wetlands for all or portions of their life cycles, vegetative matter released by wetlands into adjoining streams and rivers helps feed aquatic species living there.





As identified by MNRF's NHIC database, in the vicinity of the Hamlet Bridges are two provincially significant wetlands Sparrow Lake (located approximately 1.8 km downstream/north of the Project site) and Grass Lake (which outlets to the Upper Severn River approximately 1.2 km upstream/south of the Project site). As illustrated in Appendix A – Figure 2, there are also a large number of unevaluated wetlands in the vicinity of the Project, the closest of which is connected to an unnamed tributary which converges with the Upper Severn River on the west bank approximately 300 m downstream of the Hamlet Bridges. The Provincial Policy Statement (authorized under *The Planning Act, 1990*) protects certain wetlands from development and interference. The significance of a wetland and level of protection it is warranted it determined by the Ontario Wetland Evaluation System (MNRF 2015b).

5.6.7 Human Environment

5.6.7.1 Cultural Heritage

The Trent-Severn Waterway spans a wide and varied geographic area, it also covers a sweep of history, from pre-colonization through its developmental role in the lumbering and agriculture of the region, to its recreational use today (ACE Spirit 2004). Select portions of the Trent-Severn Waterway are deemed to be of cultural significance by the Historic Sites and Monument Board of Canada (HSMBC). The Hamlet Bridges themselves are extremely rare examples of their types in Ontario and contribute to the heritage value of the waterway (HistoricBridges.org 2018).

According to a statement from Cultural Resource Management (CRM), the bridge mechanism has a heritage value. The original swing bridge mechanism was hand cranked and converted to the current electrical and hydraulic operation system in the mid-sixties. The replacement of the mechanical system will remain similar to the existing with the upgrade (Parsons 2017g).

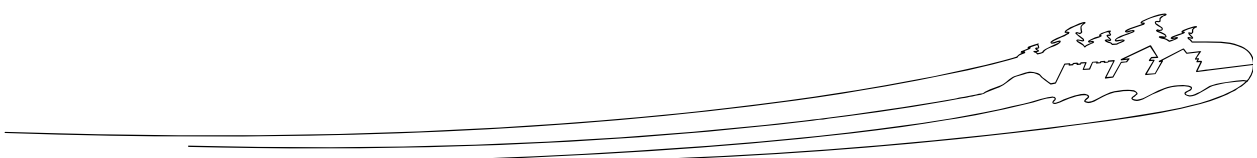
5.6.7.2 Archaeological Significance

The importance of the Trent-Severn Waterway transportation and migration route is made known through the numerous archaeological sites found throughout the area. The lower Trent Valley is one of the most intensely studied regions in southern Ontario. Middle Woodland burial mounds and those at Serpent Mounds Provincial Park on Rice Lake drew the attention of researchers at an early date and provide archaeological evidence of the areas early significance. These archaeological investigations at Rice Lake continued into the 1960s and 1970s and contributed to a great wealth of knowledge related to the reconstruction of the pre-contact period in southern Ontario. Through the findings, all major periods of occupation were represented (CAGI 2013).

Consultation with PCA has confirmed that there are no cultural or archaeological resources expected to be present at the Project site (PCA, personal communication, February 21, 2018). As such, evaluations / investigations will not be required for the Project.

5.6.7.3 Recreational Use / Navigation

The Trent-Severn Waterway navigation season typically starts Victoria Day weekend and ends Thanksgiving weekend. During this time, local residents and visitors use the waterway for recreational boating, swimming, fishing, and many other water-based activities. In 2018, the navigation season is May 18 through October 8. The hours of operation for the Trent-Severn Waterway during the navigation





season change throughout the year and can be viewed on PCA's website (www.pc.gc.ca) by searching "hours of operation".

5.6.7.4 Current Land Use and Ownership

Immediately adjacent to the Trent-Severn Waterway, lands are owned by PCA. However, this federal land is typically narrow and in the vicinity of the Hamlet Bridges, there are also private residences located off Peninsula Point Road and Canning Road on the north side of the Hamlet Bridges adjacent to the federal lands where staging areas may be located. Use of any lands beyond the federally-owned right-of-way will require written consent from the potentially affected private landowner(s) and consultation with the MNRF in the case of observations of provincial SAR. The Contractor will be responsible for making these arrangements and ensuring that all rules are adhered to and permits are acquired, as applicable.

6.0 VALUED COMPONENTS LIKELY TO BE AFFECTED

A Valued Component (VC) is an element of the environment that has scientific, economic, social, or cultural significance. The selection of VCs to be included in the effects assessment are those in the vicinity of the Hamlet Bridges and considered to be important by PCA, stakeholders (e.g. conservation groups, recreational public, etc.), regulatory agencies, and/or First Nations involved in consultation and the assessment process.

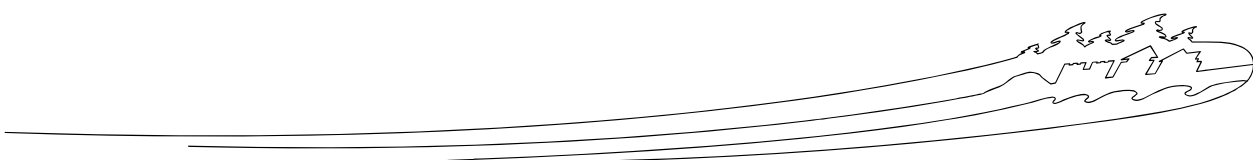
For the Hamlet Bridges Project, the applicable VCs include:

- Air quality;
- Noise exposure;
- Soils and geology;
- Surface water quality;
- Fisheries and aquatic habitat;
- Terrestrial flora, fauna, and habitat;
- SAR and SAR habitat;
- Recreational use (visitor experience) / navigation; and
- Traffic.

Potential effects of Project-environment interactions are discussed in Section 7.0 below. The determination of residual environmental effects after mitigation and the significance of those effects are discussed in Section 10.0.

7.0 EFFECTS ANALYSIS

This effects analysis was conducted to identify potential Project-related adverse effects to the natural and human environments and to provide potential mitigative strategies to avoid and/or reduce those effects. A description of Project-related effects to the above VCs is provided below for the removal / rehabilitation of the existing bridges and associated structures (e.g., abutments, approaches, and control building), construction of the new bridges and associated structures, and future decommissioning of the Hamlet Bridges. Potential interactions between the Project and the surrounding environment are





identified in the Effects Identification Matrices; VCs that may be directly affected by Project activities are identified in Appendix E and potential impacts that could indirectly affect natural resources are identified in Appendix F. Effects related to routine operations and maintenance of the bridge will be assessed under PCA's Best Management Practices and as such, are outside the scope of this BIA.

7.1 Air Quality

Project construction activities may result in short-term, localized increases in fugitive dust from non-combustion sources, and exhaust emissions from construction vehicles and stationary sources. Mitigation measures aimed at dust suppression, and proper equipment use and maintenance will be implemented to mitigate potential adverse effects to air quality. These mitigation measures are indicated in Section 8.2 below and will be described in greater detail, as required, in the Project Environmental Management Plan (EMP).

Prior to decommissioning of the bridge(s), it is recommended that the potential for effects to air quality be assessed based on the Project plan and any necessary mitigation measures, beyond those detailed in Section 8.2 below, be determined at that time.

7.2 Noise Exposure

Noise level increases are expected during Project activities. These increases are anticipated to be short-term, localized, and associated with the use of various heavy construction machinery and associated work activities. The Contractor will be expected to control noise by the proper use and maintenance of all construction machinery. Noise control mitigation measures are indicated in Section 8.3 below and will be described in greater detail, as required, in the Project EMP.

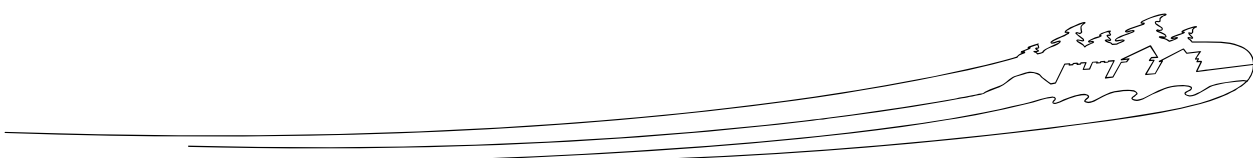
Prior to decommissioning of the bridge(s), it is recommended that the potential for noise level increases be assessed based on the Project plan and any necessary mitigation measures, beyond those detailed in Section 8.3 below, be determined at that time.

7.3 Soils and Geology

As a component of Project activities, grading and soil disturbance will be necessary to allow access to staging and laydown areas and completion of proposed approach road works. Use of heavy machinery will also result in soil compaction which could have longer-term effects on vegetation growth; however, use of heavy machinery will be restricted to pre-determined access routes as detailed in the EMP. Over the course of the Project, temporary stockpiles of stripped topsoil and/or aggregates may be stored on site for use during site restoration after construction. Mitigation measures to maintain soil quality are included in Section 8.4.

Erosion and sediment control mitigation measures are indicated in Section 8.7 below and will be described in greater detail, as required, in the Project EMP. At a minimum, silt fencing will be installed on the down-gradient side of the Project site and around all soil stockpiles. Surveillance measures (as detailed in Section 8.20) will ensure ESC measures remain effective while they are in place.

Following the completion of the Project, all materials and facilities will be removed from the site and the land will be restored to pre-construction grade and revegetated. ESC measures will remain in place until the restored Project site has stabilized (i.e., vegetation has established) and there is no longer a risk of





erosion into receiving environments. No notable changes to soil type and/or drainage are expected as a result of construction or site restoration works.

Prior to decommissioning of the bridge(s), it is recommended that the potential for soil disturbance be assessed based on the Project plan and any necessary mitigation measures, beyond those detailed in Section 8.4 and 8.7 below, be determined at that time.

7.4 Surface Water Quality

Project construction activities may result in accidental inputs of contaminants into the Upper Severn River from a number of sources, including gasoline, soils/sediment, road construction materials, debris from the bridge and supporting structures (e.g. lead-based paint, concrete residue, and concrete chipping), and various chemicals and compounds, or other hazardous materials. Due to the close proximity of work activities to water, protection of surface water quality is of utmost importance. Application of mitigation measures included in Section 8.5 will be necessary to prevent potential adverse effects to surface water quality.

As baseline water quality data was not collected as a component of the Project's background investigations, it is recommended that parameters such as pH, dissolved oxygen, total suspended solids, conductivity, and water temperature be collected over a number of days prior to the commencement of the Project activities. These parameters should be monitored regularly over the course of the Project to identify and address any resulting impacts to water quality.

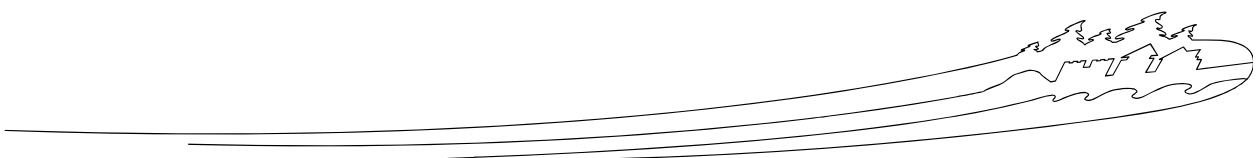
Specifically associated with concrete work, the following is a list of potential issues:

- The drilling through masonry and concrete, stone rubbles, and bedrock will generate dust and drilling slurry and potential sediment (until the casing gets socketed into the bedrock). In particular, while the casings are being installed/driven through the stone rubbles or from drilling slurry leakage/escape.
- Grout slurry spillage while mixing and/or placement in the casing.
- Grout leakage at the casing socket into the bedrock (PSPC 2017).

Surface water quality will primarily be protected by three means:

1. Installation of adequate ESC measures (i.e., measures able to contain sediment with clay components) as detailed in the EMP to prevent runoff and sedimentation;
2. Installation of cofferdams and turbidity curtains around in-water work areas (with more advanced sediment traps and methods to monitor and control pH levels, as needed); and
3. Installation of a containment system designed to confine and capture any material and/or debris (e.g., asphalt, rust, grease, paint flakes, etc.) resulting from existing bridge deconstruction and new bridge construction activities that could potentially enter the water and/or surrounding environment.

These mitigation measures will be installed prior to the start of construction works and will be maintained through the construction period or until a time they are no longer required to mitigate potential impacts.





Disposal of the bridge structure and all associated components will be completed in accordance with applicable laws and regulations. Analysis of the potential effects of water contamination are discussed in further detail with respect to fisheries and aquatic resources in Section 7.5.

Prior to decommissioning of the bridge(s), it is recommended that the potential for effects to surface water quality be assessed based on the Project plan and any necessary mitigation measures, beyond those detailed in Section 8.5 below, be determined at that time.

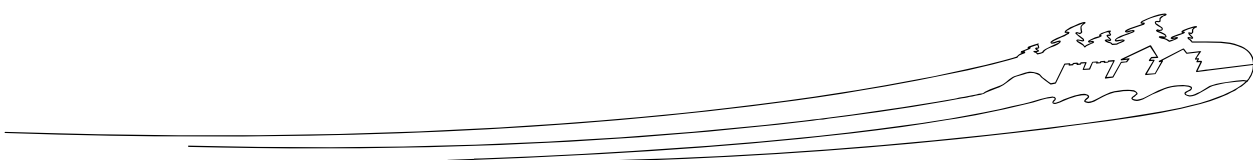
7.5 Fisheries and Aquatic Resources

The Upper Severn River is a fish-bearing watercourse, as detailed in Section 5.6.3. The Project's design and construction is not anticipated to result in permanent loss of significant fish habitat. There will be no new bridge structures or additional materials constructed/placed within/on the bed of the Upper Severn River (with the exception of a rock berm at the base of the piers to replace the existing grout bags) and there will be minimal removal of riparian vegetation. However, bridge and pier rehabilitation/replacement may result in temporary impacts to fish and other aquatic organisms resulting from in-water and/or near-water works. Specifically, concrete works incur risk of an accidental spill or release of concrete and/or concrete wastewater and removal of the existing bridge structures incurs risk of inputs of other deleterious substances into the aquatic environment. With respect to construction activities on shore, potential temporary impacts may result from accidental spills of fuels, hydraulic fluid, lubricants, and/or release of other deleterious substances (e.g., sediment) into the aquatic environment.

To mitigate potential temporary impacts to fish and fish habitat, **all in-water works** will be scheduled outside of the warmwater fisheries timing window, as identified by MNRF (i.e., all in-water works will be conducted June 1 through March 14; therefore, no in-water work will be allowed March 15 through May 31). PCA also requires that **all near-water works** be conducted within the applicable in-water construction timing window (PCA 2017b). Adherence to this construction window will mitigate potential impacts to the life processes of resident species, including Walleye which typically migrate through the system between April 1 and May 31 (PCA, personal communication, February 21, 2018). The in-water work area will be isolated from the open watercourse and all repair/construction work below the ordinary high water mark will be conducted in-the-dry through the installation of sheet pile cofferdams, surrounded by turbidity curtains, and localized dewatering (PCA, personal communication, February 21, 2018) as indicated in the design drawings (Parsons 2018a). Construction in this manner will allow maintenance of fish passage through the waterway at all times and will reduce impacts to fisheries and aquatic resources.

Only clean materials, free of particulate matter should be used to isolate the work area. All temporary containment areas should be stabilized against the impacts of high flow (Parsons 2017a). In all areas where full or partial dewatering is required, fish salvages will be conducted. Salvage will be done ahead of construction by a qualified professional, under applicable permit(s), to reduce the potential for stranding of fish and other aquatic/semi-aquatic organisms. Fish salvage efforts may use multiple gear types including seine nets, gill nets, minnow traps, and/or an electroshocking unit to maximize salvage success.

The primary impact associated with removing the grout bags from around the base of the rest piers and the east pier is sedimentation within the surrounding watercourse (Parsons 2017a). Suspension of





sediments in a waterbody is detrimental to fish and fish habitat in many ways, for example it can: increase stream turbidity, abrade fish gill membranes (leading to physical stress), cover spawning areas, decrease food production, and smother incubating juvenile fish.

Removal of any in-water structure, such as grout bags and the east pier, has the potential to alter the existing fish habitat by changing: the flow regime, channel morphology/hydraulics/stability, and substrate (Parsons 2017a). Construction of the new east pier has the potential to alter the existing fish habitats by: constricting flow, changing channel morphology, changing the substrate and aquatic macrophyte compositions (Parsons 2017a). However, these effects are expected to be minimized by the short timeline in which the watercourse will not have an east pier and the expectation that the replacement pier will be similar in terms of size, shape, footprint, and materials. Should the new pier require a larger footprint, that would be considered a loss of fish habitat and the Project may become subject to DFO review (Parsons 2017a).

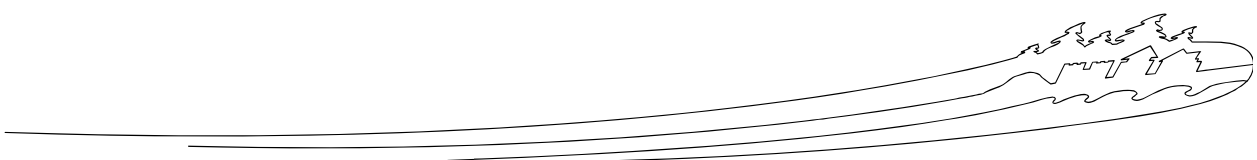
Construction of a new east pier and repairs to the pivot pier and rest piers will require the use/pouring/pumping of concrete. Raw or uncured concrete is toxic to aquatic organisms. Additionally, due to industrial equipment operating in and accessing the watercourse, there may also be mechanical risks of direct fish impingement/injury (Parsons 2017a).

Concrete and concrete leachate is alkaline and known to be toxic to fish and other aquatic life. Works that involve the use of concrete, cement, mortars, or other lime-containing materials will be managed so that sediments, debris, and fines will not be released to the aquatic environment. Containment and isolation of Project works and concrete affected water, and proper disposal of affected wash/waste water will mitigate the risk of accidental spills or releases into receiving environments. In addition, suitable measures to confine or capture other potentially deleterious materials (i.e. paint flakes, treated wood, rust, grease, etc.) that could become detached and enter the water and adjacent work areas during bridge removal will be implemented. A containment system and adherence to good housekeeping procedures and provincial and federal guidelines for working near water will serve to prevent potential adverse impacts to fisheries and aquatic resources.

To prevent potential adverse effects to the aquatic environment from on-shore works, staging areas will be selected to minimize disturbance to the natural landscape and will be setback from the water's edge to the maximum extent feasible. Equipment and materials will be on site on an as-needed basis to minimize risk of accidental spills or leaks and ESC measures will be in place prior to ground disturbance and until the restored Project site has stabilized (i.e. vegetation has established).

Mitigation measures for the protection of fisheries and aquatic resources are provided below in Section 8.0 and will be described in greater detail, as required, in the Project EMP.

Bridge decommissioning will have the potential to impact fisheries and aquatic resources in the same way the proposed rehabilitation/replacement works do. As such, all details above are expected to be relevant for the decommissioning process; however, prior to decommissioning of the bridge(s), it is recommended that the potential for effects to fisheries and aquatic resources be assessed based on the Project plan and any necessary mitigation measures, beyond those detailed in Section 8.0 below, be determined at that time.





7.6 Terrestrial Flora, Fauna, and Habitat

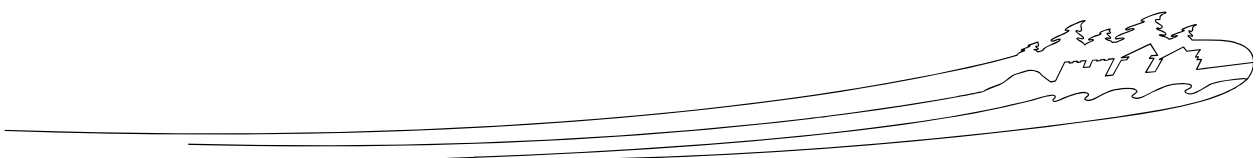
Project activities will result in the temporary disturbance of the maintained lawn area immediately adjacent to the Upper Severn River and the permanent removal of vegetation including a number of trees. Installation of construction-related facilities and staging areas (i.e., site trailer, equipment storage etc.) will result in temporary impacts to the terrestrial environment. Locations for these activities will be selected to minimize disturbance to the natural landscape by utilizing existing disturbed areas, to the extent feasible. Impacts to terrestrial flora, fauna, and habitat beyond those identified in the 99% design drawings have not been assessed. In the case that additional impacts are necessary, it is the responsibility of the Contractor to apply appropriate mitigation measures and ensure adherence to applicable legislation.

All areas disturbed by construction activities will be reinstated to pre-construction or better conditions. As the terrestrial environment at the Project site is comprised primarily of maintained landscape, with some trees, it is considered to be of low habitat sensitivity. Wildlife expected to use the area are common and transient species, with the exception of turtle species which may use the river banks and shore for nesting. With the application of suitable mitigation measures, the temporary disturbance of the habitat is not expected to result in adverse effects on local fauna or their passage around the Project site.

PCA has specified that the Contractor is to work with a conservation landscape architect to minimize the potential negative impacts on the adjacent surrounding (PCA 2017a). As Project activities require the removal and possible pruning of trees, a tree survey will be conducted by a qualified professional to identify the location, number and species that will be impacted. Based on the results of this survey, a Tree Protection and Replacement Plan will be prepared for construction. Furthermore, removal and pruning of trees will be conducted outside the regional migratory bird breeding season (April 1 through August 28) (ECCC 2017) in compliance with the *Migratory Birds Convention Act*. It is not anticipated that the removal and pruning of a select number of trees will have significant impacts on local fauna, nesting habitat, or migratory stopover habitat for birds of the region.

Certain birds protected under the *Migratory Bird Convention Act, 1994* (MBCA), such as Barn Swallow, Cliff Swallow, and/or Eastern Phoebe, could potentially utilize the existing bridge structure and/or the control house for nesting. Inspection of the Hamlet Bridges and control house on May 13, 2016 did not reveal recent evidence of nesting; however, several active Common Grackle nests were observed on the support beams at the top of Hamlet Bridges. However, Common Grackles are not protected under the MBCA or the provincial *Fish and Wildlife Conservation Act, 1997* (FWCA). At the time of the investigation, the underside of the bridge could not be thoroughly inspected from the shore; furthermore, protected species may have nested at the site since the 2016 inspection. The need for mitigation for the potential loss or alteration of nesting habitat will be determined by PCA, through consultation with Environment and Climate Change Canada (ECCC) and/or MNRF, as necessary.

For an effects analysis specific to Barn Swallow (federally-Threatened), refer to Section 7.7.





7.7 Species at Risk

Construction activities are not expected to result in direct impacts to SAR or SAR habitat, with the potential exception of Barn Swallow. Although evidence of Barn Swallows nesting at the site were not reported during the 2016 investigation, construction work on the bridges during the breeding bird season may impact the ability of this species to nest on site. Furthermore, the removal of one or both of the bridges and lack of nesting habitat during breeding season may impact the species.

To ensure compliance with SARA, field confirmation of Barn Swallow nesting should be conducted during the construction stage of the Project and a written record of the findings (with photos, if nests or remnants of nests are observed) should be provided to PCA. In the case that evidence of Barn Swallows nesting under the bridge is found, PCA's process to meet SARA requirements will be followed. This will include completion of PCA's *SARA-Compliant Authorization Decision Tool* (as mentioned in Section 15.1) and provision of recommendations for compensation (PCA, personal communication, May 30, 2018).

Prior to decommissioning of the bridge(s), consideration must be given to the loss of potential Barn Swallow habitat and nest surveys must be conducted by a qualified biologist if decommissioning is to occur during the regional breeding bird season (April 1 through August 28) (ECCC 2017). Furthermore, from the time of Project completion to the time of decommissioning, there is potential for additional species present to have been federally- and/or provincially-listed as "at risk". Consultation with PCA, ECCC, and/or MNRF shall be conducted, as necessary, to ensure compliance with applicable SAR legislation.

The need for mitigation for the potential loss or alteration of nesting habitat will be determined by PCA, through consultation with ECCC and/or MNRF, as necessary. See Section 8.18 for further details regarding mitigation measures for the removal of Barn Swallow habitat.

The use of exclusion fencing, as recommended by MNRF's *Species at Risk Branch Best Practices Technical Note: Reptile and Amphibian Exclusion Fencing* (Appendix H) and detailed in the Project-specific EMP, is expected to ensure the protection of turtle SAR that may otherwise be present on site. As the placement of temporary sheet pile cofferdams is expected to occur prior to the turtle overwintering period, impacts to any hibernating SAR turtles are not anticipated.

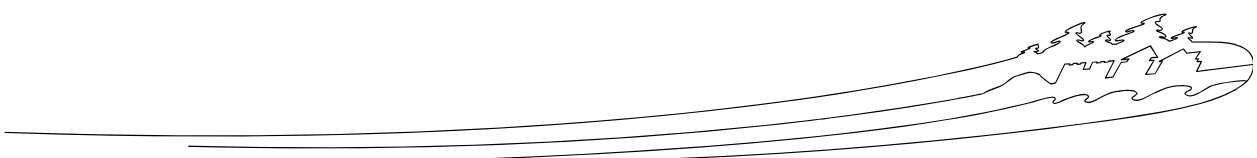
7.8 Environmentally Significant Areas

With the implementation of the mitigation measures identified herein, Project activities are not expected to have impacts on the Sparrow Lake or Grass Lake environmentally sensitive areas or the unevaluated wetlands in the area.

7.9 Human Environment

7.9.1 Recreational Use / Navigation

The Trent-Severn Waterway navigation season typically starts Victoria Day weekend and ends Thanksgiving weekend. The navigation season for 2018 and 2019 is May 18 through October 8 and May 17 through October 14, respectively. Project works have been scheduled and phased to avoid impacts to recreational use of the waterway including any interruption of in-water navigation. The earliest start of work affecting cessation of vehicular and, at most, intermittent interruption of marine traffic will be Fall





2018 and the planned completion is no later than October 2019. Adherence to this Project schedule and allowance for marine traffic through the site for the duration of the Project will mitigate any potential adverse effects to recreational use and navigation through the Trent-Severn Waterway.

At the time of decommissioning of the bridge(s), the Project plan and schedule should be considered with respect to the current year's navigation season to avoid or minimize interruption of recreational use and navigation through the waterway.

7.9.2 Traffic

Over the duration of the Project vehicular and pedestrian passage over the Trent-Severn Waterway will not be possible at the Hamlet Bridges site. A detour will be in place directing the public to the nearest crossing at Highway 11. A Traffic Control Plan, with appropriate signage, will be in place to ensure the safety of the public and on-site workers. The Project plan does not accommodate pedestrian traffic over the bridges.

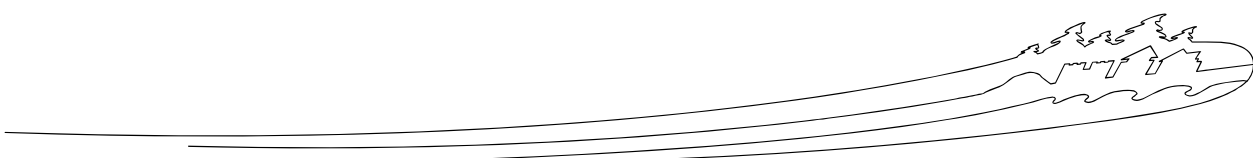
At the time of decommissioning of the bridge(s), the Project plan and schedule should be considered to determine if it is feasible to accommodate traffic while the Project is being undertaken.

8.0 MITIGATION MEASURES

A number of measures will be implemented to mitigate the likelihood and significance of potential adverse environmental effects associated with Project works. Further, the Contractor will be required to prepare an EMP and retain a qualified environmental monitor to conduct routine and/or periodic inspections of the effectiveness of the mitigation measures (details included in Section 11.0). During routine operations, PCA will implement their Best Management Practices and safe operating procedures to ensure compliance with applicable legislation, regulatory guidelines, and professional codes and standards.

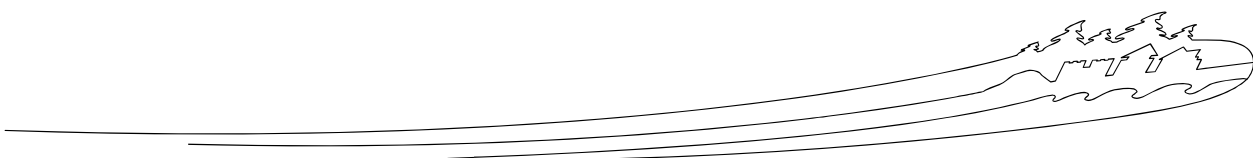
8.1 General Construction

1. Project commencement only upon submission and PCA acceptance of an EMP that outlines all the measures to be implemented by the Contractor on the Project site to eliminate or reduce environmental effects.
2. A copy of the EMP shall be kept on site for the duration of the Project and all works, as applicable, shall be completed in compliance with the EMP.
3. In preparing Project Specifications the Consultant shall use the current edition of the Canadian National Master Construction Specification (NMS) in accordance with the *NMS User's Guide* (NRC 1999).
4. All mitigation measures shall be implemented to the satisfaction of PCA.
5. Inform the Environmental Officer, Trent-Severn Waterway, of any changes to Project plans and/or scheduling. Any changes not assessed under this Basic Impact Analysis will require approval from PCA and may require further mitigation measures.
6. The PCA Environmental Officer, Trent-Severn Waterway will outline all the following mitigation measures in a construction start-up meeting with the Contractor, to ensure awareness and understanding of these measures.





7. Ensure that all on-site personnel are aware of, and comply with, these mitigation measures.
8. Mandatory submission – and acceptance by PCA – of an Erosion and Sediment Control Plan, as stand-alone or part of the EMP, demonstrating:
 - a) The area to be controlled. In addition to the construction site, it is necessary to identify adjacent areas that could be negatively impacted by construction activities;
 - b) Drainage areas and patterns based on pre-construction topography and construction design;
 - c) Design specification to address the specific soil and sediment types that are expected to be present;
 - d) How sediment-laden run-off will be directed to detention or retention facilities on site. Large drainage areas can produce a significant amount of run-off, resulting in a need for large detention or retention structures;
 - e) How clean storm run-on will be diverted around the site and away from exposed areas;
 - f) Channels that are designed and constructed to the necessary design discharge;
 - g) Temporary and permanent erosion control needs for all drainage channels;
 - h) Consideration of Project schedule in selecting, designing and laying out environmental controls; and
 - i) Consideration of seasonal requirements (for longer-term projects); select and design controls and practices for controlling erosion and sedimentation including shutdown periods.
9. The Contractor shall adhere to all federal, provincial, and municipal legislation, by-laws, regulations, guidelines, safety standards, and codes governing construction activities. In cases of overlap, the most stringent will apply, unless otherwise specified by PCA.
10. The Contractor shall obtain all permits, licenses, and approvals required to construct and operate the swing bridge.
11. The work area shall be left clean at the end of each day.
12. Only those cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, shall be used adjacent to water courses or ground water.
13. Any new, or potentially questionable, cleaning products shall be approved by PCA.
14. The existing Brighton Bridge is posted with a maximum 9 tonne limit. The Contractor must observe this posting at all times during construction.
15. Navigation shall not be impeded during the navigation season.
16. The existing Bridge Operators House is not available for use for storage or staging, by the Contractor, at any time during this Contract.
17. For the duration of the Project, protect the surrounding environment and properties, the public, vehicular and pedestrian traffic in a manner acceptable to the Departmental Representative's satisfaction at each stage of the work.





18. Upon completion, all surplus materials, rubbish, tools and equipment shall be removed from the site.
19. All personnel on site shall receive a safety briefing and review the Site-Specific Health and Safety Plan which identifies potential hazards and safe workplace practices. This Site-Specific Health and Safety Plan shall meet the requirements outlined in Section 01 35 29 of the Contract Specifications and shall be enforced through all phases of the Project and revised as needed.
20. Temporary fencing, where practical, shall secure the immediate work site during construction.

8.2 Air Quality

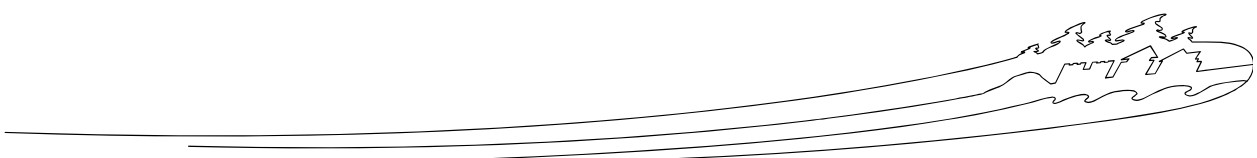
21. Work shall be carried out in compliance with the *Environmental Protection Act, 1990* and applicable air emission regulations and by-laws.
22. Provisions to assure that dust, debris, materials, and trash are contained on the Project site are detailed in the Air Pollution Control Plan, included as a component of the EMP, and shall be adhered to.
23. Do not burn waste materials on site.
24. Releases of dust shall be suppressed using water mist or other appropriate methods of control during construction. Calcium chloride shall not be used as a dust suppressant due to the proximity of the work site to water.
25. Emissions from equipment/machinery shall be controlled in accordance with local authorities' emission requirements.
26. All on-site vehicles are expected to have a Drive Clean Emissions Report in compliance with Ontario Regulation 361/98: Motor Vehicles under the *Environmental Protection Act*, R.S.O. 1990, c. E.19. Environmental Assessment Officers may stop a vehicle if they believe the vehicle is emitting excessive exhaust smoke or suspect that emission control equipment has been tampered with or removed.
27. Machinery shall be left running only while in use, with the exception of during extreme temperatures which prohibit shutting machinery down.
28. Waste and debris shall be transported from site in a fashion that limits the loss of soils and dust.

8.3 Noise Exposure

29. Local residents shall be informed in advance of potential disruption from noisy activities.
30. Minimize the noise levels from construction activities by using proper muffling devices, in addition to appropriate timing and location of these activities to reduce or minimize the effects of noise on nearby residents, recreationists, and wildlife.
31. Contractors should avoid excess and unnecessary noise.
32. Monitor and mitigate public complaints by keeping a record of complaints and addressing any issues raised by the public.

8.4 Soil Quality

33. Strip topsoil and dispose of surplus off site.

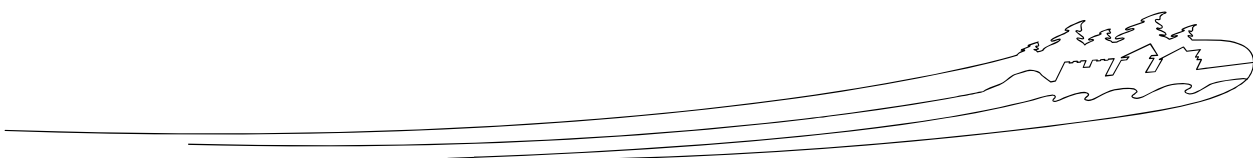




34. Do not mix topsoil with subsoil.
35. Protect fill materials from contamination.
36. If soil stockpiles are present in spring, temporary reptile fencing, such as polythene/woven geotextile secured with timber stakes, or material of a similar nature/function, shall be installed completely around gravel stockpiles and exposed soils to prevent turtle nesting in the Project area.
37. Cleared and grubbed material shall be stockpiled in separate locations from growing medium stockpiles. Where noxious or undesirable weeds are found on site, grubbed materials shall not be used as a constituent of, or as a growing medium (PCA 2017b).
38. Soil stockpiles shall be inspected monthly for growth of noxious or invasive species (PCA 2017b). If invasive plant species are found in stockpiles, soil shall be disposed of and not reused.

8.5 Surface Water Quality

39. Clean storm run-on shall be diverted around the site and away from exposed areas as detailed in the EMP;
40. Do not obstruct flow of surface drainage or natural watercourses.
41. At a minimum, surface water quality shall be protected through the implementation of an Erosion and Sediment Control Plan, included as a component of the EMP.
42. Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life will form the baseline for water and streambed quality monitoring and assessment, e.g., total particulate matter for suspended solids in the water.
43. At any discharge point from the Project site into the watercourse, a Maximum increase of 8 NTU from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTU from background levels for a longer-term exposure (e.g., >24 h period). If elevated turbidity beyond 8 NTU from background levels is observed during in-water activity, PCA will assess potential impact to the aquatic environment. Additional mitigation measures may be required.
44. At any discharge point from the Project site into the watercourse, a Maximum increase of suspended sediment concentrations by more than 25 mg/L over background levels during any short-term exposure period (e.g., 24-h). For longer term exposure (e.g., > 24 h), average suspended sediment concentrations shall not be increased by more than 5 mg/L over background levels. If elevated turbidity beyond 25 mg/L from background levels is observed during in-water activity, PCA will assess potential impact to the aquatic environment. Additional mitigation measures may be required.
45. At any discharge point from the Project site into the watercourse, pH will be maintained between 6.5 and 9.0. Water with pH > 9 cannot be released directly back into the watercourse, but must be treated prior to release. Water with a pH \geq 12.5 is considered toxic and treated as a hazardous waste under Ontario Regulation 347 of the *Environmental Protection Act* and wastewater in this condition must be removed from the site.



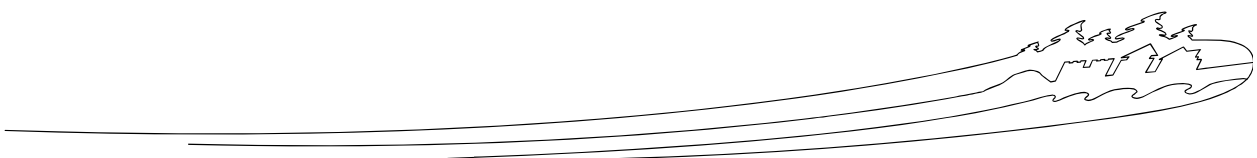


8.6 Site Access, Staging, and Storage

46. To the extent possible, existing access routes shall be used to minimize impacts to vegetation. Removal of habitat within the adjacent forest community shall not be undertaken to facilitate staging or storage.
47. Areas for staging or storage shall be identified in the Contractor's EMP.
48. The NMS Section 31 11 00 – Clearing and Grubbing, and OPSS 201 Guideline for "Clearing, Close Cut Clearing, Grubbing, Removal of Boulders and Mechanical Stump Cutting", shall be adhered to during clearing and grubbing operations unless specified otherwise in the Historic Canals Regulations permit (PCA 2017b).
49. As necessary, and approved by the Departmental Representative and PCA environmental authority, install gravel or a stabilized construction entrance to prevent tracking of dirt/mud. Clean roads as necessary.
50. Tree pruning/removal shall be conducted by an experienced professional and approved by PCA prior to commencement.
51. Any individual trees slated for pruning/removal shall be appropriately marked.
52. Trees and shrubs removed from work areas during vegetation clearing activities shall be shredded and used as mulch on newly exposed surfaces. Mulch will be weed-free to prevent the introduction of invasive species (PCA 2017b).
53. Land disturbance shall be minimized by clearly demarcating the construction envelope.
54. Staging areas shall be set aside for the storage of all deleterious substances, materials, and equipment, and shall be set-back at the maximum available on-site distance from the water's edge (recommended 30 m minimum) on impermeable pads/pans designed to allow full containment of spills.
55. All hazardous materials (e.g., oils, lubricants, fuels, paints, solvents, paint thinners, etc.) shall be securely locked-up to avoid vandalism and accidental spills.
56. Deliver, store, and handle materials in accordance with the manufacturer's written instructions and the Common Product Requirements.
57. Materials should be stored in a dry location that is clean, dry, and well-ventilated.
58. Replace defective or damaged materials with new.
59. Aggregates shall be stockpiled on level and well-drained areas, stabilized and cover by tarpaulins when not in use, and shall not be placed on completed pavement surfaces.
60. Staging areas should be set back from the river banks to avoid impacts to potential turtle nesting/basking habitat.

8.7 Erosion and Sediment Control (ESC)

61. A site-specific ESC Plan shall be prepared by the Contractor in accordance with the NMS, as applicable, as a component of the EMP.

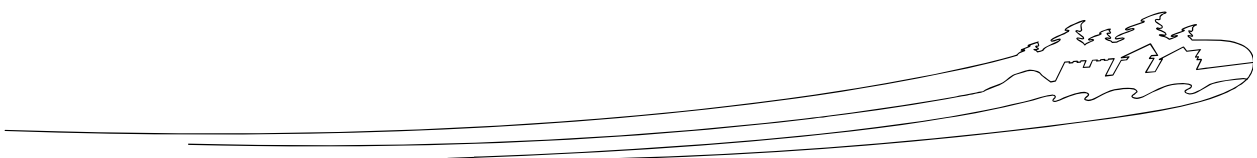




62. ESC measures shall be implemented prior to work and maintained during the work phase, to prevent entry of sediment into the water where site access or other activities cause exposed soil.
63. Any temporarily stockpiled material, construction or related materials will be properly contained (perimeter control) in areas separated a minimum of 30 meters from any waterbody (if possible). If materials stockpiles are necessary within 30 meters of a waterbody, the Contractor shall describe relevant surface water protection, ESC measures as part of its EMP. The EMP shall consider alternative stockpile locations on-site and off-site (PCA 2017b).
64. All excavated materials and debris shall be removed and deposited in an area above the high water mark of the shoreline and be contained behind properly installed and maintained sediment barriers or devices to prevent erosion and subsequent entry into the water body OR removed from the site, in accordance with all federal, municipal and provincial regulations (PCA 2017b).
65. All ESC measures shall be inspected daily to ensure they are functioning properly and are maintained and/or upgraded as required to prevent entry of sediment into the water (see Section 11.0).
66. If ESC measures are not functioning properly, no further work shall occur until the sediment and/or erosion problem is addressed to the satisfaction of PCA.
67. To the extent feasible, construction shall be undertaken during normal weather conditions, and the ESC Plan shall be designed to appropriate specifications to withstand variable weather conditions.
68. Environmental protection measures shall be checked after each extreme weather event.
69. Undertake earthworks using construction techniques designed to prevent sedimentation.
70. ESC measures shall be left in place until all areas of the work site have been stabilized; once the site has stabilized, remove all non-biodegradable ESC materials.

8.8 Structure Removal and Management of Designated Substances, Hazardous Materials, and Other Waste

71. Maintain work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
72. Construction waste management and disposal shall be conducted in accordance with the Project Waste Management Plan, which highlights recycling and salvage requirements.
73. The Contaminant Prevention Plan, included as a component of the EMP, shall identify potentially hazardous substances to be used on the job site; intended actions to prevent introduction of such materials into the air, water, or soil; and provisions for compliance with applicable laws and regulations for storage and handling of these materials.
74. Any hazardous substances, if required, shall be stored (on impermeable pads a minimum of 30 m from the water), handled, and used in accordance with local regulations and in a manner which prevents release into the environment.
75. Hazardous materials disposal containers and Personal Protective Equipment (PPE) shall be provided, as required, for the handling of such materials.

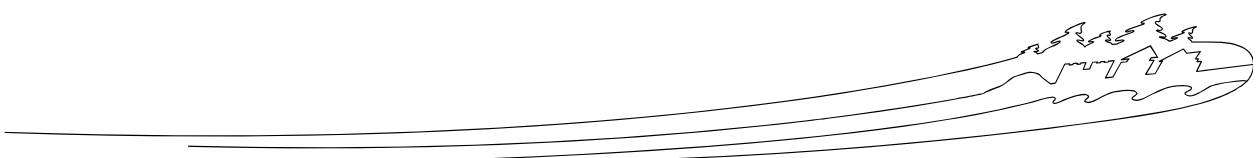




76. Hazardous materials shall be appropriately disposed of at a licensed facility that accepts this class of waste; all applicable federal, provincial, and municipal laws, regulations, and guidelines shall be strictly adhered to.
77. All lead-based paint shall be managed in accordance with Ontario Regulation 490/09.
78. An adequate containment system shall be placed below the swing bridge and inspected daily to effectively confine and capture any debris that could potentially become detached during the removal and replacement of the swing bridge superstructure, or any of its component parts, including the asphalt wearing surface and nail-laminated timber deck.
79. All debris collected within the containment system shall be carefully emptied into an enclosed container daily, or more frequently if required, to ensure that no paint chips or debris escape into the surrounding environment, or remain at the site. All paint chips and debris shall be recovered, collected, and taken to a landfill site licensed to receive it for disposal in accordance with all applicable federal, provincial, and municipal laws, regulations, and guidelines.
80. All chemicals and compounds used for this Project shall be utilized according to the appropriate Product Technical Data Sheet, stating guidelines and methods for proper use, and provided by the manufacturer of the product.
81. The Non-Hazardous Solid Waste Disposal Plan, included as a component of the EMP, shall be implemented for all construction phases such that discarded materials shall be separated, recycled, re-used, or disposed of, as appropriate, in a landfill licensed to accept the class of waste; all applicable federal, provincial, and municipal laws, regulations, and guidelines shall be strictly adhered to.
82. The Waste Water Management Plan, included as a component of the EMP, shall identify methods and procedures for management and discharge of waste waters.
83. Do not dispose of unused preservative material into sewer system, into waterbodies, onto the ground, or in any other location where they will pose a health or environmental hazard.

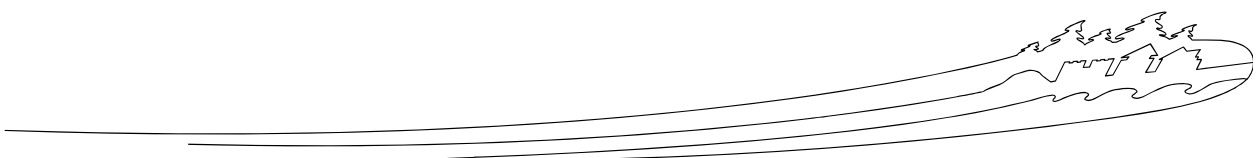
8.9 Concrete Repairs

84. An adequate containment system (e.g., tarpaulins, plywood, or other type of protective shrouding) shall be installed to receive any debris produced by sawing, chipping, etc.
85. Concrete debris leaving the site shall be placed in an enclosed container daily, or more frequently if required, to ensure that no concrete debris escapes into the surrounding environment, or remains at the site.
86. Maintain alkalinity and pH between 6.5 and 9.0. Water with pH greater than baseline conditions cannot be released directly back into the watercourse. Substances with a pH ≥ 12.5 are corrosive and considered a hazardous waste under Ontario Regulation 347 of the *Environmental Protection Act* and wastewater in this condition must be either removed from site or treated before it is released.
 - a) For underwater pouring:
 - Ensure forms are tight and no flow is occurring;
 - Isolate area with curtain or impermeable material specified for concrete particulates;





- Ensure that fish exclusion procedures are followed and fish are not trapped within the turbidity curtain during placement;
 - Isolated area should be the minimum size required to complete task;
 - Turbidity curtain shall be left in place until the pH is less than or equal to baseline conditions.
 - For tremie pours, CO₂ system must be installed and operating along the entire length of the isolated area; the tank shall be used to release carbon dioxide gas into an affected area to neutralize pH levels. Ensure sufficiently sized tanks for the concrete volumes used;
 - Workers shall be trained in the use of the system;
 - Use of neutralizing acids is not permitted;
 - pH monitoring conducted inside and outside the containment area;
 - Use Anti-washout Admixture to decrease the percentage of concrete fines released to the water column;
 - Use grout bags where possible to further contain the concrete; and
 - Stop placement of concrete if fish kill is observed and contact the Environmental Assessment Officer.
87. Filter material will consider the grain size characteristics of the concrete sediment and shall be designed around the principals of maintaining sufficient hydraulic flow and prevention of particle movement through the material;
 88. Use sealers, form release and stripping agents that are non-toxic, biodegradable, and have zero or low volatile organic compounds (VOCs). Maximum VOC level to be 250 grams per litre (g/L) based on Environmental Protection Agency (EPA) test method 24 and biodegradability as described by EPA as having a half-life of 28 days or less based on ASTM D5684/OECD 301B.
 89. The specified concrete work shall be carefully coordinated with weather conditions.
 90. Surrounding water shall be isolated for the duration of all works involving the use of concrete, cement, mortars, and/or other Portland cement or lime-containing construction.
 91. Appropriate measures shall be in place to neutralize pH levels should water make contact with un-cured concrete.
 92. All concrete, sealants, or other compounds used for this Project shall be utilized according to the appropriate Product Technical Data Sheet, stating guidelines and methods for proper use, and provided by the manufacturer of the product.
 93. Deleterious substances shall not be permitted to enter the watercourse.
 94. The Contractor shall provide an appropriate area on the job site where concrete trucks can be safely washed.
 95. All tools, pumps, pipes, hoses, and trucks used for finishing, placing, or transporting fresh concrete will be washed off to prevent contamination of the watercourse.
 96. Concrete wash water shall be directed to a collection basin or managed in accordance with General – Waste Management Schedule 8 of the *Environmental Protection Act, 1990*, to effectively remove all suspended solids, dissipate velocity, and prevent deleterious substances from entering the watercourse.





- 97. Unused admixtures and additive materials shall **not** be disposed of in sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
- 98. Due to the proximity of the work site to water, calcium chloride shall not be used to suppress concrete dust.

8.10 Operation, Maintenance and Storage of Heavy Equipment, Machinery, and Tools

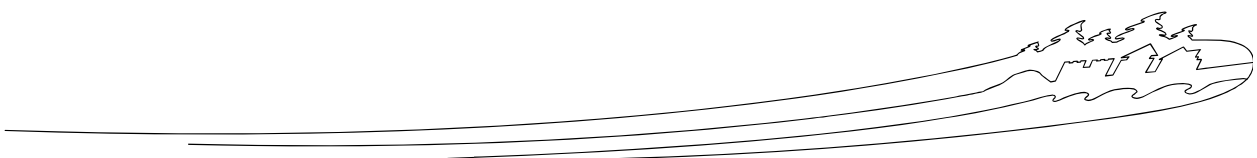
- 99. Comply with operating specifications for heavy equipment and machinery.
- 100. All machinery and equipment are to arrive on site in a clean condition and be maintained free of fluid leaks, invasive species, and noxious weeds.
- 101. Follow the Ontario Clean Equipment Protocol for Industry - Inspecting and cleaning equipment for the purposes of invasive species prevention.
- 102. Operation and idling of gas-powered equipment, machinery, and vehicles shall be minimized to the extent possible.
- 103. Movement of heavy equipment and machinery shall be avoided in areas with sensitive slopes, and vehicle traffic shall be minimized on exposed soils.
- 104. All heavy equipment, machinery, and tools required for the work shall be regularly inspected and maintained to avoid leakage of fuels and liquids, and, where feasible, shall be operated, maintained, and stored a minimum of 30 m from the water in a manner that prevents any deleterious substance from entering the watercourse or soils.
- 105. Heavy equipment, machinery, and tools shall be operated on land (from outside of the water) or on the water (i.e., from a barge or vessel) in a manner that minimizes disturbance to the banks or bed of the watercourse.
- 106. When not in use, all materials, equipment, and tools should be securely locked up to avoid vandalism and accidental spills.
- 107. Use well-maintained heavy equipment and machinery, fitted with fully functional emission control systems/muffler/exhaust baffles, engine covers, etc.
- 108. Trucks and heavy equipment shall be fitted with back-up signals/indicators.

8.11 Refueling of Heavy Equipment, Machinery, and Tools

- 109. Deleterious substances (including fuel) shall be handled, and applied in a manner to avoid contamination of soils, groundwater, and surface waters.
- 110. Refueling shall be conducted within the defined staging area as described above (Section 8.6).
- 111. All deleterious substances (including fuel, cleaners, solvents, paint, etc.) shall be mixed and transferred within the defined staging area as described above (Section 8.6).
- 112. Drip trays shall be placed under fuel-powered equipment when re-fuelling.

8.12 Spill Response

- 113. An adequate supply of clean-up materials shall be maintained on site, on both sides of the river, and employed immediately should a spill occur. In the case of a spill, including but not limited to





concrete, grout, or water with pH > 9, PCA and the Ontario Spill Action Center (1-800-268-6060) shall be notified immediately; all provincial and federal regulations shall be strictly adhered to the satisfaction of PCA. Documentation of remediation, testing and results will be provided to PCA.

- 114. Construction crews shall be fully trained in their use to ensure timely and effective responses to spill incidents.
- 115. Procedures, instructions, and reports to be used in the event of an unforeseen spill of a regulated substance are detailed in the Spill Control Plan, included as a component of the EMP, and shall be adhered to.

8.13 Treated Wood

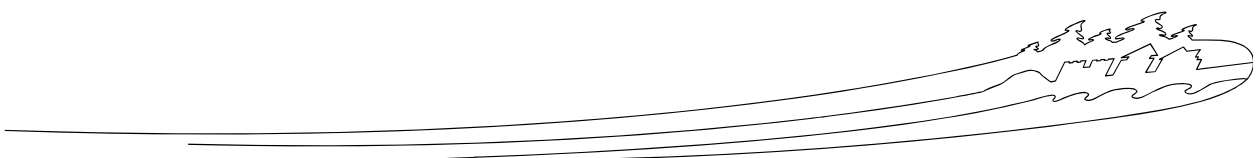
- 116. All wood is to be treated with wood preservative in accordance with the Project Specifications (Parsons 2017f) and shall meet provincial and federal guidelines. Creosote- treated and/or pentachlorophenol-treated wood must not be used.
- 117. When working with treated wood, adherence to all respective regulations and good house-keeping shall be followed. This shall include prefabrication to the desired specifications, therefore eliminating the need for cutting and field application of treatment.
- 118. Disposal of treated wood shall be done in a legal manner at a licensed facility.

8.14 Application of Paint

- 119. All machinery components shall be painted in the shop.
- 120. If application of paint is required on site, an adequate containment system shall be used to confine and capture paint, and paint overspray where wind conditions permit.
- 121. Paint with maximum useful lifetimes shall be used, where toxicity is acceptable, to maximize the period between re-painting.
- 122. Reinforced steel shall be touched-up with two coats of zinc-rich paint (Parsons 2017f).

8.15 Fisheries and Aquatic Resources

- 123. Activities shall be scheduled to protect fish, including their eggs, juveniles, spawning adults and/or the organisms upon which they feed. In-water works shall be restricted to the MNRF-approved timing window.
 - a) **All in-water and near-water works shall be conducted June 1 through March 14;** therefore, no in-water work will be allowed March 15 through May 31.
 - b) This timing window must be identified in the construction schedule and EMP (PCA 2017b).
- 124. The duration of in-water works should be minimized to the extent possible.
- 125. With respect to turbidity curtain installation:
 - a) Perform an initial sweep of the work area to drive fish out prior to completely closing off turbidity curtains surrounding the work area;

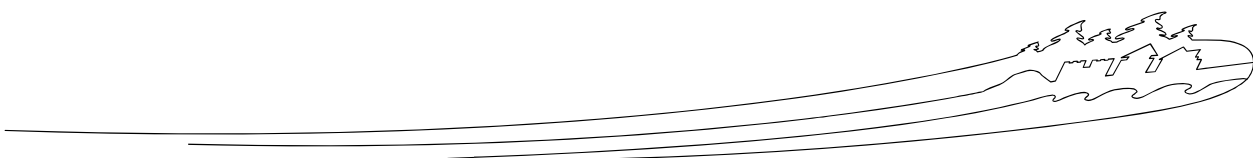




- b) Deployed turbidity curtains in a manner – e.g. moved in a direction from close to shore/structures outward – that prevent entrapment of fish inside the curtain; and
 - c) Turbidity curtains shall not be deployed fully across the watercourse to serve as a barrier to fish migration.
- 126. Turbidity curtains shall be weighted on the bottom edge and long enough to sit on the river bed.
 - 127. Dewatering shall be conducted in accordance with the *Water Resources Act* and Ontario Regulation 387/04 as well as the *Freshwater Intake End-of-Pipe Fish Screen Guideline* (DFO 1995).
 - 128. Where necessary, fish salvages will be conducted by a qualified professional in areas isolated from flows prior to construction, under applicable permit(s).
 - 129. Should flooding occur on the site, fish salvages will once again be conducted by a qualified professional, as necessary.
 - 130. Where possible, schedule work to avoid wet, windy, and rainy periods that may increase erosion and sedimentation.
 - 131. Undertake all in-water works within an isolated work area using cofferdams and turbidity curtains, appropriate to the site conditions and permeability needs, as indicated in the design drawings while maintaining natural flow of water downstream (north of the Hamlet Bridges).
 - 132. Refer to mitigation measures for Surface Water Quality (Section 8.5) for NTU and TSS requirements.
 - 133. Maintain fish passage at all times.
 - 134. If material (i.e., sediment) is removed from the waterbody, set it aside and return it to the original location once construction activities are completed.
 - 135. Restore bed and banks of the waterbody to their original contour and gradient; if the original gradient cannot be restored due to instability, a stable gradient that does not obstruct fish passage should be restored.
 - 136. Should work conditions change such that it is possible that fish or fish habitat may potentially be impacted, all works shall cease until the problem/issue has been corrected or authorization has been obtained from the appropriate authorities.
 - 137. Where a work or a portion of the work that is being constructed or maintained in navigable water causes debris or other material to accumulate on the bed or surface of such water, the Contractor shall immediately remove the debris or other material to the satisfaction of the Departmental Representative.
 - 138. For additional guidance on in-water work the Contractor shall refer to the DFO “Measures to Avoid Causing Harm to Fish and Fish Habitat” which provides advice applying to all project types (DFO 2016).

8.16 Terrestrial Flora, Fauna, and Habitat

- 139. To the extent possible, minimize disturbance to existing vegetation.
- 140. Use existing trails, roads or cut lines wherever possible to avoid disturbance to the riparian vegetation and prevent soil compaction.





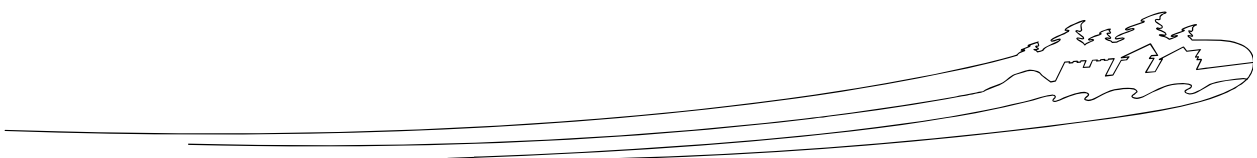
141. When practicable, prune or top the vegetation instead of grubbing/uprooting.
142. Minimize the removal of natural woody debris, rocks, sand or other materials from the banks, the shoreline or the bed of the waterbody below the ordinary high water mark.
143. Tree removal and planting shall be conducted in accordance with the District Municipality of Muskoka's By-Law No. 88-29 for the Planting, Care, and Removal of Trees on District Roads (Appendix G). Post and wire fence to be installed on the north side of Muskoka District Road 49, west of the water, should be placed at the perimeter of Staging Area A (shown on Design Drawing No. B-04) allowing for standard tree protection fencing (hoarding) around the trees that will not be removed, as per the International Society of Arborist guidelines.
144. Immediately stabilize shoreline or banks disturbed by any activity associated with the Project to prevent erosion and/or sedimentation, preferably through re-vegetation with native species suitable for the site.
145. If a reptile species is observed, it should be identified and/or photographed as all turtle species in Ontario are listed as "at risk" by COSEWIC and a number of protected turtle SAR have potential to occur in the area.

8.17 Protection of Migratory Birds

146. Removal and/or pruning of trees and herbaceous vegetation will be kept to the minimum extent necessary to allow safe execution of Project works.
147. Prior to the commencement of bridge work a nest survey should be conducted by a qualified biologist to ensure protected bird species are not directly impacted by the removal of the bridge and to determine the potential need for compensation during the subsequent breeding seasons if the bridge is not available for use by bird SAR for nesting purposes.
148. **Clearing of vegetation shall be avoided between April 1 and August 28.**
 - a) Clearing of vegetation (i.e., by pruning, or by other means) could result in the incidental take of migratory birds or their nests if conducted during the regional breeding season (April 1 through August 28) (ECCC 2017).

8.18 Species at Risk (SAR)

149. The EMP must detail procedures (e.g., exclusion fencing) for preventing turtle entry/nesting within disturbed Project gravels/soils during the turtle active season: approximately April 1 through October 14.
 - a) Refer to MNR's *Species at Risk Branch Best Practices Technical Note: Reptile and Amphibian Exclusion Fencing* (Appendix H).
150. Daily ongoing observation for SAR and wildlife in general shall be undertaken for the duration of the Project by all personnel on site.
 - a) PCA shall be notified immediately should any wildlife incident or SAR sighting occur.
 - b) Should work-related activities have the potential to impact SAR, or those thought to be SAR, all work shall cease. PCA, shall be contacted immediately for guidelines on how to proceed.





- c) Observations of SAR should be reported to ECCC and MNRF.

- 151. Park on roads or disturbed areas only.
- 152. For each Barn Swallow nests that is located on the bridge at the time of removal, if any, a replacement substitute nest cup should be installed in a suitable location (as specified by MNRF guidelines) on or near the new bridge.
 - a) Implementation of this mitigation measure, and the appropriate timing and party responsible for implementation, will be at PCA's discretion through consultation with ECCC and the MNRF, as needed.

8.19 Recreational Use

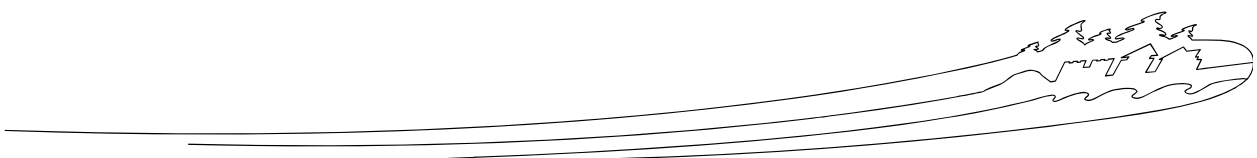
- 153. Notification of the traffic detour shall be provided through signage at the site in advance of Project commencement.
- 154. Signage shall be posted, at normal access areas to the work site, to indicate that no public access will be available during construction. The posting shall include telephone numbers to facilitate public questions/complaints.

8.20 Environmental Monitoring

- 155. Environmental mitigation measures should be inspected daily and a daily checklist/log should be maintained over the duration of the Project.
- 156. SAR and wildlife sightings, or lack thereof, should be reported on the daily inspection checklist.
- 157. Any damages/deficiencies shall be addressed immediately (within 48 hours) and any build-up of sediment should be removed and disposed of as required by all applicable federal, provincial, and municipal laws, regulations, and guidelines.
- 158. For submission to PCA, environmental summary reports should be completed monthly and provide details of monitoring work completed, the findings of all monitoring, and details of how and when issues were resolved.
- 159. Following completion of the Project, weekly ESC monitoring or ESC monitoring following precipitation / snowmelt events, should be completed until vegetation has become establish on all disturbed areas and ESC measures are removed.
- 160. The Contractor should provide a written checklist for inspection for vehicle/machinery leaks and overall condition, and, for the purpose of invasive species prevention, a written record of measures taken to clean vehicles/machinery/equipment.

8.21 Site Restoration

- 161. Upon completion of work there shall be a final clean-up of the site. No tools, temporary structures (with the exception of ESC measures), or parts thereof, used or maintained for the purpose of this Project shall be permitted to remain at the site or enter the water after completion of the Project.
- 162. Immediately following completion of work, and prior to removal of ESC measures, all disturbed surfaces and shorelines shall be stabilized and re-vegetated. Where required, site-appropriate native species are to be used for tree planting and/or ground cover.





163. Topsoil shall be placed in accordance with the depth specified in the Contract Specifications (i.e., minimum depth of 100 mm) and as approved by the Departmental Representative after settlement and consolidation.
164. In the vicinity of trees, shrubs, and obstacles, topsoil should be spread manually.
165. To ensure restoration meets or exceeds pre-construction conditions, sod placement shall be conducted in accordance with the Contract Specifications - Section 32 92 23.
166. Site restoration should be completed at a time of year that will minimize the potential for sediment, debris, and/or other contaminants to enter the water (e.g. during periods of dry weather).
167. If there is insufficient time (i.e., less than four weeks) in the growing season remaining for the seeds to germinate, or to be at risk of germinating and damaged by frost, the site shall be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.

9.0 PUBLIC/STAKEHOLDER ENGAGEMENT & ABORIGINAL CONSULTATION

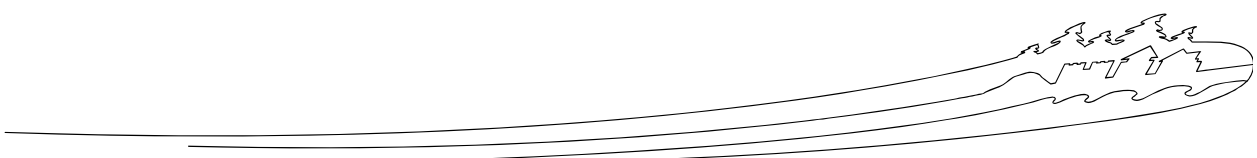
- 9 a)** Indicate whether public/stakeholder engagement was undertaken in relation to potential adverse effects of the proposed Project:
- ☐ No, public participation has not been sought on this Project to date.
 - ☒ Yes (describe the process to involve relevant parties and indicate how comments were taken into consideration).

The following points summarize the methods of public/stakeholder engagement undertaken for this Project:

- 2015 and 2016 - Funding announcements, news release;
- Community bulletins e-mailed to federal, provincial, and municipal elected officials as well as municipal staffs, area businesses, organizations, and residences;
- Presentation delivered to municipality March 2018;
- Direct mail to 615 residences in May 2018; and
- Ongoing - Development of opt-in email list of individuals who would like push notifications about construction; personal communication with numerous residents local to the community via phone and e-mail.

- 9 b)** Indicate whether Aboriginal consultation was undertaken in relation to potential adverse effects of the proposed Project:
- ☐ No, Aboriginal consultation has not been undertaken on this Project to date.
 - ☒ Yes (describe the process to involve relevant parties and how the results were taken into consideration).

There is potential for the Project to affect the use of lands or resources by Aboriginal persons. Potential effects on treaty rights, impact of activities on land, historic presence and use, and spiritual significance will be considered. The following points summarize the methods of Aboriginal consultation undertaken for this Project:





- On April 3, 2016, a letter was sent to the 7 Williams Treaties First Nations Chiefs advising them of the Trent-Severn Waterway Federal Infrastructure Projects and their status. To date, the Williams Treaties First Nations consultation officers have identified that consultation is not required as the proposed Project activities do not appear to impact Aboriginal or Treaty Rights. However, this BIA and Project scope will be shared with community members to ensure all potential impacts have been assessed. Continued information, engagement, and monitoring of Project activities will occur to ensure the accuracy of proposed mitigation measures and to ensure that no impacts occur to the communities' Aboriginal or Treaty Rights. Should such an impact arise, formal consultation to address the impact would be undertaken.
- As part of the agreed to process, the community consultation representatives receive updates throughout construction phases. As is Ontario Waterway practice, community consultation representatives have been and will be offered the opportunity for a site visit and will be accompanied by senior Project staff should they make that request. In the event of an accident on site, contamination due to construction, or discovery of archaeological material, stop work order provisions in the contract will allow work to be temporarily halted around the impacted area and the community consultation representatives will be notified and, if needed, be invited to participate in any monitoring of the site.

10.0 SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

Residual environmental effects are those that remain after mitigation measures have been factored into the analysis. As residual effects cannot be completely addressed through mitigation, they are likely to persist following Project completion. A significant residual effect is defined as any permanent, non-mitigable change in an identified VC.

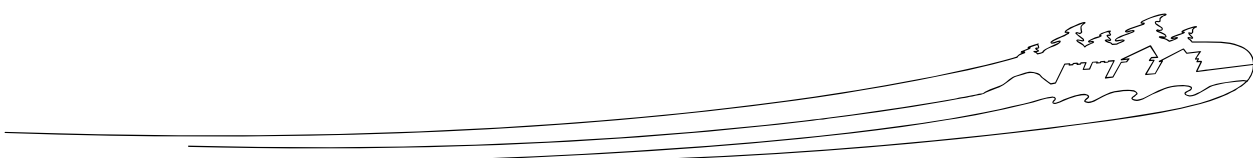
Those biophysical and human environment components identified as VCs and addressed during Project planning and environmental assessment include the following:

- Air quality;
- Noise exposure;
- Surface water quality;
- Soil and geology;
- Fisheries and Aquatic Resources;
- Terrestrial flora, fauna, and habitat;
- SAR and SAR habitat;
- Recreational use / navigation; and
- Traffic.

With the implementation of the mitigation measures described in Section 8.0 and application of the site-specific EMP (and all EMP component plans), potential adverse effects of the Project will be adequately managed and **adverse residual effects are not expected to occur.**

11.0 SURVEILLANCE

- ☐ Surveillance is not required
- ☒ Surveillance is required





11.1 Environmental Monitoring and Mitigation Measure Enforcement

The primary goals of an environmental monitoring program are to:

- Assure an appropriate level of protection is in place at all times to minimize or prevent undesirable or unauthorized impacts to environmental resources;
- Assure compliance/conformance with the site-specific EMP and BIA requirements; and
- Assure the environmental monitor is able to maintain an independent role from other Project parties.

The following surveillance and record keeping is recommended to ensure compliance with applicable environmental legislation and to show due diligence:

1. Daily enforcement and inspection of all environmental mitigation measures, including completion of a daily checklist/log, over the duration of the Project.
 - Any deficiencies should be addressed immediately (i.e., within 48 hours).
 - As per the BIA mitigation measures, daily, ongoing observations of SAR and wildlife in general should be undertaken by all personnel on site. Sightings, or lack thereof, should be reported on the daily inspection checklist.
2. Monthly completion of environmental summary reports providing details of monitoring work completed, the findings of all monitoring, and details of how and when issues were resolved.
3. Following completion of the Project, weekly ESC monitoring or ESC monitoring following precipitation / snowmelt events, until vegetation has become establish on all disturbed areas and ESC measures are removed.
 - Any damages should be repaired immediately (i.e., within 48 hours) and any build-up of sediment should be removed and disposed of as required by all applicable federal, provincial, and municipal laws, regulations, and guidelines.

12.0 FOLLOW-UP MONITORING

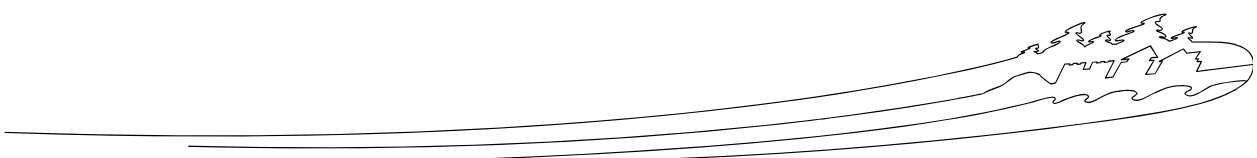
Follow-up monitoring is:

- ☒ not required, with the exception of ESC monitoring until the site if fully stabilized.
- ☐ legally required (e.g. under the *Species at Risk Act* or *Fisheries Act*)
- ☐ required in accordance with the PCA Cultural Resource Management Policy

13.0 SARA NOTIFICATION

Notification is:

- ☒ not required, unless Barn Swallow nests or remnants of nests are observed under the existing bridge, in which case notification is at PCA's discretion.
- ☐ required under the *Species at Risk Act*.





14.0 EXPERTS CONSULTED (YYYY-MM-DD)

Department/Agency/Institution: Parks Canada Agency, Cultural Resource Conservation, Heritage Conservation Branch	Date of Request: 2014
Expert's Name & Contact Information: Nathalie Desrosiers	Title: Senior Policy Advisor, Cultural Resources Management
Expertise Requested: Advice on Heritage Value	
Response: Heritage Value Statement and Character-Defining Elements - Hamlet Bridge 57	
Department/Agency/Institution: MNRF	Date of Request: 2017
Expert's Name & Contact Information: Steve Scholten	Title: Management Biologist
Expertise Requested: Relevant in water timing windows	
Response: Relevant dates are April 1 – May 31	
Department/Agency/Institution: Parks Canada Agency, Ontario Waterways Water Management	Date of Request: 2018
Expert's Name & Contact Information: Anna Ciorap	Title: Acting Water Management Manager
Expertise Requested: Information on flows in the Severn	
Response: PCA is studying bathymetry/flow further to determine potential constrictions due to cofferdam proposal.	
Department/Agency/Institution: Parks Canada Agency, Archaeology And History Branch	Date of Request: 2017
Expert's Name & Contact Information: Stacey Taylor	Title: Terrestrial Archaeologist
Expertise Requested: Archaeological Overview Assessment	
Response: Report - Archaeological Overview Assessment, Hamlet Swing and Fixed Bridge #57	

15.0 DECISION

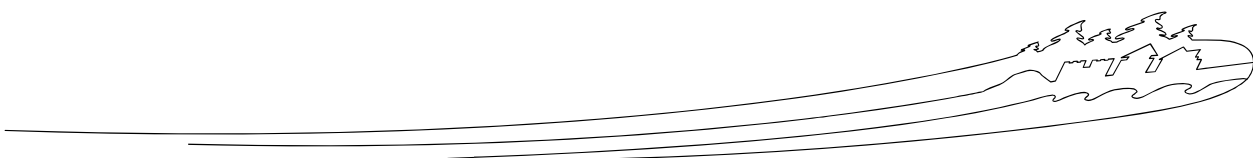
Taking into account implementation of mitigation measures outlined in the analysis, the Project is:

- ☒ not likely to cause significant adverse environmental effects.
- ☐ likely to cause significant adverse environmental effects.

NOTE: If the Project is identified as likely to cause significant adverse effects, CEAA 2012 prohibits approval of the Project unless the Governor in Council (Cabinet) determines that the effects are justified in the circumstances. A finding of significant effects therefore means the Project CANNOT go ahead as proposed.



15.1 FOR SARA REQUIREMENTS:

- ☒ There are no residual adverse effects to species at risk and therefore the SARA-Compliant Authorization Decision Tool was not required





16.0 RECOMMENDATION AND APPROVAL

Prepared by: Erin M. Hellinga, Environmental Biologist Wood Environment & Infrastructure Solutions	Date: 2018-07-06
Reviewed by: Jeff Balsdon, Senior Biologist Wood Environment & Infrastructure Solutions	Date: 2018-07-06
Recommended by: Valerie Minelga Environmental Assessment Team Lead 	Date: 2018-07-23
Approved by: Jewel Cunningham Director, Ontario Waterways 	Date: 2018/07/31

17.0 APPENDICES

- A. Project Figures
 - Figure 1: Project Location and Study Area
 - Figure 2: Species at Risk and Natural Heritage Features
- B. May 13, 2016 Site Photos
- C. Ontario Reptile and Amphibian Atlas for Squares 17PK25 and 17PK26
- D. Atlas of the Breeding Birds of Ontario Map for Region 18 Squares 17PK25 and 17PK26
- E. Environmental Impact Analysis Tools: Direct Effects Identification Matrix
- F. Environmental Impact Analysis Tools: Indirect Effects Identification Matrix
- G. Applicable By-laws
- H. MNRF's *Species At Risk Branch Best Practices Technical Note: Reptile And Amphibian Exclusion Fencing Version 1.1*
- I. References

18.0 NATIONAL IMPACT ASSESSMENT TRACKING SYSTEM

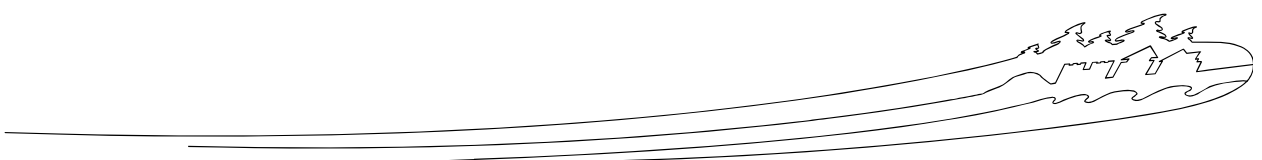
- ☒ Project registered in tracking system
- ☐ Not yet registered (CEAA 2012 requires PCA submit a report to Parliament annually. EIAs must be entered in the tracking system by the end of April to enable reporting.



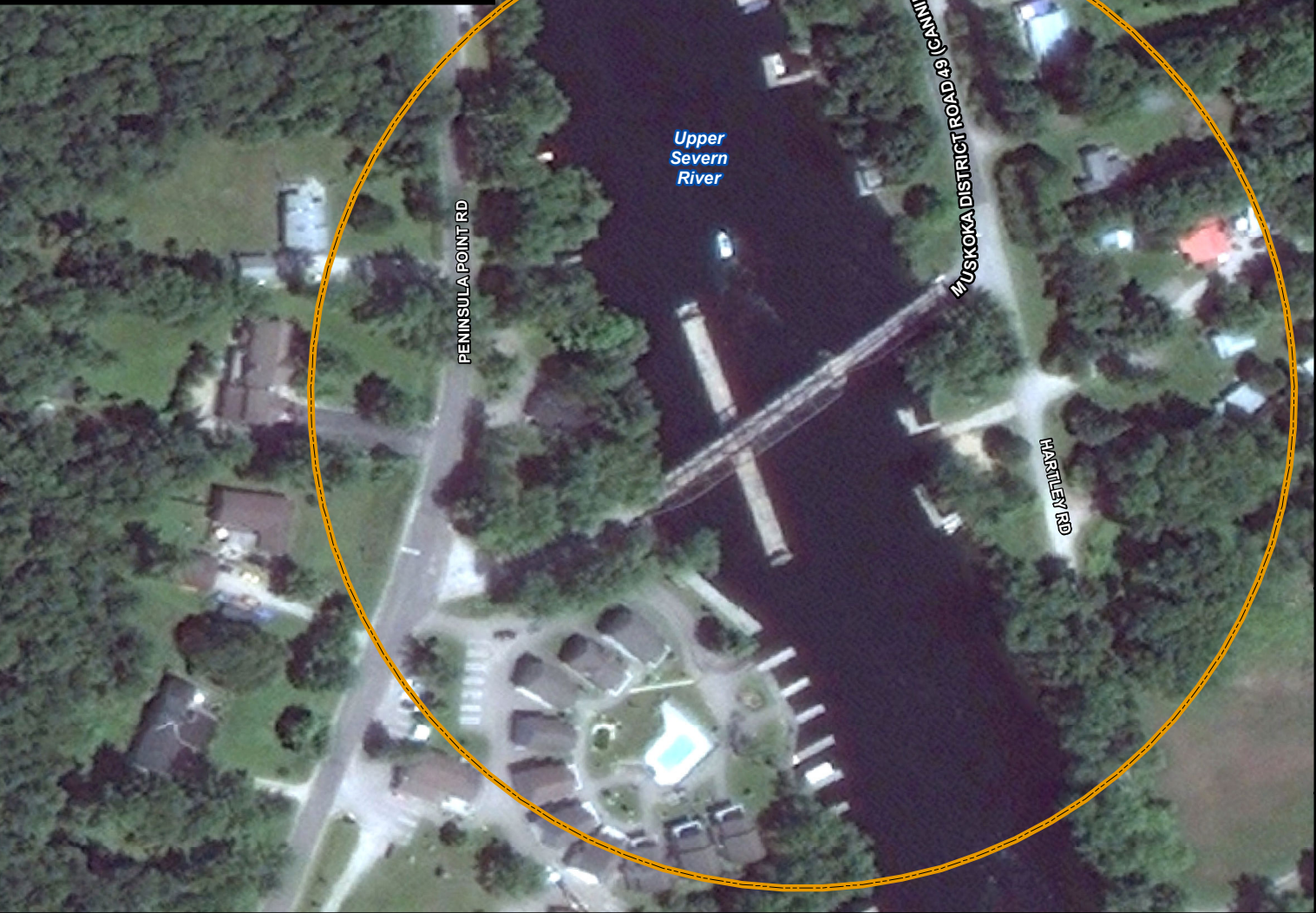
April 2015



APPENDIX A
PROJECT FIGURES





626800 626850 626900 626950 627000 627050 627100



4960300
4960250
4960200
4960150
4960100
4960050
4960000

LEGEND

-  Hamlet Bridges Project Location
-  Approximate Study Area of 120m

NOTES:
- Aerial Imagery extracted from Google Earth, date is May, 2014.



wood.

HAMLET BRIDGES BIA

Project Location and Study Area

Datum & Projection:
NAD 1983 UTM Zone 17N

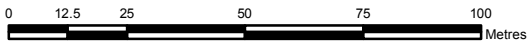


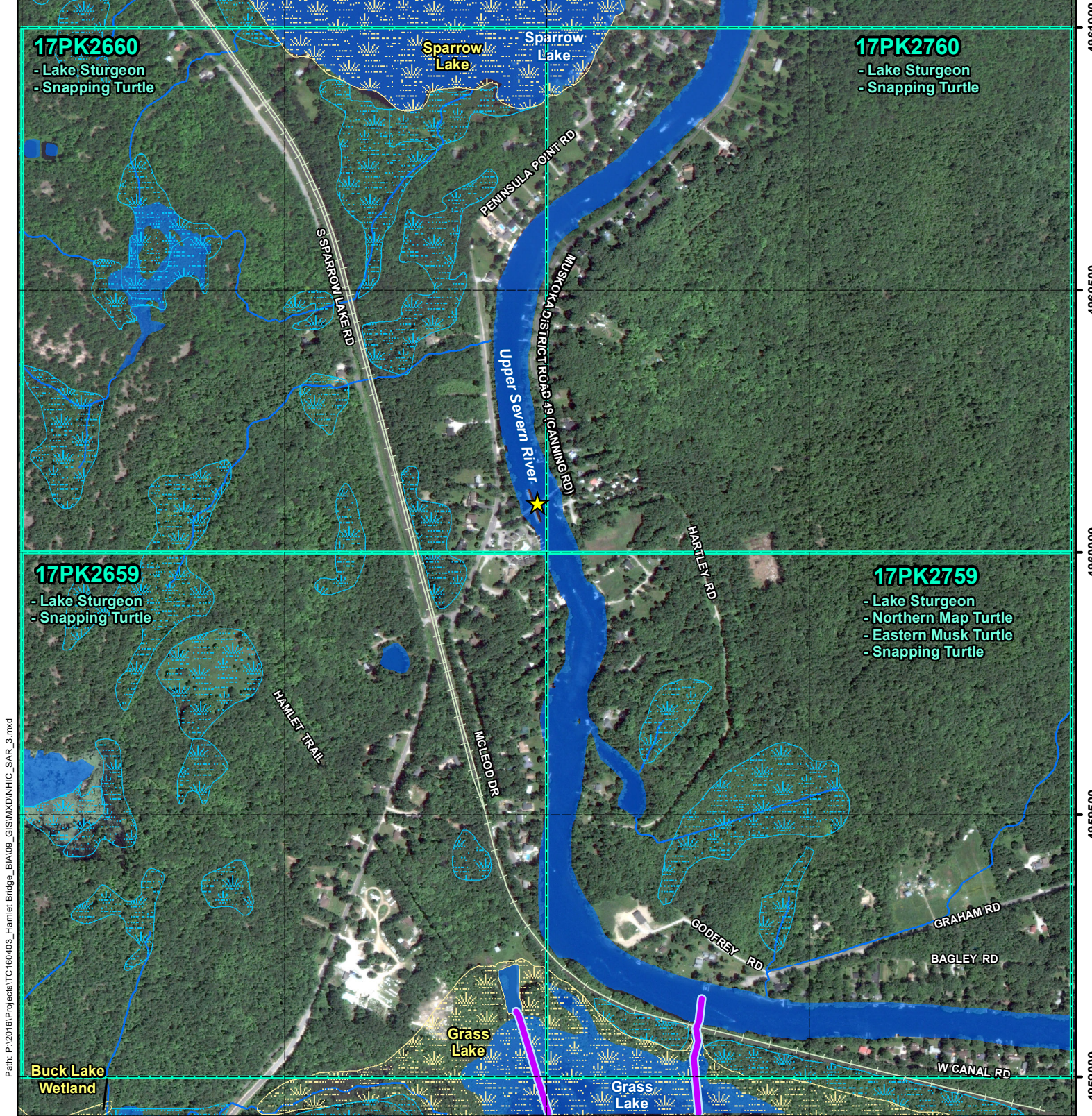
PROJECT N^o:TC160403

FIGURE: 1

SCALE: 1:1,600

DATE: July 2018





Path: P:\2016\Projects\TC160403_Hamlet Bridge_BIA\09_GIS\MXD\NHIC_SAR_3.mxd



LEGEND

- ★ Hamlet Bridges
- PSW Provincially Significant Wetland
- Other Wetland
- DFO Fish Species at Risk*
- NHIC SAR Species (Species observed within the last 20 years)
- Watercourse
- Waterbody
- Railway

NOTES:
* DFO Purple Segment represents Special Concern Species (including under consideration for listing).
- SAR data obtained from NHIC Location is generalized based on squares of 1 Km square. Species Occurrence from NHIC database December 2015.
- Topographic data extracted from Land Information Ontario (LIO).
- Imagery from Google Earth, date is May 2014.

Datum & Projection:
NAD 1983 UTM Zone 17N





HAMLET BRIDGES BIA

Species at Risk and Natural Heritage Features

PROJECT N°:TC160403**FIGURE: 2**

SCALE: 1:10,000**DATE: July 2018**



April 2015



APPENDIX B

MAY 13, 2016 SITE PHOTOS

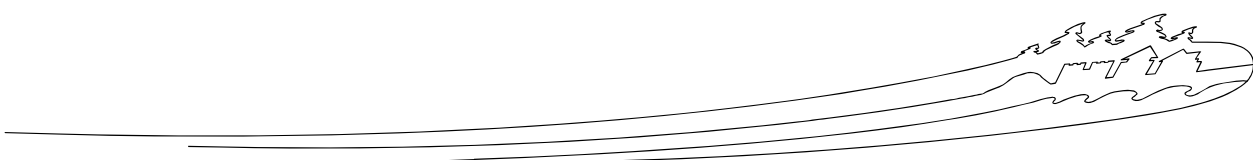




Photo 1: Hamlets Bridges sign. Located on west side.



Photo 2: Western approach to Hamlet Bridges (Swing Bridge side).



Photo 3: West abutment.



Photo 4: Swing Bridge deck.



Photo 5: West bank, south of Swing Bridge.



Photo 6: Operator's building on west shore, south of swing bridge.



Photo 7: West bank, north of Swing Bridge.



Photo 8: South side rest pier.



Photo 9: North side of rest pier.



Photo 10: West bank landing north of Swing Bridge. Potential staging area.



Photo 11: North side of Swing Bridge.



Photo 12: Eastern end of Hamlet Bridges (Fixed Bridge side).



Photo 13: East abutment.



Photo 14: Swing Bridge east end.

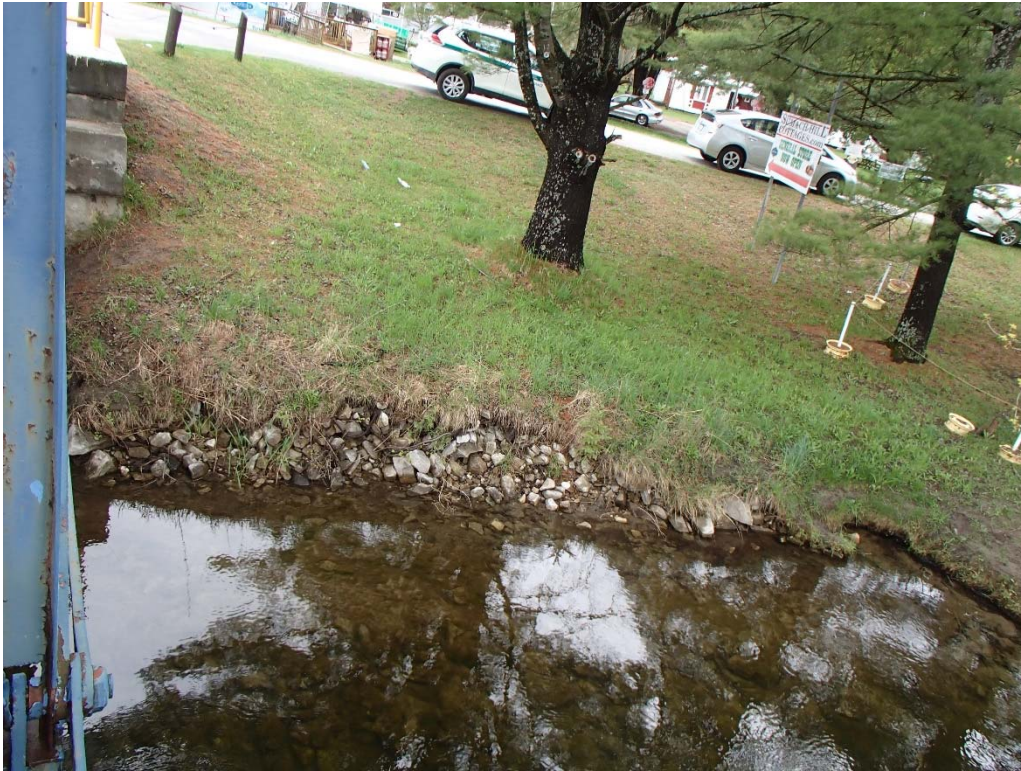


Photo 15: East bank, south of Fixed Bridge.



Photo 16: East bank, north of Fixed Bridge.



Photo 17: Eastern shore, north of Fixed Bridge. Potential staging area.



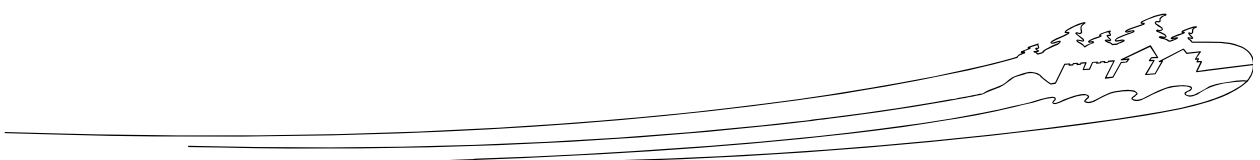
Photo 18: North side of Hamlet Bridges.

April 2015



APPENDIX C

ONTARIO REPTILE AND AMPHIBIAN ATLAS RESULTS FOR SQUARES 17PK25 AND 17PK26



**Appendix C: Ontario Reptile and Amphibian Atlas Occurrences for the Hamlet Bridges Area
(Squares 17PK26 and 17PK25)**

Common Name	Scientific Name	Provincial S-Rank
Turtles		
*Blanding's Turtle	<i>Emydoidea blandingii</i>	S3
*Eastern Musk Turtle	<i>Sternotherus odoratus</i>	S3
►Midland Painted Turtle	<i>Chrysemys picta marginata</i>	S4
*Northern Map Turtle	<i>Graptemys geographica</i>	S3
*Snapping Turtle	<i>Chelydra serpentina</i>	S3
Snakes		
Dekay's Brownsnake	<i>Storeria dekayi</i>	S5
Eastern Gartersnake	<i>Thamnophis sirtalis sirtalis</i>	S5
*Eastern Hog-nosed Snake	<i>Heterodon platirhinos</i>	S3
*Eastern Ribbonsnake	<i>Thamnophis sauritus</i>	S3
*Massasauga (Great Lakes / St. Lawrence population)	<i>Sistrurus catenatus</i>	S1
*Milksnake	<i>Lampropeltis triangulum</i>	S3
Northern Watersnake	<i>Nerodia sipedon sipedon</i>	S2
Red-bellied Snake	<i>Storeria occipitomaculata</i>	S5
Lizard		
*Common Five-lined Skink (Southern Shield population)	<i>Plestiodon fasciatus</i>	S3
Salamanders		
Blue-spotted Salamander	<i>Ambystoma laterale</i>	S4
Eastern Red-backed Salamander	<i>Plethodon cinereus</i>	S5
Four-toed Salamander	<i>Hemidactylium scutatum</i>	S4
Red-spotted Newt	<i>Notophthalmus viridescens viridescens</i>	S5
Frogs and Toads		
American Bullfrog	<i>Lithobates catesbeianus</i>	S4
American Toad	<i>Anaxyrus americanus</i>	S5
Gray Treefrog	<i>Hyla versicolor</i>	S5
Green Frog	<i>Lithobates clamitans</i>	S5
Mink Frog	<i>Lithobates septentrionalis</i>	S5
Northern Leopard Frog	<i>Lithobates pipiens</i>	S5
Spring Peeper	<i>Pseudacris crucifer</i>	S5

* Indicates Species at Risk (provincially and/or federal) refer to Section 5.6.5 for details.

► Indicates species has a COSEWIC status but is not a provincially- or federally- ranked Species at Risk; refer to Section 5.6.5 for details.

Breeding Evidence: OBS=observed, POSS=possible, PROB=probable, CONF=confirmed

Provincial S-Rank:

SH – Possibly Extirpated (Historical); species occurred historically and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years

S1 - Extremely rare in Ontario; usually 5 or fewer occurrences in the province, or only a couple remaining hectares

S2 - Very rare in Ontario; usually between 6 and 20 occurrences in the province, or only a few remaining hectares

S3 - Rare to uncommon in Ontario; usually between 21 and 80 occurrences in the province; may have fewer occurrences, but with some extensive examples remaining

S4 - Considered to be common in Ontario. It denotes a species that is apparently secure, with over 80 occurrences in the province

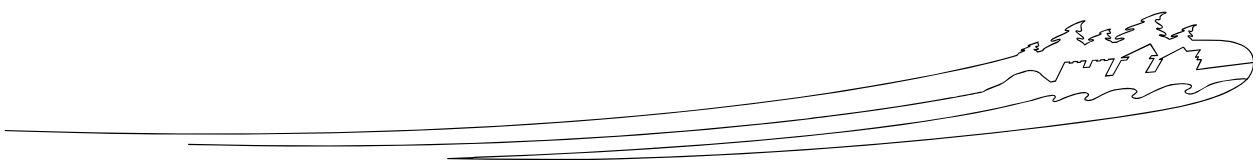
S5 - Indicates that a species is widespread in Ontario. It is demonstrably secure in the province.

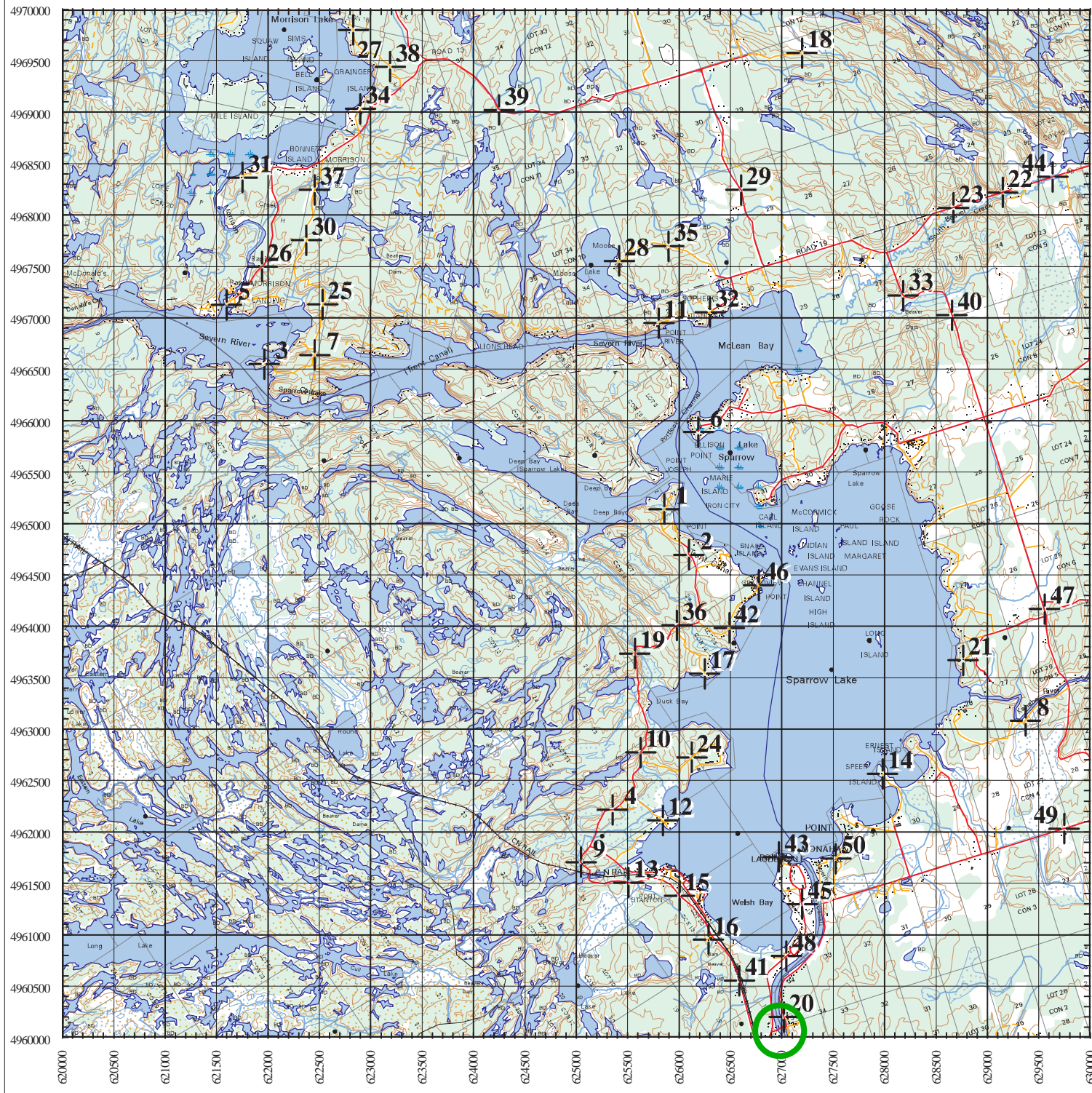
April 2015



APPENDIX D

ATLAS OF THE BREEDING BIRDS OF ONTARIO MAP AND SPECIES LIST FOR REGION 18 SQUARES 17PK25 AND 17PK26





Ontario Breeding Bird Atlas 2001 - 2005

Roadside Point Count Coordinates

No.	Easting	Northing
01	625856	4965139
02	626096	4964695
03	621964	4966551
04	625352	4962216
05	621598	4967127
06	626189	4965889
07	622455	4966639
08	629370	4963080
09	625048	4961706
10	625628	4962774
11	625804	4966950
12	625843	4962111
13	625509	4961508
14	627979	4962564
15	626006	4961381
16	626287	4960955
17	626249	4963538
18	627197	4969576
19	625571	4963735
20	627020	4960200
21	628764	4963670
22	629149	4968219
23	628670	4968070
24	626125	4962725
25	622532	4967130
26	621945	4967499
27	622831	4969800
28	625418	4967554
29	626604	4968245
30	622375	4967755
31	621751	4968365
32	626302	4967055
33	628180	4967217
34	622901	4969033
35	625898	4967696
36	625981	4964010
37	622453	4968244
38	623189	4969444
39	624249	4969022
40	628653	4967026
41	626586	4960552
42	626490	4963985
43	626971	4961755
44	629636	4968371
45	627199	4961298
46	626774	4964399
47	629556	4964168
48	627044	4960794
49	629745	4962032
50	627525	4961740

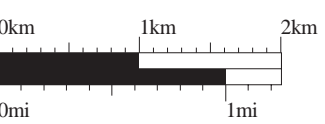
Legend

- Wooded Areas
- Water Bodies
- Water Area
- Water Bodies
- Wetland Area
- Wetlands
- ANSI
- Pits and Quarries
- Parks and Reserves
- Public Road
- Private Road
- Track
- Trail
- Railway
- Contour Lines
- Lots
- Roadside Point Count Locations
- Hamlet Bridges
- Project Site
- Fences
- Wall
- Hedge
- Feature Outline
- Race Track
- Building Points
- Building Polygons
- Airports
- Petroleum Tank
- Water Tank
- Survey Monuments
- Smoke Stack
- Towers
- Named Places
- Pipelines
- Transmission Line

North American Datum 1983
Universal Transverse Mercator (6 degrees) projection
Zone 17, Central Meridian 81 degrees W.
Grid Interval 1000 meters
Contour Interval 10 meters
Some features on the Breeding Bird Atlas field maps may not have been updated since the early 1980's.

Atlas Square: 17PK26 Region: 18

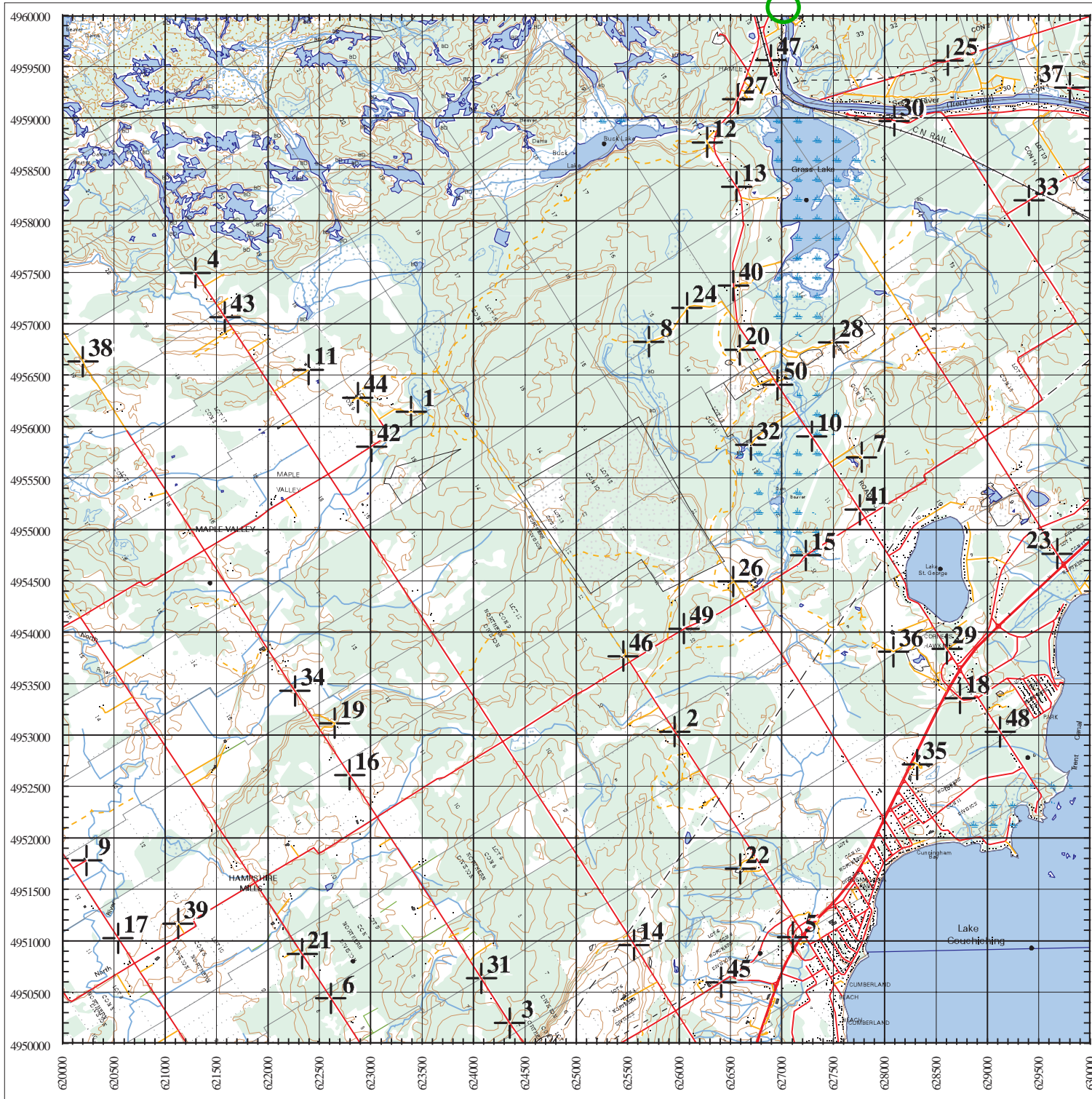
(NAD27 - 17PV26)



Ontario
Breeding
Bird Atlas



Copyright 2002, Queen's Printer for Ontario
Map may only be used for Ontario Breeding Bird Atlas Work



Ontario Breeding Bird Atlas 2001 - 2005

Roadside Point Count Coordinates

No.	Easting	Northing
01	623394	4956146
02	625957	4953033
03	624352	4950200
04	621295	4957495
05	627106	4951035
06	622611	4950441
07	627776	4955702
08	625707	4956825
09	620236	4951782
10	627291	4955905
11	622396	4956552
12	626274	4958764
13	626559	4958333
14	625561	4950960
15	627232	4954747
16	622795	4952613
17	620541	4951023
18	628734	4953356
19	622649	4953116
20	626591	4956745
21	622333	4950872
22	626597	4951700
23	629679	4954763
24	626077	4957155
25	628617	4959560
26	626527	4954494
27	626571	4959184
28	627504	4956817
29	628608	4953837
30	628093	4958972
31	624077	4950634
32	626697	4955822
33	629405	4958200
34	622262	4953429
35	628317	4952714
36	628087	4953810
37	629800	4959296
38	620200	4956631
39	621127	4951167
40	626528	4957371
41	627760	4955191
42	623008	4955806
43	621581	4957065
44	622874	4956281
45	626408	4950596
46	625456	4953768
47	626894	4959566
48	629124	4953031
49	626049	4954035
50	626958	4956405

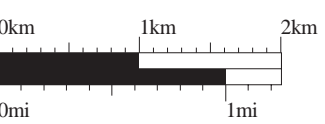
Legend

- Wooded Areas
- Water Bodies
- Water Area
- Water Bodies
- Wetland Area
- Wetlands
- ANSI
- Pits and Quarries
- Parks and Reserves
- Public Road
- Private Road
- Track
- Trail
- Railway
- Contour Lines
- Lots
- Roadside Point Count Locations
- Hamlet Bridges
- Project Site (slightly off map)
- Fences
- Wall
- Hedge
- Feature Outline
- Race Track
- Building Points
- Building Polygons
- Airports
- Petroleum Tank
- Water Tank
- Survey Monuments
- Smoke Stack
- Towers
- Named Places
- Pipelines
- Transmission Line

North American Datum 1983
Universal Transverse Mercator (6 degrees) projection
Zone 17, Central Meridian 81 degrees W.
Grid Interval 1000 meters
Contour Interval 10 meters
Some features on the Breeding Bird Atlas field maps may not have been updated since the early 1980's.

Atlas Square: 17PK25 Region: 13

(NAD27 - 17PV25)



Ontario
Breeding
Bird Atlas



Copyright 2002, Queen's Printer for Ontario
Map may only be used for Ontario Breeding Bird Atlas Work

**Appendix C: Atlas of the Breeding Birds of Ontario Species List for the Hamlet Bridges Area
(Squares 17PK25 and 17PK26)**

Common Name	Scientific Name	Provincial S-Rank	Breeding Evidence Category
Alder Flycatcher	<i>Empidonax alnorum</i>	S5B	PROB
American Bittern	<i>Botaurus lentiginosus</i>	S4B	CONF
American Black Duck	<i>Anas rubripes</i>	S4	CONF
American Crow	<i>Corvus brachyrhynchos</i>	S5B	CONF
American Goldfinch	<i>Spinus tristis</i>	S5B	CONF
American Kestrel	<i>Falco sparverius</i>	S4	POSS
American Redstart	<i>Setophaga ruticilla</i>	S5B	CONF
✓ American Robin	<i>Turdus migratorius</i>	S5B	CONF
American Woodcock	<i>Scolopax minor</i>	S4B	CONF
*Bald Eagle	<i>Haliaeetus leucocephalus</i>	S4B, S2N	POSS
Baltimore Oriole	<i>Icterus galbula</i>	S4B	CONF
✓*Barn Swallow	<i>Hirundo rustica</i>	S4B	PROB
Barred Owl	<i>Strix varia</i>	S5	PROB
✓ Belted Kingfisher	<i>Megaceryle alcyon</i>	S4B	CONF
Black-and-white Warbler	<i>Mniotilta varia</i>	S5B	CONF
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	S5B	POSS
Blackburnian Warbler	<i>Setophaga fusca</i>	S5B	PROB
✓ Black-capped Chickadee	<i>Poecile atricapilla</i>	S5	CONF
Black-throated Blue Warbler	<i>Setophaga caerulescens</i>	S5B	PROB
✓ Black-throated Green Warbler	<i>Setophaga virens</i>	S5B	PROB
Blue Jay	<i>Cyanocitta cristata</i>	S5	CONF
Blue-headed Vireo	<i>Vireo solitaries</i>	S5B	POSS
Blue-winged Teal	<i>Anas discors</i>	S4	CONF
Blue-winged Warbler	<i>Vermivora cyanoptera</i>	S4B	PROB
*Bobolink	<i>Dolichonyx oryzivorus</i>	S4B	CONF
Broad-winged Hawk	<i>Buteo platypterus</i>	S5B	CONF
Brown Creeper	<i>Certhia americana</i>	S5B	CONF
Brown Thrasher	<i>Toxostoma rufum</i>	S4B	CONF
Brown-headed Cowbird	<i>Molthrus ater</i>	S4B	PROB
✓ Canada Goose	<i>Branta canadensis</i>	S4N	CONF
*Canada Warbler	<i>Cardellina pusilla</i>	S4B	PROB
Cedar Waxwing	<i>Bombycilla cedrorum</i>	S5B	CONF
✓ Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	S5B	CONF
✓ Chipping Sparrow	<i>Spizella passerina</i>	S5B	CONF
Clay-colored Sparrow	<i>Spizella pallida</i>	S4B	PROB
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	S4B	CONF
✓ Common Grackle	<i>Quiscalus quiscula</i>	S5B	CONF
Common Loon	<i>Gavia immer</i>	S5B, S5N	CONF
✓ Common Merganser	<i>Mergus merganser</i>	S5B, S5N	CONF
*Common Nighthawk	<i>Chordeiles minor</i>	S4B	PROB
Common Raven	<i>Corvus corax</i>	S5	CONF
Common Tern	<i>Sterna hirundo</i>	S4B	CONF
✓ Common Yellowthroat	<i>Geothlypis trichas</i>	S5B	CONF
Cooper's Hawk	<i>Accipiter cooperii</i>	S4	POSS
Dark-eyed Junco	<i>Junco hyemalis</i>	S5B	PROB

Common Name	Scientific Name	Provincial S-Rank	Breeding Evidence Category
Downy Woodpecker	<i>Picoides pubescens</i>	S5	CONF
Eastern Bluebird	<i>Sialia sialis</i>	S5B	CONF
Eastern Kingbird	<i>Tyrannus tyrannus</i>	S4B	CONF
*Eastern Meadowlark	<i>Sturna magna</i>	S4B	CONF
✓ Eastern Phoebe	<i>Sayornis phoebe</i>	S5B	CONF
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	S4B	POSS
*Eastern Whip-poor-will	<i>Antrostomus vociferus</i>	S4B	CONF
*Eastern Wood-Pewee	<i>Contopus virens</i>	S4B	PROB
European Starling	<i>Sturnus vulgaris</i>	SNA	CONF
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	S4B	POSS
Field Sparrow	<i>Spizella pusilla</i>	S4B	POSS
Golden-crowned Kinglet	<i>Regulus satrapa</i>	S5B	POSS
*Golden-winged Warbler	<i>Vermivora chrysoptera</i>	S4B	PROB
*Grasshopper Sparrow	<i>Ammodramus savannarum ssp. pratensis</i>	S4B	PROB
Gray Catbird	<i>Dumetella carolinensis</i>	S4B	CONF
✓ Great Blue Heron	<i>Ardea herodias</i>	S4	CONF
✓ Great Crested Flycatcher	<i>Myiarchus crinitus</i>	S4B	CONF
Great Horned Owl	<i>Bubo virginianus</i>	S4	CONF
Green Heron	<i>Butorides virescens</i>	S4B	CONF
Hairy Woodpecker	<i>Picoides villosus</i>	S5	CONF
Hermit Thrush	<i>Catharus guttatus</i>	S5B	PROB
✓ Herring Gull	<i>Larus argentatus</i>	S5B, S5N	CONF
House Finch	<i>Haemorhous mexicanus</i>	SNA	PROB
House Sparrow	<i>Passer domesticus</i>	SNA	CONF
House Wren	<i>Troglodytes aedon</i>	S5B	PROB
✓ Indigo Bunting	<i>Passerina cyanea</i>	S4B	PROB
Killdeer	<i>Charadrius vociferus</i>	S5B, S5N	CONF
*Least Bittern	<i>Ixobrychus exilis</i>	S4B	CONF
Least Flycatcher	<i>Empidonax minimus</i>	S4B	CONF
Magnolia Warbler	<i>Setophaga magnolia</i>	S5B	CONF
✓ Mallard	<i>Anas platyrhynchos</i>	S5	CONF
Marsh Wren	<i>Cistothorus palustris</i>	S4B	POSS
Merlin	<i>Falco columbarius</i>	S5B	CONF
Mourning Dove	<i>Zenaida macroura</i>	S5	CONF
Mourning Warbler	<i>Geothlypis philadelphia</i>	S4B	CONF
Nashville Warbler	<i>Oreothlypis ruficapilla</i>	S5B	PROB
Northern Cardinal	<i>Cardinalis cardinalis</i>	S5	CONF
Northern Flicker	<i>Colaptes auratus</i>	S4B	CONF
Northern Harrier	<i>Circus cyaneus</i>	S4B	PROB
Northern Mockingbird	<i>Mimus polyglottos</i>	S4	POSS
Northern Waterthrush	<i>Parkesia noveboracensis</i>	S5B	PROB
*Olive-sided Flycatcher	<i>Contopus cooperi</i>	S4B	PROB
Osprey	<i>Pandion haliaetus</i>	S5B	CONF
✓ Ovenbird	<i>Seiurus aurocapilla</i>	S4B	PROB
✓ Pileated Woodpecker	<i>Dryocopus pileatus</i>	S5	CONF
✓ Pine Warbler	<i>Setophaga pinus</i>	S5B	CONF
Purple Finch	<i>Carpodacus purpureus</i>	S4B	PROB

Common Name	Scientific Name	Provincial S-Rank	Breeding Evidence Category
Purple Martin	<i>Progne subis</i>	S4B	PROB
Red-breasted Nuthatch	<i>Sitta canadensis</i>	S5	CONF
✓Red-eyed Vireo	<i>Vireo olivaceus</i>	S5B	CONF
*Red-shouldered Hawk	<i>Buteo lineatus</i>	S4B	PROB
Red-tailed Hawk	<i>Buteo jamaicensis</i>	S5	POSS
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	S4	CONF
✓Ring-billed Gull	<i>Larus delawarensis</i>	S5B, S4N	CONF
Rock Pigeon	<i>Columba livia</i>	SNA	POSS
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>	S4B	CONF
Ruby-throated Hummingbird	<i>Archilochus colubris</i>	S5B	CONF
Ruffed Grouse	<i>Bonasa umbellus</i>	S4	CONF
Savannah Sparrow	<i>Passerculus sandwichensis</i>	S4B	CONF
Scarlet Tanager	<i>Piranga olivacea</i>	S4B	PROB
Sedge Wren	<i>Cistothorus platensis</i>	S4B	POSS
Sharp-shinned Hawk	<i>Accipiter striatus</i>	S5	POSS
Song Sparrow	<i>Melospiza melodia</i>	S5B	CONF
Sora	<i>Porzana carolina</i>	S4B	CONF
Spotted Sandpiper	<i>Actitis macularius</i>	S5	CONF
Swamp Sparrow	<i>Porzana carolina</i>	S5B	CONF
Tree Swallow	<i>Tachycineta bicolor</i>	S4B	CONF
Trumpeter Swan	<i>Cygnus buccinators</i>	S4	CONF
Turkey Vulture	<i>Cathartes aura</i>	S5B	CONF
Upland Sandpiper	<i>Bartramia longicauda</i>	S4B	PROB
Veery	<i>Catharus fuscescens</i>	S4B	PROB
Vesper Sparrow	<i>Poocetes gramineus</i>	S4B	POSS
Virginia Rail	<i>Rallus limicola</i>	S5B	CONF
Warbling Vireo	<i>Vireo gilvus</i>	S5B	CONF
White-breasted Nuthatch	<i>Sitta carolinensis</i>	S5	CONF
White-throated Sparrow	<i>Zonotrichia albicollis</i>	S5B	CONF
Wild Turkey	<i>Meleagris gallopavo</i>	S5	CONF
Wilson's Snipe	<i>Gallinago delicata</i>	S5B	CONF
Winter Wren	<i>Troglodytes troglodytes</i>	S5B	PROB
Wood Duck	<i>Aix sponsa</i>	S5	CONF
✓*Wood Thrush	<i>Hylocichla mustelina</i>	S4B	PROB
✓Yellow Warbler	<i>Setophaga petechia</i>	S5B	CONF
✓Yellow-bellied Sapsucker	<i>Sphyrapicus varius</i>	S5B	CONF
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	S4B	POSS
Yellow-rumped Warbler	<i>Setophaga coronata</i>	S5B	CONF

✓ Indicates species was recorded during the May 13, 2016 terrestrial site visit.

* Indicates Species at Risk (provincially and/or federal) refer to Section 5.6.5 for details.

Breeding Evidence: OBS=observed, POSS=possible, PROB=probable, CONF=confirmed

Provincial S-Rank:

SH – Possibly Extirpated (Historical); species occurred historically and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years

S1 - Extremely rare in Ontario; usually 5 or fewer occurrences in the province, or only a couple remaining hectares

S2 - Very rare in Ontario; usually between 6 and 20 occurrences in the province, or only a few remaining hectares

S3 - Rare to uncommon in Ontario; usually between 21 and 80 occurrences in the province; may have fewer occurrences, but with some extensive examples remaining

S4 - Considered to be common in Ontario. It denotes a species that is apparently secure, with over 80 occurrences in the province

S5 - Indicates that a species is widespread in Ontario. It is demonstrably secure in the province.

? - A question mark following the rank indicates that there is some uncertainty with the classification due to insufficient information.

SNA - Not Applicable – a conservation status rank is not applicable because the species is not a suitable target for conservation activities

S#B – Conservation status refers to the breeding population of the species in Ontario.

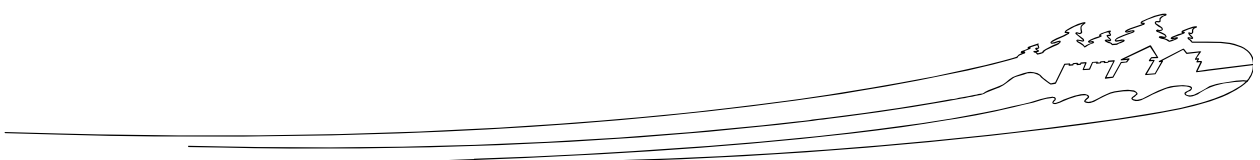
S#N - Conservation status refers to the non-breeding population of the species in Ontario.

April 2015



APPENDIX E

ENVIRONMENTAL IMPACT ANALYSIS TOOLS: DIRECT EFFECTS IDENTIFICATION MATRIX



Appendix D: Environmental Impact Analysis Tools: Direct Effects Identification Matrix

	Phase	Examples of Associated Activities	Valued components potentially directly affected by the proposed project							
			Natural Environment					Human Environment		
			Air (dust and noise)	Soil & Geology	Water (surface, ground, crossings, etc.)	Flora (including SAR)	Fauna (including SAR)	Cultural Heritage & Archaeology	Recreational Use & Navigation	Traffic
Project Components	Preparation / Construction / Operation / Decommission	Supply and storage of materials	<input type="checkbox"/>	<input checked="" type="checkbox"/> Note 1	<input checked="" type="checkbox"/> Note 1	<input checked="" type="checkbox"/> Note 1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Grading	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Note 2	<input checked="" type="checkbox"/> Note 3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Note 4	<input checked="" type="checkbox"/> Note 5	<input type="checkbox"/>	<input type="checkbox"/>
		Implementation of traffic detour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/> Note 6
		Bridge repair/upgrade-replacement/demolition	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Note 7	<input checked="" type="checkbox"/> Note 7	<input checked="" type="checkbox"/> Note 7,8	<input checked="" type="checkbox"/> Note 5,7	<input checked="" type="checkbox"/> Note 5	<input checked="" type="checkbox"/> Note 9	<input checked="" type="checkbox"/> Note 6
		Wastewater disposal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Waste Disposal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Excavation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Use of machinery	<input checked="" type="checkbox"/> Note 4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Note 3	<input checked="" type="checkbox"/> Note 4	<input checked="" type="checkbox"/> Note 4	<input checked="" type="checkbox"/> Note 5	<input type="checkbox"/>	<input type="checkbox"/>
		Transport of materials/equipment	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Localized dewatering	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Concrete repairs	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Use of chemicals / compounds	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Removal of temporary facilities/roads	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Note 3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Note 4	<input checked="" type="checkbox"/> Note 5	<input type="checkbox"/>	<input type="checkbox"/>
		Revegetation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Removal of ESC	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Notes:

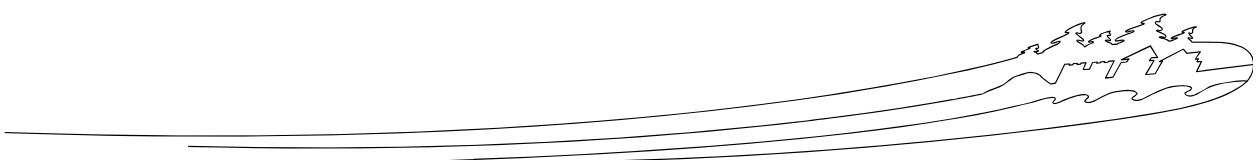
1. Potential for spill; however, mitigation measures are designed to contain spills and eliminate impacts.
2. Minor grading to accommodate site access and staging areas may be necessary.
3. ESC measures will be in place to mitigate effects.
4. Temporary noise disturbance.
5. Use of heavy machinery has potential to impact artifacts. Clearance from the appropriate authorities will be necessary prior to commencement.
6. Passage for vehicular and foot traffic will not be available at the site over the duration of the project. Impacts will be significant related to the required traffic detour. A Traffic Control Plan will be in place in accordance with the Transportation Association of the Canada and the Ontario Ministry of Transportation.
7. Waste produced will have to be contained and disposed of according to regulatory requirements.
8. Temporary laydown areas may be necessary.
9. May result in minor delays for passage; however, the waterway is expected to remain open for use over the duration of the project.

April 2015



APPENDIX F

ENVIRONMENTAL IMPACT ANALYSIS TOOLS: INDIRECT EFFECTS IDENTIFICATION MATRIX



Appendix E: Environmental Impact Analysis Tools: Indirect Effects Identification Matrix

Phase	Natural resource components affected by the project	Impacts as a result of changes to the environment					
		With respect to non-Aboriginal peoples:	With respect to Aboriginal peoples:		With respect to recreation (visitor experience):		
		Health & socio-economic conditions	Health & socio-economic conditions	Current use of lands and resources for traditional purposes	Access & Services	Recreation	Safety
Preparation / Construction / Operation / Implementation / Decommission	Could impacts to <u>air</u> lead to adverse effects on...	No	No	No	No	No	No
	Could impacts to <u>soils and landforms</u> lead to adverse effects on...	No	No	No	No	No	Yes Note 1
	Could impacts to <u>water</u> (e.g. surface, ground water and water crossings) lead to adverse effects on...	No Note 2	No Note 2	No Note 2	Yes Note 3	No Note 2	No Note 1
	Could impacts to <u>flora</u> (including SAR) lead to adverse effects on...	No	No	No	No	No	No
	Could impacts to <u>fauna</u> (including SAR) lead to adverse effects on...	No	No	No	No	No	No

Notes:

1. Safety concerns are inherent to construction and temporary changes to traffic routes. All necessary precautions will be taken to ensure personnel and the public are safe and traffic signage is efficient. A Traffic Control Plan will be in place in accordance with the Transportation Association of the Canada and the Ontario Ministry of Transportation.
2. Based on the assumption that mitigation measures will be enforced for all phases and project works will not interfere with the Trent-Severn Waterway navigation season.
3. Passage for vehicular and foot traffic will not be available at the site over the duration of the project. Impacts will be significant related to the required traffic detour.

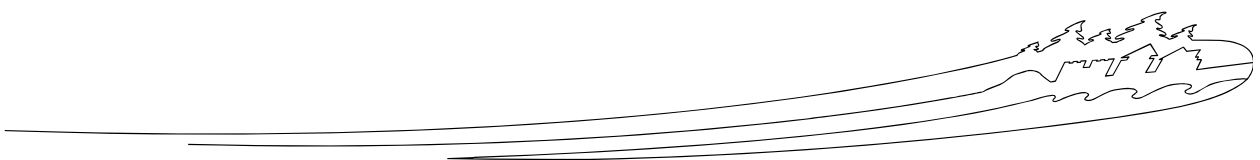
April 2015



APPENDIX G

APPLICABLE BY-LAWS

(Important Note: It is the Contractor's responsibility to ensure all applicable by-laws are adhered to during construction. At the time of construction, by-law requirements may extend beyond those included in this appendix.)



THE DISTRICT MUNICIPALITY OF MUSKOKA

BY-LAW NO. 88-29

Being a by-law providing for
the planting, care and removal
of trees on District Roads.

WHEREAS authority for enacting such by-laws is provided by Section 38 of the District Municipality of Muskoka Act, R.S.O. 1970, c. 121 and subsection 4 of Section 313 of the Municipal Act, R.S.O. 1980, c. 302;

NOW THEREFORE THE COUNCIL OF THE DISTRICT MUNICIPALITY OF MUSKOKA
HEREBY ENACTS AS FOLLOWS:

INTERPRETATION:

1. In this by-law,
 - a) "District Engineer" means the District Engineer of the District Municipality of Muskoka or his designate;
 - b) "District" means The District Municipality of Muskoka;
 - c) "Council" shall mean the Council of The District Municipality of Muskoka;
 - d) "Tree" includes a growing tree or shrub planted or left growing within the lateral limits of a highway for the purpose of shade or ornament and also the portion of a tree on private property extending over a highway;
 - e) "Highway" shall include all common and public highways under the jurisdiction of the District.

MUNICIPAL ARBORIST:

2. The District Engineer shall be the municipal arborist for the District and shall have supervision and care over all trees now and hereafter planted or growing on any highway of the District, and it shall be his duty to enforce the provisions of this by-law.

3. The Council may annually appropriate and expend out of its current revenues, such sums of money as shall be requisite for the purchase and planting, caring for, trimming and removing of trees upon highways of the District in accordance with this by-law.

4. The District Engineer may formulate a master Tree Plan specifying the species of trees to be planted on each highway or designated portions of highway of the District, having regard to the needs of the residents of the District including safety, aesthetic considerations, noise and pollution control, maintenance of utilities, recreation and the protection of wildlife, water and soil, and the desirability of employing indigenous species of trees and shrubs.

PLANTING TREES UPON HIGHWAY:

5. Any tree planted upon a highway shall be located at such distance from the street line or from the sidewalk or from any other tree planted or growing on the same highway as may be determined by the District Engineer.

6. No tree shall be so planted that the same is or may become a nuisance or obstruct the reasonable use of the highway.

7. The District Engineer may refuse to permit the planting of trees, or the planting of any one or more species or variety of trees, upon a highway of the District, or part thereof, by reason of the nature of the pavements, walks, sewers or other works thereon, or the use to which the lands abutting the highway are put, or in consequence of the extent and nature of the traffic thereon, or the insufficient breadth thereof, or by reason of the existence of rock or unfertile soil thereunder, or where the planting of trees thereon would be impracticable or dangerous to traffic or constitute a nuisance upon the property or equipment of the District.

8. Where all or more than one-half the total number of trees planted on any highway or on one side thereof are of a certain species or variety, the District Engineer may require that all trees proposed to be planted on such highway or upon one side thereof, shall be of the same species and variety as the trees, or the greatest number of the trees already planted thereon.

9. The District Engineer may plant or cause to be planted, trees upon any highway.

PROHIBITED SPECIES:

10. No person shall plant on a highway of the District any tree of any of the following species or varieties:

Manitoba Maple, Poplar (all kinds), and Willows (all kinds).

11. The District Engineer may remove without notice any of the species of tree referred to in Section 10 herein growing on a highway of the District or planted thereon contrary to this by-law.

PROHIBITING INJURY OR DESTRUCTION TO TREES:

12. (1) Except as herein provided, no person shall destroy or injure or cause or permit any activity which may destroy or injure any tree.

(2) No person shall attach any object or thing to a tree located on any highway of the District except with the written consent of the District Engineer.

REMOVAL OF TREES:

13. No person shall remove or cut down any tree growing upon a highway except with the written permission of the District Engineer.

14. After the Engineering and Public Works Committee of Council has recommended that it is necessary in the public interest to cause any healthy tree planted upon a highway to be removed and Council has confirmed such recommendation in a by-law, then the District Engineer shall serve ten (10) days notice of the intention of the Council to remove such tree to the owner of the adjacent land nearest thereto in accordance with the requirements of the Municipal Act.

15. The Council shall hear in person or by his agent any person to whom a notice was served under Section 14, who within ten (10) days of service gives notice in writing to the Clerk of the District that he desires to make representations respecting the intention of Council to remove the tree referred to in the Notice. Council may, after hearing the person's representations, revoke or reconfirm its intention to remove the tree from the highway.

16. Any person who has planted and protected a tree upon a highway, the proof of which is upon the person, shall upon its removal be entitled to be recompensed for such trouble by having the log cut in convenient firewood lengths to be determined by the District Engineer and neatly piled on the person's property adjacent to the highway or to receive in lieu thereof if the person so desires the current market value of such an amount of firewood.

17. The District Engineer may cause any decayed or dangerous trees to be removed without notice.

18. If the owner of a property that abuts a highway is denied proper access to the use of his property by the existence of healthy trees on the highway, the District Engineer may approve the removal of the healthy trees on the condition that the owner of the abutting property replaces such trees with young trees approved by the District Engineer and provided at the abutting owner's expense.

19. The District Engineer may approve in writing the removal of healthy trees on a highway for the construction of road, water, sewer, hydro, gas and telephone services or any other necessary public services.

20. The District Engineer may trim or cause to be trimmed trees planted upon a highway or upon private property where the branches extend over a highway.

ENFORCEMENT AND ADMINISTRATION:

21. Any person who contravenes any of the provisions of this by-law is guilty of an offence and on conviction is liable to a fine of not more than Two Thousand (\$2,000.00) Dollars exclusive of costs. Procedure to be by way of the Provincial Offences Act, R.S.O. 1980, c. 400.

22. When a person has been convicted of an offence under this by-law, the Provincial Offences Court or any Court of competent jurisdiction thereafter may, in addition to any other penalty imposed on the person convicted, issue an Order prohibiting the continuation or repetition of the offence or the doing of any act or thing by the person convicted directed towards the continuation or repetition of the offence.

23. Any notice required to be given hereunder may be given by leaving it with a grown-up person residing on the land or if the land is unoccupied by posting it in a conspicuous place on the land.

EFFECTIVE DATE:

24. This by-law shall come into force and take effect upon the date it receives third reading.

READ A FIRST TIME: April 5, 1988

READ A SECOND TIME: April 5, 1988

READ A THIRD TIME
AND FINALLY PASSED: April 5, 1988

THE DISTRICT MUNICIPALITY
OF MUSKOKA

By *Ally Sand*
Chairman

S. Gorman
Dep Clerk

THE DISTRICT MUNICIPALITY
OF MUSKOKA

By *Ally Sand*
Chairman

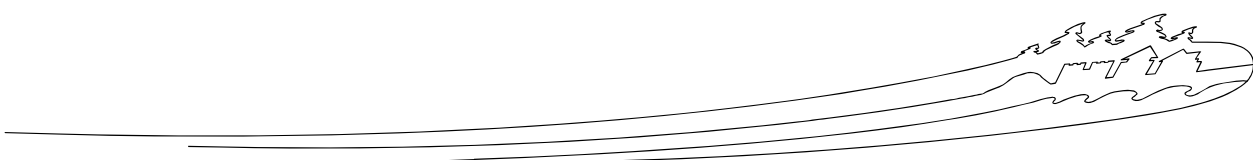
S. Gorman
Dep Clerk

April 2015



APPENDIX H

MNRF'S SPECIES AT RISK BRANCH BEST PRACTICES TECHNICAL NOTE: REPTILE AND AMPHIBIAN EXCLUSION FENCING VERSION 1.1

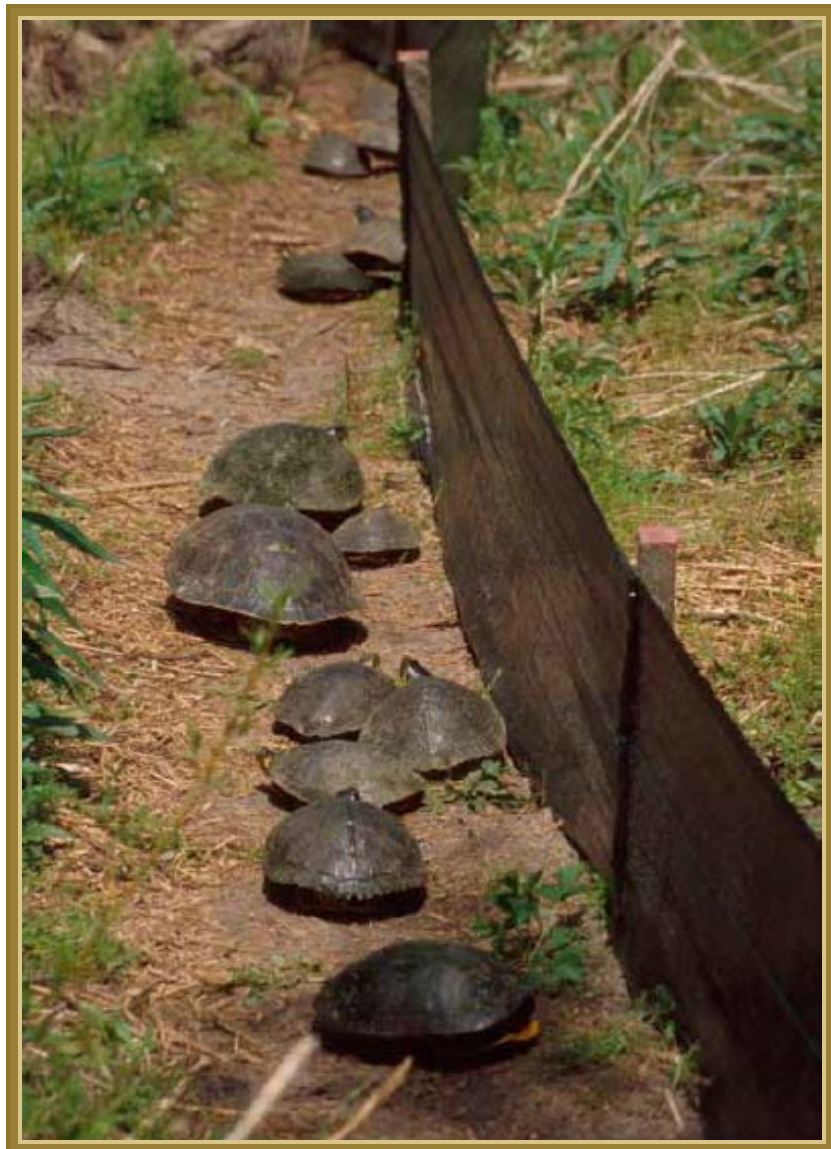


SPECIES AT RISK BRANCH BEST PRACTICES TECHNICAL NOTE

REPTILE AND AMPHIBIAN EXCLUSION FENCING

Version 1.1

July 2013



July 2013

Ontario Ministry of Natural Resources
Species at Risk Branch

Recommended Citation:

OMNR. 2013. Reptile and Amphibian Exclusion Fencing: Best Practices, Version 1.0. Species at Risk Branch Technical Note. Prepared for the Ontario Ministry of Natural Resources, Peterborough, Ontario. 11 pp.

Cover illustration: Photograph by Matthew J. Aresco, Conservation Director, Nokuse Plantation

Before an activity can be initiated, permissions, approvals or authorizations may be required from MNR (e.g. Endangered Species Act authorization, Wildlife Scientific Collector's Authorization) or other agencies, levels of government (e.g. a conservation authority, municipality, federal or provincial government), or landowners. It is your responsibility to ensure that all necessary permissions, approvals and authorizations are acquired prior to proceeding with your activity.

This document presents information as of the point in time of publication and is meant to be updated through time as improved information becomes available.

Cette publication hautement spécialisée, Reptile and Amphibian Exclusion Fencing Best Practices n'est disponible qu'en anglais en vertu du Règlement 671/92 qui en exempte l'application de la Loi sur les services en français. Pour obtenir de l'aide en français, veuillez communiquer avec le ministère des Richesses naturelles au Pamela Wesley, 705-755-5217.

Document History

Revision Number	Revision Date	Summary of Changes	Originated	Reviewed	Authorized
1.1	June, 2013	Pre-publishing edits	June, 2013	June, 2013	June, 2013

REPTILE AND AMPHIBIAN EXCLUSION FENCING - BEST PRACTICES -

The purpose of this guidance document is to provide an overview of proven design and installation techniques for reptile and amphibian exclusion fencing. Though this document points to site and species-specific design requirements, it is important to recognize that every situation is different. This guidance is not meant to replace site-specific advice obtained from local MNR staff or experienced exclusion fencing contractors. Moreover, exclusion fences are only effective when well planned, properly constructed, and maintained.

Exclusion fencing seeks to eliminate access to specific areas where activities that could harm animals are occurring (e.g. active aggregate operations, construction sites, and roads). The selection and installation of exclusion fencing can present some challenges, particularly if multiple species are being excluded. For example, some reptiles and amphibians are able to dig under fencing while others can climb over. Some may also take advantage of burrows dug by other animals. To maintain effectiveness, the bottom of the fence should be buried or secured firmly to the ground and minimum height recommendations (Table 1) are considered.

Exclusion fence design should consider the target species as well as those that might be unintentionally impacted. Fencing material should not pose a risk of entanglement or permit individuals to pass underneath or between openings. Landscape features such as topography and substrate need to be considered as they may constrain fencing design.

Including plans for fencing in advance of a project can increase efficiency and fence

effectiveness. For example, long-term road projects that will include a permanent sound barrier could design the sound barrier such that it also meets the specifications of the required exclusion fence.

EFFECTIVE FENCE CHARACTERISTICS

The fence burial and height recommendations listed in Table 1 below have been compiled from scientific literature, established management practices, and practitioner best advice. These are general recommendations and at times other specifications may be more appropriate. For instance, in areas where the substrate does not permit fence burial, weighing down the fence with heavy items (e.g. sand bags) or backfilling may be acceptable. Where needed, speak with your local MNR staff or experienced exclusion fencing contractor to develop site-specific plans.

If multiple species are being excluded from the same area, and the species-specific fencing specifications differ, the uppermost minimum height and greatest depth recommendation should be used (Table 1). If you are excluding both Blanding's Turtle and Gray Ratsnake, for example, the exclusion fence should be a minimum of 2 m tall (see Gray Ratsnake section below for additional details).

Exclusion fences should be installed prior to emergence from hibernation. A survey of the enclosed/secluded area should be conducted immediately following fence installation to ensure that no individuals have been trapped on the wrong side of the fence.

Table 1. Recommended burial depth and height requirements of exclusion fencing for reptiles and amphibians. Recommended height is the height of the fence after it has been installed including the buried components and any installed overhangs or extended lips.

SPECIES	RECOMMENDED DEPTH OF FENCE BURIED (cm) *	RECOMMENDED HEIGHT OF FENCE (cm) **
Turtles – general	10 – 20	60
Eastern Musk Turtle, Wood Turtle	10 – 20	50
Massasauga, Eastern Hog-nosed Snake, Butler's Gartersnake, Queensnake	10 – 20	60
Gray Ratsnake & Eastern Foxsnake	10 – 20	200
Fowler's Toad	10 – 20	50
Snakes - general	10 – 20	100
Common Five-lined Skink	10 – 20	unknown
Salamanders	10 – 20	30

* does not include the 10 cm horizontal lip that should extend outward an additional 10 – 20 cm (see Figure 2)

** the height of fencing has been provided as an approximate. Fencing materials may in fact not be available in proportions that would allow for these precise measurements. It is most effective, if the height and burial depth recommendations are met.

DURATION OF ACTIVITIES & DEGREE OF ANTICIPATED DISTURBANCE

The type of disturbance, the proximity to disturbance, and the planned fence longevity are factors that influence which type of exclusion fence is most effective. For short-term activities (i.e. 1 to 6 months) such as minor road repairs, a light-duty geotextile fence is appropriate. Longer term or permanent fencing projects, however, require more durable materials such as – heavy-duty geotextile, wood, concrete, woven-wire, sheet metal, vinyl panels, or galvanized mesh.

GEOTEXTILE FENCES

Geotextile fences (e.g. silt fences) come in many types and qualities. They can be very effective for the temporary exclusion of reptiles and amphibians. For the purposes of this document, temporary use ranges from a few months up to 2-3 years. Winter

weather is generally damaging to geotextile materials and the cost of maintenance over the long-term should be considered during the planning phase. Depending upon the quality, geotextile can be resistant to UV degradation and the bio-chemical soil environment.

Light-duty Geotextile Fencing:

Light-duty geotextile fencing is made of nylon material and is typically purchased with wooden stakes pre-attached at 2 m to 3 m intervals (Plate 1). It can also come without pre-attached stakes. Light-duty geotextiles are largely intended for projects with shorter durations of only a few months in duration and up to one season.

Geotextile fencing with nylon mesh lining should be avoided due to the risk of entanglement by snakes.

To use light-duty geotextile fencing:

- Fencing fabric is effective if attached to wooden, heavy plastic or metal stakes using heavy-duty wire staples or tie-wire (Figure 2).
- Secure the fence on posts that are placed at 2 m to 3 m apart. If using the greater recommended distance between posts, additional maintenance may be required to maintain effectiveness.
- Securely drive the stakes into the ground to a recommended depth of 30 cm. The fencing fabric should be buried to the recommended specifications in Table 1 and back-filled with soil.
- For snakes, supporting posts should be staked on the activity side (e.g. on the side facing the aggregate stock pile or the road - Figure 2).
- Light-duty geotextile fences are not effective where rocks or other hard surfaces prevent proper anchoring of fence posts and burial of the fence fabric.
- Light-duty geotextile fences are not effective where a large amount of concentrated run-off is likely or to cross streams, ditches or waterways without specific modifications.
- Contact your local MNR staff or experienced exclusion fencing contractor for advice and recommendations.
- See general best practices section below for additional details.

Generally, light-duty geotextile fences are not effective if they exceed 1 metre in height unless purposely manufactured for greater height (e.g. stakes placed at closer intervals or cross braces). If greater height is required consider using heavy duty geotextile, hardware cloth or other fencing materials.



Plate 1. Light-duty geotextile fencing with pre-attached wooden stakes used to exclude turtles from a road as seen on a regular maintenance check (photo credit: Brad Steinberg).

Heavy-duty Geotextile Fencing:

Heavy-duty geotextile fencing is typically constructed of a thick felt-like fabric. It may also be called 'double row' or 'trenched' fencing. For support, this fencing uses a woven wire fence (e.g. chain link) or some other structure (Plate 2). It is recommended that a minimum density of 270R or equivalent woven geotextile fabric is used.

Heavy-duty geotextile material can be effective for up to 2 or 3 years with proper maintenance. This type of fencing can be damaged by small mammals chewing through or torn by heavy debris (e.g. tree branches). Therefore, it may be best suited to turtles, which are less likely to take advantage of holes or tears in the fabric. If

used to exclude snakes or other animals, more maintenance may be required.

Heavy-duty geotextile fencing:

- The wire fence should be installed on the activity side to prevent animals from leveraging and climbing into the exclusion area while allowing the animal to escape if they find themselves on the wrong side (Figure 2).
- Geotextile fences across streams, ditches or waterways should have case-specific modifications.
- Contact your local MNR staff or experienced exclusion fencing contractor for advice.
- See light-duty geotextile section above and general best practices below for additional details.



Plate 2. Example of a heavy-duty geotextile fencing used to exclude snake species (photo credit: Jeremy Rouse).

HARDWARE CLOTH FENCES

Hardware cloth (also known as galvanized mesh or Birdscreen) is durable, cost effective and useful for excluding reptiles and amphibians. The fence should be made of heavy galvanized hardware cloth with a ¼ inch mesh. For fences intended to exclude small snakes, a ⅛ inch mesh may be more effective. In contrast, fencing intended to exclude turtle species can have a larger mesh size (e.g. ½ inch). Larger mesh may have a longer lifespan as it is constructed from a thicker material compared to smaller mesh sizes.

To use hardware cloth fencing:

- Secure the fence on posts placed a recommended 2.5 m apart with the stakes on the activity side (Figure 2).
- Pull the mesh taught and staple or secure with screws and a metal stripping to prevent the mesh from being ripped when pressure is applied.
- Installing a top rail or folding the mesh over a taut smooth wire reduces tearing (Plates 3 and 4).
- An outward facing lip installed on the species side ensures that snakes and amphibians are unable to climb or jump over the fence (Figure 2; Plate 4)
- Tears can be mended with 18-gauge galvanized wire.
- See general best practices section below for additional details.



Plate 3. Example of a galvanized mesh fencing used for the long-term exclusion of snakes and turtles from the adjacent highway (photo credit: Megan Bonenfant).



Plate 4. Long-term to permanent exclusion fencing using galvanized mesh with over-hanging lip to prevent animals from climbing or jumping over (photo credit: Megan Bonenfant).

WOOD LATH SNOW FENCING

In certain circumstances, wood lath snow fencing can be effective at excluding turtles. This fencing is typically constructed from soft wood slats that have been woven together with 13-gauge wire and is then attached to steel fence posts which have been driven into the ground.

Wood lath fencing is cost effective and can easily be laid down during the winter to prevent damage. The durability of the material, however, is not meant for very long-term use (e.g. more than 3 years), unless regular maintenance occurs.

To use wood lath snow fencing:

- The fencing should be attached to heavy plastic or metal stakes using heavy-duty wire staples or tie-wire.
- The stakes are recommended to be placed at 2 to 3 m intervals and securely driven into the ground 30 cm or more.
- Wood lath snow fencing across streams, ditches or waterways should have case-specific modifications.
- Wood lath snow fencing lends itself well to being combined with other types of material to ensure complete exclusion.
- See general best practices section below for additional details.



Plate 5. Example of a wood lath snow fencing used to exclude turtles (photo credit: Karine Beriault).

EXCLUSION FENCING FOR GRAY RATSNAKE AND EASTERN FOXSNAKE

Gray Ratsnake and Eastern Foxsnake are the largest snakes in Ontario - reaching nearly 2 m in length. They are also excellent climbers. For this reason, fencing intended to exclude either of these species has additional recommended design specifications.

- The fence should be at least 2 m high.
- The material on the species side (Figure 2) should be smooth to prevent the snakes from climbing into the excluded area.
- Stakes should be on the activity side of the fence (Figure 2).
- Due to the increase in fence height, it is valuable to decrease the distance between posts or install diagonal braces.
- See general best practices section below for additional details.

CONCRETE, SHEET METAL & VINYL WALLS

Concrete, metal or vinyl walls can stand alone or be combined with woven wire or chain link fences. They are durable, require minimal maintenance and are effective in excluding target species from high risk areas and guiding them to crossing structures or other desired locations (Plates 6 and 7). This fence type is comprised of a continuous vertical face of concrete, metal or vinyl sheeting with no gaps. Concrete walls can be installed as either pre-cast sections or pour directly in place.



Plate 6. Stand-alone continuous concrete wall used to exclude salamander species installed as pre-cast forms (photo credit: Steven Roorda).



Plate 7. Pre-formed vinyl sheeting fence intended to exclude salamanders for a construction site (photo credit: Herpetosure Ltd.)

The wall height depends upon the target species, but they are usually between 45 and 60 cm tall and buried 25 cm. Concrete, metal or vinyl exclusion fencing is most appropriate for salamanders, skinks, small snakes, and small turtles. For large turtle species, a chain link fence can be installed directly on top of the concrete wall for complete exclusion.

HABITAT CONNECTIVITY

Habitat connectivity is the connectedness between patches of suitable habitat or the degree to which the landscape facilitates animal movement. Exclusion fencing installed along roads or other large projects can effectively reduce or eliminate habitat connectivity for animals. In these scenarios, exclusion fencing should be considered with eco-passages in order to maintain connectivity. Fencing in isolation should be viewed as a temporary method to reduce mortality until species movement can be restored. Where eco-passages are not feasible they should be identified for consideration with any future road work or development to improve connectivity.

During the installation of fencing with an eco-passage, it is important that the fencing sits flush with the passage to ensure that

there are no gaps where animals can squeeze through.



Plate 7. A wood turtle travelling through a dry eco-passage. Ecopassages such as this help to ensure the long-term connectivity of seasonal habitat for this and other reptile and amphibian species (photo credit: Amy Mui).

GENERAL BEST PRACTICES:

- To deter digging, bury the fence 10 cm down with an additional 10 cm horizontal lip (Figure 2).
- Backfill and compact soil along the entire length on both sides of the fence (Figure 2).
- Once the fence is installed, a survey should be done to ensure that no individuals have been trapped inside (speak with MNR for survey advice).
- Exclusion fencing intended to exclude snakes should have the stakes installed on the activity side (opposite the normal requirement for sediment control fencing) to prevent snakes from using the stakes to maneuver over the fencing.
- For snakes and toads, the fence should have an overhanging lip on the species side (Figure 2).
- Fences should be inspected after spring thaw and at regular intervals throughout the active season, especially following heavy rain events. This is particularly important

for geotextile fences. Any damage that affects the integrity of the fence (e.g. tears, loose edges, collapses, etc.) should be fixed promptly.

- Tall or woody vegetation on the species side of the fence should be managed if there is a risk that it may enable the animals to climb over. This is most important during spring and fall. Proceed cautiously to not harm animals protected plant species during vegetation removal.
- When installing an eco-passage, fencing or exclusion walls should be used as a guiding system to direct animals to passage openings.
- Natural screens such as trees or shrubs can help to reduce road access and can be combined with fencing to provide protection of individuals from predation.
- Install fences with a turn-around at the ends furthest from the wetland habitat and at any access areas to assist in redirecting animals away from any fence openings (Figure 1).
- Curving the ends of the fencing inward (i.e. away from the road or construction site) may help to reduce access to these locations. The ends may also be tied off to natural features on the landscape such as trees or rock cuts.

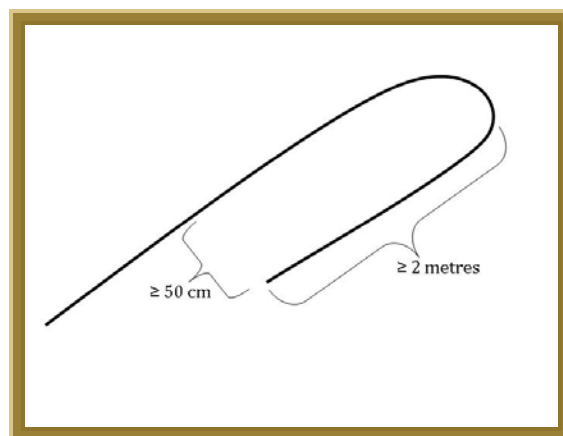


Figure 1. Diagram of the ends of the fence designed to curve inward in order to direct animals away from the area of exclusion.

WATER MOVEMENT & DRAINAGE

- In areas where surface water run-off may erode a soil-based backfill, consider using rocks or sand bags. Ensure these materials cannot be used by animals to climb over the fence.
- Where possible, minimize the number of water crossings: when necessary, it should occur where flow is minimal.
- Fence posts in waterways or areas prone to seasonal flooding should be driven rather than dug – unless following established best practices.
- Fencing should be placed above the high water mark anticipated for high water events such as spring freshet or periods of heavy or continuous rainfall.

TOPOGRAPHY:

- Fence posts should be closer together in undulating topography.
- Fences installed on slopes have a different effective height depending upon whether the animal will be approaching from the up or down slope. The fence height can be adjusted accordingly.

Improvements or questions regarding exclusion fencing can be brought to the local MNR Species at Risk Biologist or other MNR staff.

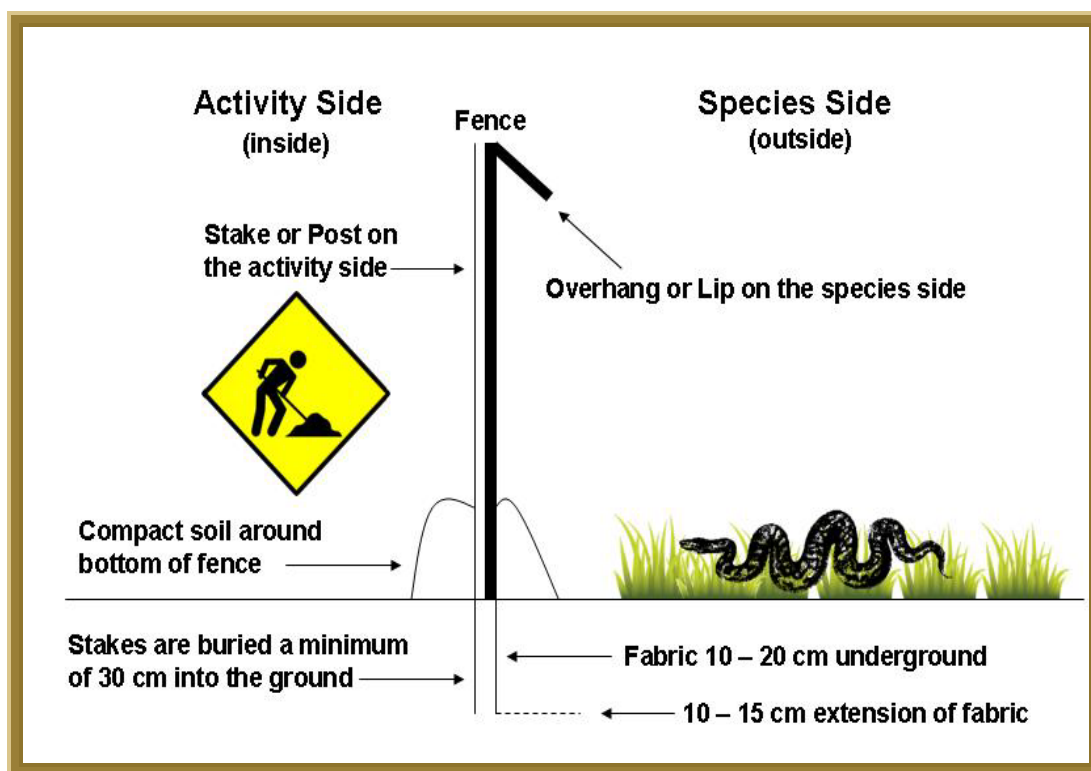


Figure 1. A side view of a basic exclusion fence including an overhang or flexible lip to deter animals from climbing or jumping over the fence. Placement of the stake on the Activity Side or on the inside of excluded area is also illustrated. This is particularly important for snake species which may use the stakes to maneuver over the fence.

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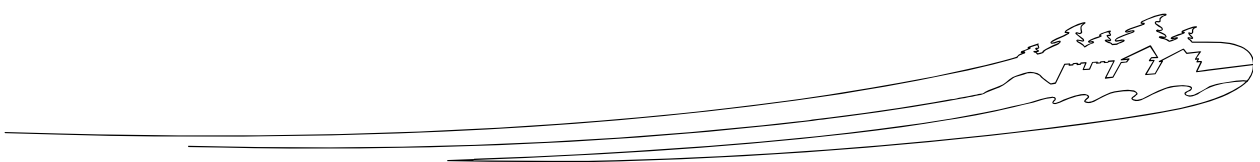
For additional information:

Visit the species at risk website at
ontario.ca/speciesatrisk
Contact your MNR district office
Contact the Natural Resources
Information Centre
1-800-667-1940
TTY 1-866-686-6072
mnr.nric.mnr@ontario.ca
ontario.ca/mnr

April 2015



APPENDIX I
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