CN Milton Logistics Hub: Wildlife Management and Connectivity Plan

February 14, 2022
File: 160960844

Prepared for:

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Table of Contents

LIST OF TABLES

LIST OF APPENDICES

Abbreviations

ARU	Automated Recording Units
CH	Conservation Halton
CN	Canadian National Railway Company
ECCC	Environment and Climate Change Canada
EIS	Environmental Impact Statement
EPP	Environmental Protection Plan
IAAC	Impact Assessment Agency of Canada
LAA	Local Assessment Area
MNRF	Ministry of Natural Resources and Forestry
PDA	Project Development Area
RNHS	Regional Natural Heritage System
SARA	*Species at Risk Act*
SWM	stormwater management
VES	Visual encounter surveys
WSCA	Wildlife Scientific Collector's Authorization

1.0 INTRODUCTION

This document outlines the details of the Wildlife Management and Connectivity Plan (WMCP) and incorporates the Follow-Up Programs for migratory birds, Western Chorus Frogs, grassland bird habitat, Snapping and Midland Painted Turtles, Monarch butterfly, Eastern Milksnake and habitat connectivity, in relation to pre-construction and operation of the Milton Logistics Hub and has been developed concurrently with other programs to ensure consistency and efficiencies in monitoring throughout the lifespan of this Project.

The wildlife management and connectivity plan presented below and the associated monitoring details, has been developed to comply with the conditions of approval in the Minister of the Environment and Climate Change's Decision Statement issued January 21, 2021. This program has been developed to comply with Conditions 8.4, 8.10, 8.13, 8.21, 8.25, 8.28, 8.32 and 8.33 of the Decision Statement and has been developed in consultation with Environment and Climate Change Canada (ECCC), Halton Region, Conservation Halton (CH), Mississaugas of the Credit First Nation (MCFN), Six Nations of the Grand River, and other relevant authorities. Draft versions of this document were provided to ECCC on May 31, 2021, Ministry of the Environment Conservation and Parks (MECP) on June 8, 2021, Halton Region on June 4, 2021, CH on June 28, 2021, MCFN on January 14, 2021, and Six Nations of the Grand River on March 3, 2021. Comments were received from ECCC, MECP and have been considered in finalizing this document. Any revisions and manner by which comments were addressed, including corresponding rationale, were communicated to those who responded to CN's request for input. No updates to this follow-up program are proposed over the implementation of this follow-up program, unless conditions of monitoring outlined below are identified.

The wildlife management and connectivity plan contains the mitigation measures that will be implemented which are specific to wildlife and migratory bird management prior to and post construction of the Project. In accordance with Condition 8.33.5 of the Decision Statement, the process for the identification of each mitigation measure took into consideration the preference to avoid environmental effects over minimizing environmental effects and to minimizing environmental effects overcompensating for environmental effects. When no mitigation to minimize environmental effects were possible, compensation for environmental effects was completed.

While the wildlife management and connectivity plan focuses on the mitigation measures for migratory birds, species at risk and habitat connectivity, the exhaustive list of mitigation measures that will be implemented during the construction of the Project are listed in the Environmental Protection Plan (EPP).

2.0 PROJECT DESIGN CONSIDERATIONS

The wildlife management and connectivity plan will be implemented during pre-construction and operation of the terminal to verify the accuracy of the environmental assessment and determine the effectiveness of proposed mitigation measures. The program has been developed in accordance with the information outlined in Condition 2.6 of the Decision Statement. Wildlife mitigations measures to be implemented during construction are included in the EPP.

This plan consists of two components:

1. Pre-Construction Wildlife Management: The pre-construction wildlife management and connectivity plan includes additional field assessments prior to construction, to update and document the local presence of Western Chorus Frogs, Little Brown Myotis, Eastern Milksnake, turtle habitat and habitat connectivity.
2. Post-Construction (Operation) Wildlife Management: The post-construction and operations wildlife management and connectivity plan will include monitoring to confirm that habitat enhancements and compensation both onsite and offsite are functioning as intended.

3.0 PRE-CONSTRUCTION WILDLIFE MANAGEMENT PLANS

Prior to the commencement of construction, assessments will be completed to confirm key wildlife species, local presence and habitat within the Project Development Area (PDA), and to further evaluate habitat connectivity between the PDA and surrounding regional landscapes (existing or planned through development). Any changes in the species presence or habitat since the last wildlife assessments were completed will be used to focus mitigation measures and ongoing monitoring requirements.

Specific assessments to be completed prior to construction are described below.

3.1 WESTERN CHORUS FROG FOLLOW-UP PROGRAM

In accordance with Condition 8.5 of the Decision Statement, additional targeted Western Chorus Frog surveys have been completed during the spring 2020 to identify breeding and hibernating habitat within the PDA and nearby areas. These surveys were carried out based on survey methodologies developed through consultation with ECCC that were previously used in 2017 during targeted surveys for Western Chorus Frog within the PDA and the Local Assessment Area (LAA). Surveys included auditory surveys (to listen for calling Western Chorus Frogs) and habitat surveys (to assess habitat suitability for Western Chorus Frogs). Survey methods followed the Draft Western Chorus Frog Detection Survey Protocol for Ontario (Blazing Star Environmental).

3.1.1 Auditory Surveys

[redacted]

Daytime surveys were completed between 12:00 and 4:00 pm, to take advantage of the warmest periods of the day. Surveys were conducted on three separate dates between March 27 and April 3, 2020. On each date, five-minute call counts were conducted at each survey station. The PDA was between each station traversed on foot and amphibians observed incidentally between stations were recorded.

[redacted] safety precautions were required, including accompaniment of a flag person. This required advance scheduling, so long term weather forecasts to select survey dates were relied on. As such, not all surveys were conducted during ideal weather conditions (e.g., >10˚C). Temperatures were also seasonally cool in 2020, during the brief period when Western Chorus Frog were calling. To address this concern and to provide additional survey effort, Stantec installed Automated Recording Units (ARU) at each survey station, which recorded throughout the active season. Wildlife Acoustic Song Meter SM3 was the model of ARU used for the surveys. The ARUs were installed on March 20, 2020 and left in place until April 14, 2020. Eight dates during this period were selected for interpretation, based on weather conditions. Although not all eight days selected met the ideal weather conditions, the survey dates selected had the best weather (e.g., warmest temperatures with relatively low winds) during the 2020 Western Chorus Frog breeding period.

On each of the eight ARU dates, a twenty-minute daytime sampling period was analyzed, using recordings that started at 3:00pm. An additional twenty-minute period was analyzed starting at 9:30pm, except for April 7th, which started at 9:45pm to avoid a rain shower. For the daytime analyses, start times were adjusted to avoid times when construction equipment on adjacent lands was in proximity to the ARU causing excessive background noise.

During each of the three in-person surveys, roadside surveys were also conducted at other wetlands in the south Milton area with past records of Western Chorus Frog, to determine if the species was actively calling on that day. The Western Chorus Frog Habitat Data Sheets provided in the draft Ontario protocol were used for the habitat surveys.

3.1.1.1 Auditory Survey Results

During the eleven auditory survey dates, Western Chorus Frogs were observed calling at two survey stations adjacent to the PDA.

- Station 5
    - A single Western Chorus Frog was heard calling on the March 27th in-person survey.
    - A single Western Chorus Frog was heard calling on the April 4th ARU recording during the evening sampling period.

- Station 6
    - A single Western Chorus Frog was heard calling on the March 27th in-person survey.
    - Two Western Chorus Frogs were heard calling on the April 4th ARU recording during the daytime and evening survey period.
    - A single Western Chorus Frog was heard calling on the April 6th ARU recording during the evening survey period.

[redacted] The direction of frog calls heard on the ARU recordings is unknown, but each Western Chorus Frog was heard calling in the distance, suggesting it was on adjacent lands, outside of the PDA. Survey dates and weather conditions of habitat surveys are provided in Table 3-1.

Table 3-1: Summary of survey dates, times and weather conditions

Date	Survey Type	Weather Conditions		
		Temp (˚C)	Wind*	Cloud Cover
March 25, 2020	Auditory - ARU	11	2	Partly cloudy
March 27, 2020	Auditory - In person	8	1	Sunny
March 31, 2020	Auditory - In person	5	2	Overcast
April 1, 2020	Auditory - ARU	9	2	Sunny
April 2, 2020	Auditory - ARU	12	3	Sunny
April 3, 2020	Auditory - In person	11	2	Overcast
April 4, 2020	Auditory - ARU	10	2	Mostly cloudy with periods of light rain.
April 5, 2020	Auditory - ARU	10	2	Sunny
April 6, 2020	Auditory - ARU	13	3	Sunny
April 7, 2020	Auditory - ARU	10	2	Cloudy with periods of light rain.
April 8, 2020	Auditory - ARU	12	3	Cloudy
June 1, 2020	Habitat	18	3	Partly cloudy
June 2, 2020	Habitat	21	2	Partly cloudy

* Wind conditions expressed using Beaufort Scale:

0 – calm, <2km/hr 2 – light, 7-12 km/hr 4 – moderate, 20-30 km/hr 6 – strong, 41-51 km/hr
1 – light, 2-6 km/hr 3 – moderate, 13-19 km/hr 5 – fresh, 31-40 km/hr

3.1.2 Habitat Surveys

Habitat descriptions also considered the critical habitat definition in the Recovery Strategy for the Western Chorus Frog, Great Lakes/St. Lawrence – Canadian Shield population, in Canada (Environment Canada 2015).

Western Chorus Frog habitat was categorized as either wetland (e.g., breeding and dispersal) or terrestrial (e.g., hibernation, foraging, local movement, and dispersal). Habitat patches were mapped in the field and recorded using Arc-GIS Collector on a mobile device.

Descriptions of the wetland habitat included the type of wetland (e.g., marsh, swamp, pond, flooded field or ditch), dominant wetland plant species, presence and relative cover of shrubs and trees, presence and depth of water. Survey dates in late spring provided an indication of the hydro-period of wetland habitats (i.e., if wetland persisted long enough to allow tadpole metamorphosis). Presence of fish or the potential for fish to occur was also noted.

Terrestrial habitat was described by type (e.g., pasture, clearing, meadow, shrubland, woodland), dominant plant species and presence and relative cover of shrubs and trees. Agricultural fields adjacent to the PDA did not appear to be in production in 2020, likely because of construction activities. Those fields that had developed an herbaceous ground layer were considered suitable terrestrial habitat. Fields with predominantly bare soil were not considered suitable.

[redacted]

3.1.2.1 Habitat Survey Results

Descriptions of the Western Chorus Frog habitats at each monitoring station are provided in **Table 3-2**. and depicted in **Figures 1 and 2, Appendix A**. Photos of the Western Chorus Frog habitat at each monitoring station are provided in the Photographic Log (**Appendix** B).

[redacted]

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[redacted] In 2020, suitable terrestrial habitat was present both within and adjacent to the PDA. The total amount of Western Chorus Frog habitat within the PDA is 5 ha. Of note, since completion of the habitat surveys during the Spring of 2020, one of the wetlands [redacted] where Western Chorus Frogs were observed in 2020 has been removed by others.

In accordance with Conditions 8.6 and 8.7 of the Decision Statement, temporary exclusion fencing will be employed to minimize the interaction of construction activities and Western Chorus Frogs. [redacted].

The fence design will be in accordance with the *Species at Risk Branch Best Practices Technical Note: Reptile and Amphibian Exclusion Fencing* (MNRF 2013). The fence will be 50cm above grade, with an additional 10cm below grade, and comprised of heavy-duty silt fence or hardware cloth with 1/8” mesh through existing ditches.

The fence will be installed in the early spring, after adult frogs move from their overwintering habitat into breeding pools, outside of the PDA. The onset of the breeding season is weather dependent and therefore variable from year to year, but typically occurs in mid to late March. Adult Western Chorus Frog move into the breeding pools following a relatively warm, wet weather event. Movement into pools is usually very concentrated, with most individuals entering the pools within a day or two (Picard, per comms, 2021).

Confirmation of Western Chorus Frogs in the breeding pools, outside the PDA, will be completed through auditory surveys. As the local population adjacent to the PDA appears to be small, with little vocalization detected during previous surveys, there is a risk the onset of the breeding season may not be detected right away. As such, records of calling Western Chorus Frogs elsewhere within a 5km radius (confirmed through in field surveys or iNaturalist reports) will also be used as verification of the onset of the breeding season. [redacted] The timing of the onset of Western Chorus Frog breeding can depend on vegetation structure of the site, with shaded sites start later than sunny locations. The existing breeding habitat

adjacent to the PDA is dominated by cattails, which tends to be more shaded with later Western Chorus Frog breeding; this will be considered when confirming reference sites.

Once Western Chorus Frogs move into the breeding pools, females typically remain in the ponds for a few days, while males may remain for a week or longer (Picard, per comms, 2021). Although once they leave the pools, they often remain in close proximity to the wetland for a longer period of time. iNaturalist data from Halton Region supports this timing, with reported occurrences of calling Western Chorus Frog typically spanning a 2-week period each year. Based on this timing, the exclusion fencing will be installed as quickly as feasible, but no longer than 7 days from the observed onset of the breeding season, before adult Western Chorus Frogs would be expected to return upland habitat within the PDA.

In accordance with Condition 8.8 of the Decision Statement, replacement of culverts located adjacent to breeding habitat will occur outside of the breeding season. For the purposes of culvert replacement, the onset of the breeding season will be determined as above, with the end of the breeding season being either mid-July, or when the culvert becomes dry; whichever is sooner.

3.2 LITTLE BROWN MYOTIS FOLLOW-UP PROGRAM

In accordance with Condition 8.29, pre-construction surveys for Little Brown Myotis were completed in thicket communities along Indian Creek and in the coniferous plantation and deciduous woodland fragment west of the railway tracks. Survey methods were developed with ECCC and followed Bats and bat habitats: guidelines for wind power projects (MNR 2011) (the MNR Guidelines). Survey included:

- The 10 best candidate roost trees were selected in the thicket, plantation communities along Indian Creek and an additional 5 best candidate roost trees were selected in the small woodland fragment off Lower Base Line, west of the railway tracks.
- Best candidate roost trees were selected for exit surveys, based on criteria in the MNR Guidelines, with one (1) exit survey conducted at each of the 10 trees in June 2020. The locations of the best candidate roost trees are provided in **Figure 3, Appendix A**. Weather conditions are provided in **Table 3-3**.
- In addition to exit surveys, 10 automated acoustic recorders (ARU) were deployed. Detectors were distributed through the thicket, coniferous plantation and deciduous woodland (**Figure 3, Appendix A**).
- The ARUs were deployed on June 5, 2020 and ran each night until retrieved on June 23, 2020. All data was analyzed for records of species at risk bats.
- Wildlife Acoustic bat detectors were used. The exit surveys were conducted with handheld Echo Meter Touch 2 Pro detectors and the automated surveys used Song Meter SM4 Bat detectors.

- Calls were analyzed using Wildlife Acoustic's Kaleidoscope Pro software. The auto-ID batch analysis function was used as an initial screening to remove noise files and separate high frequency calls (Myotis sp., Tricolored Bat and Red Bat) from low frequency calls (Big Brown Bat, Silver-haired Bat and Hoary Bat). All high frequency calls were analyzed by a biologist experienced in bat identification to identify the number and species of species at risk (SAR) bat calls recorded. Low frequency calls (i.e., not SAR) were spot check to assess species presence.

Table 3-3: Summary of survey dates, times and weather conditions of bat exit surveys

Date	Weather Conditions		
	Temp (˚C)	Wind*	Cloud Cover (%)
June 4, 2020	28	2	0
June 5, 2020	24	1	20
June 8, 2020	23	1	0
June 11, 2020	20	1	0
June 19, 2020	26	1	25
June 20, 2020	29	0	10
June 23, 2020	24	2	50

* Wind conditions expressed using Beaufort Scale:

0 – calm, <2km/hr
1 – light, 2-6 km/hr
2 – light, 7-12 km/hr
3 – moderate, 13-19 km/hr
4 – moderate, 20-30 km/hr
5 – fresh, 31-40 km/hr
6 – strong, 41-51 km/hr

Through the exit surveys and ARU's, five species of bats were observed: Big Brown Bat, Eastern Red Bat, Silver-haired Bat, Hoary Bat and Little Brown Myotis. One species, Little Brown Myotis is listed as endangered on Schedule 1 of the *Species at Risk Act* (SARA). The other species are not considered at risk.

The exit surveys recorded a total of 359 bat calls across the 15 trees surveyed, averaging approximately 24 calls through the evening of survey at each tree. It should be noted that the number of bat passes does not provide an indication of the number of bats present, as multiple calls could be made by different bats or the same bat making multiple passes. Fourteen of the recorded calls were identified as Little Brown Myotis (one call at Tree 5, eight calls at Tree 6, four calls at Tree 11 and one call at Tree 13). No bats, either Little Brown Myotis or other species, were observed exiting a potential maternity roost tree. All bats observed were flyovers.

The ARU's recorded 18,201 bat calls, which averages to 96 calls per night at each detector. Of those, 6719 were identified as either Little Brown Myotis or Myotis sp. (i.e., could not be identified to species). On average, 35 Little Brown Myotis calls were recorded per night at each detector. A summary of the calls is provided in Table 3-4.

Table 3-4: Summary of automated acoustic recorder results

Bat Detector	# of calls recorded	Species recorded	# of Little Brown Myotis (or Myotis sp) calls recorded	# of nights with Little Brown Myotis (or Myotis sp) calls
SM4bat_8	566	Big Brown Bat Eastern Red Bat Silver-haired Bat Hoary Bat Little Brown Myotis	73	11
SM4bat_9	3970	Big Brown Bat Eastern Red Bat Silver-haired Bat Hoary Bat Little Brown Myotis	1300	19
SM4bat_10	891	Big Brown Bat Eastern Red Bat Silver-haired Bat Hoary Bat Little Brown Myotis	413	16
SM4bat_12	771	Big Brown Bat Eastern Red Bat Silver-haired Bat Hoary Bat Little Brown Myotis	471	15
SM4bat_13	1650	Big Brown Bat Eastern Red Bat Silver-haired Bat Hoary Bat Little Brown Myotis	230	19
SM4bat_14	3610	Big Brown Bat Eastern Red Bat Silver-haired Bat Hoary Bat Little Brown Myotis	2660	16
SM4bat_15	1617	Big Brown Bat Eastern Red Bat Silver-haired Bat Hoary Bat Little Brown Myotis	290	15

Table 3-4: Summary of automated acoustic recorder results

Bat Detector	# of calls recorded	Species recorded	# of Little Brown Myotis (or Myotis sp) calls recorded	# of nights with Little Brown Myotis (or Myotis sp) calls
SM4bat_16	491	Big Brown Bat Eastern Red Bat Silver-haired Bat Hoary Bat Little Brown Myotis	144	11
SM4bat_17	1586	Big Brown Bat Eastern Red Bat Silver-haired Bat Hoary Bat Little Brown Myotis	212	19
SM4bat_18	3049	Big Brown Bat Eastern Red Bat Silver-haired Bat Hoary Bat Little Brown Myotis	926	16

The highest bat activity was associated with detector SM4bat-9, SM4bat-14 and SM4bat-18. Two of the detectors were located along Indian Creek; SM4bat-14 was at the top of the valley and SM4bat-18 at the bottom. SM4bat-9 was situated at the edge of the small woodland fragment off Lower Base Line.

3.3 EASTERN MILKSNAKE FOLLOW-UP PROGRAM

In accordance with Condition 8.26, pre-construction surveys of Eastern Milksnake were conducted along Tributary A and in the wooded area along Indian Creek. The surveys took place in the fall of 2020. Survey methods followed those previously developed in consultation with ECCC in 2017. These methods were consistent with Ontario's Survey Protocol for Ontario's Species at Risk Snakes. Surveys consisted of:

- Artificial cover objects (ACOs) were deployed in along Tributary A and the wooded area along Indian Creek, as shown in **Figure 4, Appendix A**.
- Visual encounter surveys (VES) were conducted by slowly walking, observing, and listening for snakes. Natural and ACOs found within the PDA, including plywood, logs, and steel roofing material, were turned and searched. Water features were observed using binoculars and edges of wetland and woodlands were walked slowly, observing for potential snake habitat or presence of snakes.
- Snake assessments and the capture and relocation program were completed by qualified biologists trained in the identification of Ontario's snakes, with authorization from MNRF through receipt of a Wildlife Scientific Collector's Authorization.

- VES for snakes were carried out under sunny conditions and when air temperature was between 10 and 25 °C or under overcast conditions and when air temperature was between 15 and 30 °C.
- ACOs were placed a minimum of two weeks prior to initiating surveys (August 19, 2020). Searches under ACOs were conducted by a qualified biologist.
- Ten days of surveys were completed between September 15 and 29, 2020; weather conditions are provided in Table 3-5.
- Snakes of any species observed under ACOs were captured by a qualified biologist and handled in accordance with the Ontario Species at Risk Handling Manual: For Endangered Species Act Authorization Holders (MNRF, undated). Snakes were identified and released.

Throughout the 10 surveys, no Eastern Milksnake were observed within the PDA. Two Common Gartersnakes were observed on September 25th under the same ACO (14).

No snakes were captured or relocated during the fall 2020 surveys. Construction of the project is now anticipated to start in fall 2021 which will result in the reptile salvage program to take place in the fall of 2021, under a new WSCA application.

Table 3-5: Summary of survey dates, times and weather conditions

Date	Weather Conditions		
	Temp (˚C)	Wind*	Cloud Cover (%)
September 15, 2020	12	2	30
September 17, 2020	17	3	30**
September 18, 2020	14**	3**	30**
September 21, 2020	20	3	5
September 22, 2020	18	2	70
September 23, 2020	25	3	10
September 24, 2020	25	3	70
September 25, 2020	21	1	100
September 28, 2020	24	3	90
September 29, 2020	18	3	95

* Wind conditions expressed using Beaufort Scale:

0 – calm, <2km/hr
1 – light, 2-6 km/hr
2 – light, 7-12 km/hr
3 – moderate, 13-19 km/hr
4 – moderate, 20-30 km/hr
5 – fresh, 31-40 km/hr
6 – strong, 41-51 km/hr

** Based on data from ECCC weather station

3.4 SNAPPING TURTLE & MIDLAND PAINTED TURTLE FOLLOW-UP PROGRAM

As described in the EIS, mitigation measures identified to prevent mortality and reduce the risk of individual turtles entering the construction site include the installation of exclusion fencing. Exclusion fencing was installed in the PDA during the pre-construction phase in the fall of 2021 (**Figure 5, Appendix A)**. Methods for installation of exclusion fencing will follow the *Species at Risk Branch Best Practices Technical Note: Reptile and Amphibian Exclusion Fencing* (MNRF 2013).

The location of the exclusion fencing was based on the presence of existing Snapping Turtle habitat within the LAA, which is primarily associated with two small marsh communities, watercourses and dug online ponds. **Figure 5, Appendix A** shows the extent of suitable foraging and overwintering habitat in the LAA, in accordance with Condition 8.14 of the Decision Statement. Overwintering habitat is restricted to the online pond on Tributary A, which provides sufficient depth of still water, with a soft substrate. Foraging habitat is contained with Indian Creek and Tributary A. Potential nesting habitat within the LAA is comprised of agricultural fields, roadsides and gravel driveways. These sites are unlikely to result in successful nesting and likely to act as population sinks. As such, protection of these sites has not been considered in the exclusion fencing plan.

In accordance with Condition 8.17, 8.18 and 8.19, exclusion fencing will be employed to minimize the interaction of construction activities and turtles, which will include moving exclusion fencing based on where construction activities are or will be occurring, as necessary. The temporary fencing will be relocated after creek diversion has been completed to create a barrier between the newly created turtle habitat and the remainder of the construction activities, as shown in **Figure 6, Appendix A**.

Following construction, permanent exclusion fencing will be installed to protect turtles from exposure to vehicle traffic, as shown on **Figure 7, Appendix A**. Permanent fencing will be placed around retained and enhanced turtle habitat:

- Between enhancement wetlands and Tremaine Road
- Between Tributary A wetlands and paved areas of the Terminal or SWM Pond 1
- Between Indian Creek and SWM Pond 2
- Between Indian Creek and paved areas of the terminal.

Fencing is specifically intended for turtles and snakes but will also form a barrier for other small wildlife (e.g., small mammals and amphibians). While the intent is to exclude all wildlife from the facility and Stormwater Management (SWM) ponds, the fencing layout has been designed to avoid restricting wildlife movement through natural features in the local landscape.

All fencing will be installed according to the following parameters:

- The height of fencing will be 50 to 60 cm and adjusted in consideration of topography. To deter reptiles digging under fencing, the bottom of the fence will be buried 10 cm below grade with an additional 10 cm horizontal lip ('keyed in') on the species side. An alternative design along Tremaine Road would allow one-way movement of reptiles by cutting into the existing grade such that the entire fence is below grade (short 'retaining wall').
- At access locations, the fence will be designed to curve inward in order to direct animals away from the area of exclusion.
- Fencing reinforced with a woven nylon mesh is not an acceptable material, as this can cause entanglement and mortality for snakes; this type of fencing will not be used. Permanent fencing will be constructed using durable materials, such as PVC or recycled plastic (e.g., Animex wildlife fencing).

The locations of temporary and permanent fencing along Tremaine Road and the natural channels are summarized in **Table 3-6**, below.

Table 3-6: Temporary and Permanent Wildlife Exclusion Fencing

	Phase 1 Construction (Figure 5, Appendix A)	**Phase 2 Construction (Figure 6, Appendix A)**	**Permanent (Figure, Appendix A)**
Tributary A	Phase 1 construction will include the removal of the existing online pond on Tributary A, as well as construction of the new channel and associated wetland habitat. Phase 1 fencing will be installed prior to the pond's removal and will isolate Tributary A from turtle habitat in Indian Creek. Phase 1 fencing is to be installed across the tributary, with screening in the water as a barrier to movement. Once fencing is in place, turtles (if present) will be relocated to the adjacent pond or downstream in Tributary A.	Once the new channel and enhanced wetland have been installed, the Phase 1 fencing will be removed to reconnect Tributary A to Indian Creek. While the remainder of the facility is being constructed, Phase 2 fencing will be installed between the wetland habitat and the facility. Note: If feasible, the permanent fencing could be installed at this point, in place of Phase 2 fencing.	Permanent fencing will be installed between the wetland habitat and the stormwater pond 1. A retaining wall will provide a barrier to movement between the wetland and the paved surface of the facility. Permanent fencing will also be installed between the wetland habitat and Tremaine Road. The fence will provide a gap at Tributary A, maintaining the connection to habitat in Indian Creek. Permanent fencing along Tremaine Road will allow one way movement of turtles. Turtles crossing the road from the southwest (toward the site) would not be blocked by the fence and would be allowed to enter the enhanced wetlands. Those turtles leaving the site from the northeast would be funneled into Tributary A.
Indian Creek	Phase 1 construction along Indian Creek will include construction of the new channel and associated wetland habitat. During this time, the existing Indian Creek channel will be maintained. Phase 1 fencing will be installed between the existing Indian Creek channel and the construction site for the wetland enhancement.	Once the new channel and enhanced wetland have been installed, the Phase 1 fencing will be removed and Indian Creek will be diverted into the new channel. Turtles (if any) in portions of the old channel that will not be retained as wetland will be relocated into the newly created channel. While the remainder of the facility is being constructed, Phase 2 fencing will be installed between the wetland habitat and the facility. Note: If feasible, the permanent fencing could be installed at this point, in place of Phase 2 fencing.	Permanent fencing will be installed between the wetland habitat and the stormwater pond 2. Permanent fencing will also be installed between the wetland habitat and Tremaine Road. The fence will provide a gap at both crossings of Indian Creek, funneling turtles under the bridges, connecting the wetland habitat with offsite habitat.

In accordance with Conditions 8.21 and 8.28 of the Decision Statement, exclusion fencing will be inspected by a qualified biologist prior to initiating construction. Weekly monitoring will be implemented during construction to confirm the fence remains intact and functional. Once permanent exclusion fencing is installed, annual monitoring of the fence will take place each spring (e.g., March or April) during operations. Repairs will be conducted as needed, immediately after the monitoring event, prior to spring reptiles emergence.

In accordance with Conditions 8.21.2 and 8.28.1 of the Decision Statement, CN will develop an internal reporting system for onsite employees which will record and track turtle crossing or collision observations in areas of construction activities. All observations will also be submitted to the Natural Heritage Information Centre, in Accordance with Condition 8.22 of the Decision Statement.

The internal reporting system will be reviewed by a qualified biologist annually through construction and 5-years post-construction, to assess the effectiveness of the exclusionary fence design. If it is determined fencing modifications or additional mitigation measures are required to reduce the risk of turtle collisions, such measures will be developed and implemented, taking into account Ontario's Reptile and Amphibian Exclusion Fencing: Best Practices, Version 1.1. Species Technical Note and Ontario's Best Management Practices for Mitigating the Effects of Roads on Amphibian and Reptile Species at Risk in Ontario.

3.4.1 Turtle Relocation

In accordance with Condition 8.16 of the Decision Statement, in-water construction activities will occur outside of the overwintering period for Snapping Turtle (October 1 to April 30), unless not technically feasible. Prior to in-water works, relocation of turtles will be completed by qualified professionals.

To perform this activity, CN has retained the services of Stantec. Stantec biologists in Ontario have extensive experience with turtle relocation, specifically with regards to dewatering of watercourses and ponds, and Stantec has a Wildlife Scientific Collector's Authorization (WSCA) approved Animal Care Protocol for *Turtle and Amphibian Incidental Disturbance during Fish Salvage Operations*. The WSCA Animal Care Protocol approval process ensures every reasonable effort is taken to minimize stress, harm and mortality for all wildlife impacted by the activity.

Relocation of turtles and snakes will be undertaken between May 1 to September 30, unless not technically feasible. Where not feasible, relocations will be covered under an approved WSCA. All handling of reptiles will be undertaken by qualified biologists in accordance with *Ontario Species at Risk Handling Manual: For Endangered Species Act Authorization Holders (*MNRF undated) and *Best Management Practices for Mitigating the Effects of Roads on Amphibian and Reptile Species at Risk in Ontario* (MNRF 2016).

In terrestrial habitats, turtles will be relocated when encountered incidentally during construction. Snakes will be targeted using methods described for Eastern Milksnake in **Section 6.0**, below. Capture and relocation of turtles in aquatic habitats (e.g., Indian Creek and Tributary A) will be undertaken once water levels are drawn down as part of the channel reconstruction. In Indian Creek, this will be done when the creek is diverted into the new channel. In Tributary A, this will be done by using a temporary diversion

channel to take the pond off-line, then cutting through the existing berm to allow the pond to drain. Once the feature has been drawn down, any turtles present will be visible.

If the turtle does not appear willing or able to leave the construction area, it will be captured by a qualified professional. Turtles will be handled with gloved hands only, and safe handling techniques as described in *Ontario Species at Risk Handling Manual* will be used. Netting is not a preferred method of capturing turtles. However, if netting is the only viable capture technique, then nets used will be fine-meshed and sturdy enough to prevent turtles from becoming entangled. Captured turtles will immediately be placed individually into secure covered containers with adequate ventilation and moisture.

All captured indiciduals will be released as soon as possible. No turtle will be left in an unsupervised container, no container will be left standing in direct sunlight or unattended vehicle, and all containers will be checked every 15 minutes by a qualified animal care professional who will respond to any signs of distress. Captured indivisuals will be released in the designated relocation habitat as quickly as possible. Handling of any animal will be kept to a minimum during the release.

Turtles will be relocated within the same watercourse (i.e., those from Indian Creek will be transferred to an upstream or downstream location on Indian Creek, while those from Tributary A will be relocated downstream along Tributary A or the existing pond). If multiple turtles are being relocated, they will be released as far apart as possible within the target area. In anticipation of potential translocations, a qualified biologist will identify suitable release sites on both Indian Creek and Tributary A. In the event of inadvertent injury during the course of relocation, the qualified animal care professional will transport the turtle to an authorized wildlife rehabilitator.

In accordance with Condition 8.16 of the Decision Statement, in the event in-water works during the overwinter period is not technically feasible to avoid, turtles captured during the overwintering period will be directly transported to an authorized wildlife rehabilitator

3.5 ECOPASSAGE FOLLOW-UP PROGRAM - HABITAT CONNECTIVITY ASSESSMENT

In accordance with Condition 8.33.1 of the Decision Statement, habitat connectivity within the Regional Assessment Area (RAA) was reviewed to assess where and how the Project Development Area (PDA) will remain connected to the surrounding region once the Project is built. The review included an assessment of Halton Region's Regional Natural Heritage System (RNHS) approach, as well as consideration for the biological diversity and ecological function within the RAA.

The Key Features of Halton Region's RNHS are shown in **Figure 8, Appendix A**. The Key Features capture wildlife habitat in the RAA, by including the following natural heritage features and areas:

- Significant wetlands
- Significant woodlands

- Significant habitat of endangered and threatened species
- Significant valleylands
- Significant wildlife habitat
- Areas of natural and scientific interest
- Fish habitat
- Permanent and intermittent streams
- Seepage areas and springs
- Significant habitat of special concern species

The Key Features also include linkages between the natural features listed above, including linkages through agricultural fields. The Regional floodplain areas associated with permanent and intermittent streams are included in the RNHS mapping. Furthermore, the Key Features mapping include buffers to the natural features and linkages. **Figure 8, Appendix A** also shows areas proposed for wildlife habitat enhancements, including those proposed as part of the Project, and those shown in the Boyne Survey Tertiary Plan (Town of Milton 2017).

The existing conditions in the RAA provide a fragmented landscape of wildlife habitats (e.g., woodlands, wetlands and watercourses), separated by agricultural fields, residences, roads and urban development. Identification of movement corridors through this fragmented landscape considered the movement habits of different groups of wildlife that occur in the PDA, as discussed below.

3.5.1 Large Mammals

- White-tailed Deer, Coyote and Red Fox are relatively mobile compared to smaller animals and can more easily move through fragmented landscapes. Individuals may move through agricultural fields, between habitat patch, as part of their daily movement patterns.
- Large mammals are expected to show avoidance areas of urban development in the RAA.
- Rail embankments are not expected to be a barrier to movement for large mammals.
- Large mammals are expected to move throughout the RAA post-construction. As such, ecopassages have not been designed for large mammals, as they are not considered necessary to facilitate movement through the RAA or adjacent lands.

3.5.2 Small Mammals (excluding bats)

- Small mammals identified in the PDA such as Grey Squirrel and Raccoon are able to move through the fragmented landscape and utilize habitats outside of the Key Features, such as agricultural lands or urban areas.
- Roads can be a source of mortality for small mammals. As such, wildlife in this group can benefit from ecopassages under roads.
- Rail embankments are unlikely to act as a barrier to movement for small mammals. Regardless, the proposed terrestrial ecopassage through rail embankments will consider design elements for small mammals.

3.5.3 Reptiles (snakes and turtles)

- Turtles typically move through aquatic environments but can also make overland movement. Snake species observed in the PDA (i.e., Common Gartersnake and Eastern Milksnake) are generally able to move through agricultural lands.
- Reptiles are unlikely to make frequent movements between Key Features as part of their daily movement patterns. However, they will move further distances to facilitate different life processes, such as moving to nests or hibernation areas.
- Roads are a source of mortality for reptiles. Ecopassage under roads have been demonstrated to help reduce the risk of mortality.
- Terrestrial ecopassage design considers design elements for snakes and turtles.

3.5.4 Amphibians

- Amphibian movement is best facilitated within wetland complexes, where occasional pools or wet environments provide refuge and prevent individuals from becoming too dry.
- Amphibians are likely to make localized movements, within an individual wetland complex or Key Feature, to facilitate different life processes. Movement between Key Features may occur as amphibians disperse to other habitat patches.
- Existing amphibian habitat within the PDA is limited, with low breeding activity (i.e., below the threshold of significant wildlife habitat to be considered a Key Feature in the RNHS). However, proposed wildlife enhancements in the PDA along Indian Creek and Tributary A have been designed to provide amphibian habitat, enhancing the opportunity for amphibian movement along the watercourse corridor. Terrestrial ecopassages also have design considerations for amphibians.
- Western Chorus Frog, a species with particularly low mobility and limited range within the PDA, is not covered by this corridor study and has been addressed separately in Section 5.2.

3.5.5 Aquatic Species

- Fish and other aquatic species are restricted to movement through aquatic environments. Permanent watercourses can provide year-round movement, while intermittent watercourses can provide dispersal opportunities while they are flowing.
- Within the RAA, movement corridors for aquatic species are restricted to Indian Creek and Tributary A, with potential seasonal movement in Tributary C.
- Aquatic ecopassages have been proposed on Tributary A to maintain connectivity.

3.5.6 Birds, Bats and Insects

- These groups of wildlife are highly mobile, being able to fly between habitat patches. As such, they have not been considered in the wildlife corridor assessment or ecopassage design.

With consideration of the movement habitats and the different groups of wildlife in the PDA, movement corridors within and between Key Features were delineated, as shown in **Figure 8, Appendix A**.

4.0 CONSTRUCTION WILDLIFE MANAGEMENT PLANS AND FOLLOW-UP PROGRAM

4.1 WILDLIFE MANAGEMENT AND MITIGATION

General wildlife mitigation measures that will be implemented during construction will be led or carried out by the construction contractor and by the Environmental Monitor. Wildlife sensitivity training will be completed by all onsite personal at the beginning of construction and wildlife education will be posted for all construction phases. These mitigations include:

- Implementation and adherence to restricted activity periods (see Table 4-1).
- Harassment of wildlife will be prohibited, and relocation of wildlife discovered on the Project site will be completed, as necessary.
- In accordance with Condition 8.30 of the Decision Statement, regular awareness training about actions to take to protect wildlife will be provided to all employees and contractors associated with the Project who may encounter wildlife within the PDA.
- Onsite building design will consider elements that reduce the risk of avian collisions, taking into account the *City of Toronto's Bird Friendly Development Guidelines*.
- In accordance with Condition 8.20 of the Decision Statement, signs to drivers of the risk of turtle collisions will be installed along temporary and permanent road located within the PDA. Signage will

take into account Ontario's Best Management Practices for Mitigating the Effects of Roads on Amphibians and Reptile Species at Risk in Ontario.

- Inspection and maintenance of turtle and snake exclusion fencing and Western Chorus Frog exclusion fencing will be completed on a weekly basis during construction; adjustments will be made as necessary (e.g., repairs, relocation to accommodate construction and maintain wildlife exclusion).
- While no Eastern Milksnake were observed in the PDA during the 2017 or 2020 surveys, they are anticipated to occur in low densities in the area. As such, while not required by Condition 8.27 of the Decision Statement (as presence was not confirmed), a capture and relocation program will be conducted prior to construction and installation of exclusion fencing.
  - ACOs will be placed a minimum of two weeks prior to initiating surveys, or earlier, if possible. Searches under ACOs will be conducted by a qualified biologist. Searches will be conducted in either spring (April 15 – June 30) or fall (September 1 – October 30). One full week of capture and relocation surveys will be required during either spring or fall, depending on the timing of site preparation.
  - Snakes of any species observed under ACOs will be captured by a qualified biologist and handled in accordance with the Ontario Species at Risk Handling Manual: For Endangered Species Act Authorization Holders (MNRF, undated). Snakes will be relocated into suitable habitat on CN-owned lands within the LAA, as follows, unless permission is granted by a third-party to release snakes on other nearby, suitable lands. Snakes will be relocated following guidance in the *Ontario Species at Risk Handling Manual: For Endangered Species Act Authorization Holders*.
  - Incidental captures of snakes in the work area will be handled and relocated as noted above and in accordance with MNRF protocol. Staff will be trained in the identification and proper handling of snakes. In the event of inadvertent injury during the course of relocation, a qualified animal care professional will transport the snake to an authorized wildlife rehabilitator.
- In accordance with Condition 8.23.3 of the Decision Statement, contractor will implement measures to discourage Bank Swallows from nesting in temporary banks during construction from May 15th to August 3rd , through slope management (reducing slopes to 70 degrees or less) or where slope angles cannot be maintained, implement exclusion techniques (e.g. geotextile, plastic covers, or tarping). In the event a Bank Swallow nest does become established, the nest will be protected, and a buffer zone established around the nest, until such time the nest is no longer active. The size of the buffer zone will be determined by a qualified biologist.
- Site preparation, including vegetation clearing shall take place outside of the nesting season (April 1st to August 31st) and following guidance in ECCC's *Avoidance Guidelines*, in accordance with Condition 8.1, 8.2 and 8.11 of the Decision Statement. Site preparation during the nesting period should only be under very limited circumstances and where a wildlife sweep has been performed by a professional biologist and confirmed no breeding evidence.

- Sightings of species of management concern or species at risk will be reported to the Environmental Monitor and the sighting will be recorded in daily reports. Specific protection measures will be implemented by the contractor at the direction of CN in consultation with a qualified ecologist.
- Implement and enforce speed limits for vehicles on internal roads.
- During construction, the use of site flood lighting during the migration periods will be limited, as outlined below.
- Wildlife connectivity along the Indian Creek corridor will be maintained during construction by using a phased approach. During Phase 1, temporary wildlife exclusion fencing will be erected between the existing creek to allow wildlife to continue to move along Indian Creek while construction of the realigned creek and created habitat enhancements take place. Once the realigned creek and habitat enhancements have been installed, Phase 2 wildlife exclusion fencing will be installed between the enhanced habitat and other construction activities for the Project. The Phase 1 fencing will then be removed, allowing wildlife to access the newly created and enhanced Indian Creek corridor.

Table 4-1: Restricted Activity Periods for Construction Activities

Activity	Restricted Activity Period (No Work) *
In-water works in Indian Creek, Tributary A and Tributary C (i.e., fish habitat)	March 15 to June 30
Vegetation clearing (bat maternity roosts period / nesting birds / migratory bird habitat)	April 1 to August 30**
Use of flood lighting (limitations on night-time use during migratory bird window)	April 1 to May 31; August 15 to October 31
Earth moving in proximity to the Heritage Barn (Barn Swallow nesting structure)	May 12 to August 22
In-water works (Tributary A or Indian Creek) or reduction of water in existing ponds (Tributary A) (Snapping Turtle habitat)	October 1 to April 30 (unless turtle relocation is completed by qualified biologist and exclusion fences are installed / maintained prior to September 30)
[redacted] (Western Chorus Frog)	No work in habitat until exclusionary fence is installed (fencing to be installed during breeding season, typically mid-March to mid-April (temperature dependent))

* All dates are inclusive; some dates are weather / temperature dependent (as indicated above)
** Select / targeted vegetation clearing during this window may be possible subject to completion of nest sweeps confirming absence of nesting birds by a qualified biologist, only upon approval by CN

In addition to the wildlife mitigation measures implemented above, general site management will also be completed by the contractor and Environmental Monitor to prevent interactions that could be harmful to wildlife, including storage of hazardous materials, erosion and sediment control measures, animal resistant storage containers for food waste (to prevent access by rodents and other wildlife), among other commitments, as outlined in the Project-specific Environmental Protection Plan (under separate cover).

4.2 CONSTRUCTION MONITORING

Monitoring will be undertaking during construction to assess the effectiveness of mitigation measures to avoid or reduce harm to wildlife.

In accordance with Condition 8.4 of the Decision Statement, monitoring will take place to assess the effectiveness of mitigation measures to avoid harming migratory birds, including migratory birds that are listed species at risk, their eggs and nests. Migratory bird monitoring during construction will include:

- Weekly monitoring that vegetation in migratory bird habitat located within the PDA remains undisturbed during the breeding season (April 1st to August 31st).
- Under very limited circumstances, where vegetation disturbance in migratory bird habitat is required during the breeding season, breeding bird monitoring will be undertaken to assess the potential presence of migratory bird nests or eggs. Where breeding evidence is observed, vegetation clearing will be avoided, to protect the nests and eggs.
- During the Bank Swallow nesting season (May 15th to August 3rd) daily monitoring of the PDA will be undertaken to assess the effectiveness of measures to dissuade Bank Swallow nesting. Monitoring will involve scanning areas of exposed soil (e.g., excavation areas and stock piles) for Bank Swallows, or evidence of nesting (i.e., excavated nesting holes). In the event of confirmed Bank Swallow nesting activity in the PDA, specific protection measures will be implemented by the contractor at the direction of CN in consultation with a qualified ecologist.
- Sightings of bird collisions at buildings within the PDA will be reported to the Environmental Monitor and reviewed with a qualified ecologist to assess the effectiveness of building design elements to reduce collision risk.
- Develop and implement modified or additional mitigation measures for migratory birds, if mitigation measures are found to be insufficient.
- Monitoring of offsite grassland habitat (associated with Condition 8.12) and onsite Barn Swallow habitat (associated with Condition 8.23) are discussed below in Section 5.1.

In accordance with Condition 8.21 of the Decision Statement monitoring will take place to assess the effectiveness of mitigation measures for Snapping Turtle and Midland Painted Turtle. Turtle monitoring during construction will include:

- Sightings of turtles (road collisions or live) in the PDA will be reported to the Environmental Monitor and the sighting will be recorded in daily reports. Specific protection measures will be implemented by the contractor at the direction of CN in consultation with a qualified ecologist.
- Inspection and maintenance of turtle exclusion fencing on a weekly basis during construction.

- Develop and implement modified or additional mitigation measures for turtles, if mitigation measures are found to be insufficient.

In accordance with Condition 8.28 of the Decision Statement monitoring will take place to assess the effectiveness of mitigation measures for Eastern Milksnake. Snake monitoring during construction will include:

- Sightings of snakes in the PDA will be reported to the Environmental Monitor and the sighting will be recorded in daily reports. Specific protection measures will be implemented by the contractor at the direction of CN in consultation with a qualified ecologist.
- Inspection and maintenance of snake exclusion fencing on a weekly basis during construction.
- Develop and implement modified or additional mitigation measures for snakes, if mitigation measures are found to be insufficient

5.0 POST-CONSTRUCTION WILDLIFE MANAGEMENT PLAN AND FOLLOW-UP PROGRAM

The purpose of the post-construction wildlife management plan and follow-up program is to confirm long-term viability of created and enhanced wildlife habitat in the PDA and off-site, through monitoring of wildlife use of the created and enhanced habitat. Post-construction monitoring of vegetation plantings are a component of the CN Milton Logistics Hub Wetland Monitoring Program.

5.1 MIGRATORY BIRDS FOLLOW-UP PROGRAM

5.1.1 Wetland Migratory Birds

In accordance with Condition 8.4 of the Decision Statement, monitoring of on-site wetland migratory birds will be completed through breeding bird monitoring.

Wetland enhancements along Tributary A and Indian Creek have been designed to improve breeding opportunities for wetland birds (**Figures 9A and 9B, Appendix A**). The habitat enhancement plan includes creation of different types of wetland habitat, such as:

- New creek channels for Tributary A and Indian Creek, totaling 0.7 ha of lotic wetland habitat.
  - These will provide additional habitat for wetland migratory birds, especially through facilitating connectivity among riparian wetlands.
  - The channel riparian areas will be seeded with a wetland seed mix and shrubs will be established using live stakes.

- Riparian meadow marsh wetlands of 5.7 ha.
  - This community will be similar to the existing wetland communities in the LAA, with a mix of wetland grasses and forbs, but it will be established with native wetland plant species, in contrast to the existing meadow marsh in the LAA that is dominated by the non-native, invasive reed canary grass.
  - The open, wet meadow community will be established with a floodplain seed mix; using Conservation Halton Early Succession/Riparian Mix or other appropriate seed mix. Wetland trees and shrubs will be planted in clusters.
  - This portion of the enhancement habitat is expected to support similar species as the existing wetlands, such as Red-winged Blackbird. The larger size and use of native wetland plant species are expected to increase the potential to support higher species diversity, compared to the existing wetlands.
- Riparian wetlands comprising 12 small, shallow marsh wetlands along the new channel for Tributary A, and four larger wetlands along Indian Creek; total area of 0.7 ha.
  - The shallow water marshes will include a mix of emergent and riparian native wetland plants, and open water. Borders of the wetland pools will be seeded with a wetland seed mix and shrubs will be established using live stakes. Wetland plants will be established in the pools using plugs.
  - Riparian wetlands are expected to support some existing species in the PDA (Red-winged Blackbird and Spotted Sandpiper), as well as a greater number and variety of breeding wetland migratory birds than the existing wetlands, such as waterfowl.

Breeding bird monitoring will be completed to assess presence, abundance and breeding evidence of wetland migratory birds within the wetland compensation habitat over a period of five years post construction. Three rounds of surveys per year will be completed by a qualified ecologist during the core breeding period for the species (June-early July) spaced at least one week apart. Each survey will consist of transects and point counts. Transects will be traversed crossing the wetland compensation habitat lengthwise, with point count stations at 250m intervals. Ten-minute point counts will be conducted at each station on each survey date. Bird observations will be recorded at four distance categories: within a 50 m radius, 50 to 100 m, outside the 100 m radius and flyovers.

Transects and station locations will be determined on the first field visit based on site conditions as required, following the intervals and distances described above. For each point count and transect (start point and end point), the start time and location will be recorded (using a hand-held GPS unit). The same locations will be surveyed in each of the five years.

Baseline studies identified 8 breeding pairs of migratory birds of five different species using existing wetlands. Most species were not wetland obligate, but species common to agricultural settings (e.g. Mourning Dove, Song Sparrow), using field adjacent to the wetlands. Should follow-up monitoring find a larger number of breeding pairs from baseline conditions (i.e., 9 or more) from a diversity of species (i.e., 5 or greater) using the wetland enhancements along Tributary A and Indian Creek, than the enhancements will be deemed to be effective offsets of the project impacts to existing wetland migratory bird habitat. In accordance with Condition 2.6.4 of the Decision Statement, not meeting this objective will require the proponent to implement modified or additional measures. The cause of the wetland habitat not attracting migratory birds will be assessed by a qualified biologist, who will prescribe corrective measures to be implemented by CN, in accordance with Condition 2.6.5 of the Decision Statement.

Grassland migratory birds are further addressed in Section 5.1.3, through the off-site grassland habitat.

5.1.2 Barn Swallow

In accordance with Condition 8.23 of the Decision Statement, existing Barn Swallow habitat will be retained, in addition to creation of artificial nesting structures.

Two nesting structures will be installed adjacent to the on-site wetland enhancement areas, which are anticipated to provide ideal foraging habitat for Barn Swallows (**Figure 9A and 9B, Appendix A**). These structures will comprise a shed style structure, as opposed to a kiosk style, as shed style structures are known to be successful at attracting Barn Swallows. Nine artificial nesting cups will be installed in each structure.

5.1.2.1 Created Barn Swallow Structures

The nesting structures will be surveyed annually following installation and will continue to a minimum the end of the fifth year of operation. In each year, two rounds of surveys will be completed by a qualified ecologist, with the first visit occurring during the core breeding period for the species (i.e., June). Timing of the second visit will be decided based on nest status as determined during the first visit, ideally timed to return when young are fairly large such that nest success may be determined (i.e., late June – mid July).

Each survey will consist of an inspection of the interior of the nesting structures, recording the following details, as prescribed by in the Barn Swallow structure replacement protocol specified in Ontario Regulation 242/08:

- The number, description and location of new nests created by Barn Swallows; and
- An estimate of the number of Barn Swallows using each structure.

Artificial nest cups will be inspected and signs of nesting by any species will be documented. Emphasis will be placed on nesting House Sparrow observations, as this species is known to usurp and directly compete with Barn Swallows for nesting sites, particularly those nesting near barn entrances (COSEWIC 2011).

5.1.2.2 Existing Barn

In accordance with Condition 8.23.4 of the Decision Statement, a buffer will be established around the barn used by a Barn Swallow colony. Construction activities in proximity to the barn will include grading and construction of the proposed SWM pond 2 to the north of the structure. Grading for the installation of the wetland enhancement habitat will occur in the Indian Creek floodplain to the south of the structure. An access road will be built on the opposite side of the SWM pond 2, to the northwest of the barn (more than 150m away).

Given the Barn Swallow nests are located on the bottom floor of the barn with access from the south, the second level of the barn is anticipated to provide a visual and noise buffer from construction activities occurring on the north and northwest side. As such, specific mitigation or timing windows for construction of these nearby activities is deemed unnecessary.

To the south of the barn, grading or heavy earth moving associated with construction of the wetland enhancements will be avoided within 100m, between May 12th and August 22nd.

The barn will be surveyed annually for 3 years to document nesting activity and use of the barn. One round of surveys will be completed by a qualified ecologist, occurring during the core breeding period for the species (i.e., June). Given the barn's low ceilings and high density of nests, the barn will not be entered during the surveys to avoid the risk of disturbance to Barn Swallows. A survey station will be established at a vantage point of entry points to the barn (i.e., on the south side). The number of Barn Swallows entering the barn, as well as the number foraging in proximity to the barn, will be counted to estimate the number of Barn Swallow pairs using the barn.

5.1.3 Eastern Meadowlark and Bobolink

5.1.3.1 Off-site Grassland Habitat

In accordance with Condition 8.12 of the Decision Statement, CN has entered into an agreement with Ducks Unlimited Canada (DUC) to create off-site habitat within the Luther Marsh Wildlife Management Area (**Figure 10, Appendix A**). The creation of off-site grassland habitat is proposed as an offset for the loss of on-site grassland habitat. This will include a focus on conditions suitable for species at risk (Bobolink, Eastern Meadowlark and Monarch) but will also provide habitat for other grassland species.

The creation of off-site grassland habitat began in 2019. It adhered to MNRF Guidelines for Bobolink and Eastern Meadowlark Habitat, specifically Ontario Regulation 242/08 subsection 23.6 (8). This guidance requires:

- 60-80% of the habitat to be covered by grasses
- Three or more species of grasses, at least one of which typically grows to >50 cm under normal growing conditions and
- Remainder of the habitat covered with forbs or legumes.

The off-site grassland habitat lands were previously in annual row crops. In the fall of 2018, crops were removed and site preparation was undertaken. In the spring of 2019, the site was seeded with a native grassland mix, including:

Table 5-1: Off-site Native Grassland Mix

Common Name	Scientific Name	%	Common Name	Scientific Name	%
Black-eyed Susan	*Rudbeckia hirta*	16.8%	Wild Senna	*Senna hebecarpa*	0.5%
Big Bluestem	*Andropogon gerardii*	14.7%	Partridge Pea	*Chamaecrista fasciculata*	0.5%
Indiangrass	*Sorghastrum nutans*	12.6%	Fox Sedge	*Carex vulpinoidea*	0.5%
Virginia Wild Rye	*Elymus virginicus*	8.4%	Pale Purple Coneflower	*Echinacea pallida*	0.3%
Switchgrass	*Panicum virgatum*	8.4%	Golden Alexanders	*Zizia aurea*	0.2%
Canada Wild Rye	*Elymus canadensis*	6.3%	Beebalm	*Monarda sp.*	0.2%
Little Bluestem	*Schizachyrium scoparium*	6.3%	Evening Primrose	*Oenothera biennis*	0.2%
Orchardgrass	*Dactylis glomerata*	4.2%	Ohio Spiderwort	*Tradescantia ohiensis*	0.1%
Timothy	*Phleum pratense*	4.2%	Common Milkweed	*Asclepias syriaca*	0.1%
Purple Coneflower	*Echinacea purpurea*	2.1%	Butterfly Milkweed	*Asclepias tuberosa*	0.1%
Sweet Oxeye	*Heliopsis helianthoides*	2.1%	Heath Aster	*Symphyotrichum ericoides*	0.1%
Sand Dropseed	*Sporobolus cryptandrus*	1.0%	Boneset	*Eupatorium perfoliatum*	0.1%
Rough Dropseed	*Sporobolus compositus*	1.0%	Sneezeweed	*Helenium autumnale*	0.1%
Showy Tickseed Sunflower	*Bidens aristosa*	1.0%	Thimbleweed	*Anemone virginiana*	0.1%
Lanceleaf Coreopsis	*Coreopsis lanceolata*	1.0%	Swamp Milkweed	*Asclepias incarnata*	0.1%
Tall Coreopsis	*Coreopsis tripteris*	1.0%	Canada Milkvetch	*Astragalus canadensis*	0.1%
Show Tick Trefoil	*Desmodium canadense*	1.0%	Virginia Mountain Mint	*Pycnanthemum virginianum*	0.1%
Round-headed Bushclover	*Lespedeza capitata*	1.0%	Rough Blazing Star	*Liatris aspera*	0.1%
Bergamot	*Monarda fistulosa*	1.0%	Cardinal Flower	*Lobelia cardinalis*	0.1%
Hairy Beardtongue	*Penstemon hirsutus*	0.5%	Great Blue Lobelia	*Lobelia siphilitica*	0.1%
Grey-headed Coneflower	*Ratibida pinnata*	0.5%	New England Aster	*Symphyotrichum novae-angliae*	0.1%
Hoary Vervain	*Verbena stricta*	0.5%	Flat-topped White Aster	*Doellingeria umbellata*	0.1%
Blue Vervain	*Verbena hastata*	0.5%			

In addition to migratory birds, the native seed mix was designed for Monarch, including common milkweed (larval host plant) and a variety of nectaring wildflowers for adult butterflies.

The off-site grassland habitat will be managed by DUC for a period of 20 years, starting with the seeding that occurred in spring 2019, with a minimum of five maintenance cycles over the 20-year period, as well as additional maintenance as required, which could entail invasive species removal, woody shrub removal, or any other maintenance.

There will also be annual breeding season surveys for Bobolink and Eastern Meadowlark conducted by DUC on behalf of CN for a 20-year period to verify the habitat has been established. Survey frequency will be annual for the first five years followed by monitoring every 5th year for the 20-year period (i.e. monitoring on Years 1, 2, 3, 4, 5, 10, 15 and 20). These will take place three times each year between May 21 and July 7, starting 30 minutes after dawn and ending by 9 am. Surveys will also be suitable for detecting other breeding bird species. The agreement includes the establishment of 40.7 ha of grassland habitat, to offset for the loss of 40.7 ha of species at risk (Bobolink and Eastern Meadowlark) grassland bird habitat in the PDA. The 1:1 ratio of habitat removed to habitat replaced conforms to MNRF's requirements, designed to achieve a benefit to the species. The offset habitat will be managed to prevent loss of habitat due to development pressure or natural succession into shrubland. Unlike the existing PDA grassland habitat, the offset habitat will not be subject to the agricultural activities (e.g., hay cutting), which are the most significant current threat to breeding success of grassland birds. The agreement specifies management of the grassland habitat for a 20-year period, which is again consistent with MNRF expectations. Should monitoring find habitat suitability is not adequate, remedial actions will be identified, which may include improvements to the off-site grassland habitat, or creation of additional habitat. Results of the annual monitoring and recommendations for remedial actions and those implemented, if required, will be provided to the relevant authorities.

In accordance with Condition 8.13 of the Decision Statement, the off-site grassland habitat will be monitored. The monitoring will include the following components:

- *Photo Monitoring*: to be completed once prior to habitat creation and once after the activities.
- *Habitat Assessment:* one annual habitat assessment of the off-site grassland habitat during the core breeding season for each of the first five years after the habitat has been created to assess the suitability of the habitat for Bobolink and Eastern Meadowlark.
- *Bobolink and Eastern Meadowlark Surveys*: surveys to document presence and evidence of breeding success of Bobolink, Eastern Meadowlark and other breeding birds will occur three times every year during the core breeding season for each of the first five years after the habitat has been created.

Photo Monitoring

Photographs of the off-site grassland habitat will be taken prior to any habitat creation. All locations of photographs will be georeferenced with the direction of the photograph indicated. Post habitat creation photographs will be taken from the same locations and at approximately the same time of year as the pre-creation/enhancement photographs. A minimum of one round of post-habitat creation is required but annual monitoring will assist with documenting habitat change over time.

Habitat Assessment

A habitat assessment will be completed once annually during the breeding season in conjunction with species surveys for each of the first five years. This information will complement the species survey information and allow an assessment of establishment of the off-site grassland habitat.

The literature review provided in COSEWIC (2010) concludes that Bobolink abundance is positivity associated with moderate little depth, high lateral little cover and high grass to legume ratio. The report also concluded that Bobolink avoid habitat dominated by dense shrubs and/or a high percentage of bare soil. McCracken et al, (2013), made the same conclusions about habitat preferences and expanded that Bobolinks prefer grass cover 25 cm in height or more at the start of the breeding season.

McCracken et al, (2013), concludes Eastern Meadowlark prefer similar habitat to Bobolink; taller grasses (25 to 50cm), with abundant litter cover, a high proportion of grass cover, moderate forb density, low proportions of shrub and woody vegetation) and low percent cover of bare ground.

The following field measurements will be collected and then used to assess habitat suitability in accordance with available information about the microhabitat requirements of the species (as documented in COSEWIC, 2010 and McCracken et al, 2013).

Field measurements will assess:

- Ground cover species composition of suitable grasses and forbs (i.e., presence of species listed in Table 5-1 above).
- Depth of ground cover (i.e., over 25cm or species that will obtain that height once mature).
- Habitat patch size (i.e., meeting the required 40.7 ha)
- Density and height of ground cover (i.e., continuous density and height required for nesting).
- Proportion of bare soil (i.e., high litter-to-bare soil ratio).
- Density of shrub cover (i.e., less than 5% shrub density).
- Ratio of ground cover composition (i.e., 60% or greater grass cover)
- Litter layer characteristics (i.e., preference for 1-2 cm of depth).
- Record the cover of milkweed and nectaring wildflowers

In accordance with Condition 2.6.4 of the Decision Statement, not meeting objectives above will require the proponent to implement modified or additional measures. In accordance with Condition 2.6.5 of the Decision Statement, a qualified biologist will assess the site conditions and noted deficiencies to develop feasible remedial measures to achieve the requirements. Measures may include overseeding with desired grass species, mowing, prescribed burn or other feasible measures.

Species Surveys

The off-site grassland habitat will be surveyed annually for five years following the MNRF's 2012 Bobolink Survey Protocol.

Three rounds of surveys will be completed by a qualified ecologist during the core breeding period for the species (June-early July) spaced at least one week apart. Each survey will consist of transects and point counts. Transects will be traversed crossing the fields lengthwise at approximately 250 m intervals with point counts placed every 250m along the transects. Ten-minute point counts will be conducted at each station on each survey date. Bird observations will be recorded at four distance categories: within a 50 m radius, 50 to 100 m, outside the 100 m radius and flyovers. All species, in addition to Bobolink and Eastern Meadowlark, will be documented.

Transects and station locations will be determined on the first field visit based on site conditions as required, following the intervals and distances described above. For each point count and transect (start point and end point), the start time and location will be recorded (using a hand-held GPS unit). The same locations will be surveyed in each of the five years.

Baseline conditions of active hay fields result in unsuccessful nesting of Bobolink and Eastern Meadowlark, acting as an "ecological sink". Use of the off-site grassland habitat by Bobolink and Eastern Meadowlark would effectively offset the project impacts, as nesting success would be expected to be much higher without the risk of mortality from agricultural activities. In accordance with Condition 2.6.4 of the Decision Statement, CN will implement modified or additional mitigation measure(s) if Bobolink or Eastern Meadowlark are found to not be using the off-site grassland habitat. In accordance with Condition 2.6.5 of the Decision Statement, a qualified biologist will review the site conditions and possible causes of the habitat not attracting Bobolink or Eastern Meadowlark. Corrective measures will be prescribed by the qualified biologist and implemented by CN.

Bobolink and Eastern Meadowlark, as sensitive species at risk, act as surrogates for other less sensitive grassland migratory birds. If requirements under Condition 2.6.4 and 2.6.5 of the Decision Statement are met for Bobolink and Eastern Meadowlark, the off-site grassland habitat would also be suitable for other grassland migratory birds.

5.2 WESTERN CHORUS FROG FOLLOW-UP PROGRAM

In accordance with Condition 8.9 of the Decision Statement, replacement habitat will be created for Western Chorus Frog in a greater than 1:1 ratio. Considering the removal of breeding habitat [redacted] by others, and CN's constraints of habitat compensation and enhancements within their right of way, other options have been considered.

The selected site for replacement habitat (**Figure 11, Appendix A)** is located to the south of the proposed Project, on CN owned lands. It falls outside of the Urban Area zoning of the Town of Milton's Official Plan and therefore adjacent lands will not be subject to the same urban development pressure that surrounds the existing Western Chorus Frog habitat. The selected site is connected to the North Oakville-Milton West Wetland Complex and appears to be the best alternative for potential connectivity with existing Western Chorus Frog occurrences. The North Oakville-Milton West Wetland Complex measures 20.2 hectares in size, made up of many wetland pockets within a larger forested tract between Milton and Oakville. The wetland pockets are predominantly comprised of wooded swamps or woodland pools, expected to provide amphibian breeding habitat. Available records of Western Chorus Frog occurrences within the North Oakville-Milton West Wetland Complex are limited to sites with public assess, [redacted] However, as much of the wetland complex occurs on private lands that have not been surveyed for the species, additional occurrences of Western Chorus Frog are expected to occur throughout the complex.

Western Chorus Frog habitat enhancement and monitoring was developed in consultation with species expert, Isabelle Picard (Stantec), who will continue to be involved in the detailed design and monitoring requirements, as the Western Chorus Frog habitat compensation is further developed. Ms. Picard has authored several publications on Western Chorus Frog, including the 2008 COSEWIC report. She is experienced in habitat creation for Western Chorus Frog, participating and being senior scientific advisor on the Terraformex Canada Western chorus frog pond creation project conception (2018–2019) and CIEL et Terre Experimental project for the creation of ponds for the chorus frog (2016–2019). A full CV of Ms. Picard's expertise is provided in **Appendix C**.

Breeding Pond Number, Size and Hydroperiod

Western Chorus Frog are known to generally breed in small or shallow aquatic habitats, mostly temporary ponds or wetlands that become dry in the summer (referred to as breeding "ponds" herein). The species is also known to have high site-fidelity to their natal ponds.

Further, the species exhibits relatively low mobility and as such, the design takes into account a number of characteristics related to pond number, size, hydroperiod and proximity to other wetlands and terrestrial habitat aimed at optimizing breeding success for the species in the proposed compensatory habitat area.

- In total, an area of 550 m^2 of breeding habitat is proposed to be created, following the design elements as follows: Habitat Diversity (Pond Cluster): Several ponds with different hydroperiods, depth and sizes are recommended as this will provide suitable breeding habitat for a range of

different seasonal conditions each spring as well as provide additional diversity / resilience in the face of uncertain changes in both landscape level and local micro-climactic conditions. This cluster of breeding habitat is shown in **Figure 11, Appendix A**. Five ponds with a diversity of hydroperiods will also provide greater resiliency of the habitat to climate change. All ponds should allow for a minimal hydroperiod of 90-100 days from April to July. One pond should be semi-permanent (dried up for only 1-2 weeks in August once every two years).

- Pond proximity to each other and proximity to terrestrial habitat: The cluster of ponds will be close together; all within 10 to 100m of each other. Further, the ponds will be located in close proximity to other terrestrial habitat features, such as fallow fields or natural meadows, thickets and woodland features. It is recommended that thicket habitat exist or be created within 20m of the breeding pools. Overwintering habitat will be located in an area where potential shading of the ponds can be avoided (ex. In the north or west side), as the shrubs continue to grow or if the habitat stochastically evolves to a community with taller vegetation in the future through succession or otherwise.
- Pond dimensions (individual): At least three of the breeding ponds will occupy an area of 80 – 100 square metres (m^2). The remaining ponds will vary in size and include very small (e.g. 10m2) to medium sized ponds (i.e. up to 250m^2). Ponds that are larger than 120 m^2 and deeper than 60cm are not recommended as they can attract waterfowl, which can be detrimental to the chorus frog habitat / survival success. Depth is less important as the species can use and breed in ponds with a variety of depths. Depth of the pond will be considered in the design in relation to its impact on the pond's hydroperiod, which is a variable that has considerable impact on the success of Western Chorus Frog use for breeding and success throughout its life cycle. However, ponds should not be too deep or permanent to avoid use by Green Frog, Bullfrog or fishes as these are predators of Western Chorus Frog. A pond that dries up and/or freezes to the bottom will avoid colonization by these predators.
- Pond Hydroperiods: Ponds should be designed such that surface waters dry out in late summer (late July through August). The following is prescribed for each of the breeding ponds:
  - Pond #1 (largest; ~200m^2): Designed such that it dries out every 2 to 4 years. Design details can include adjustments to depth and location where aspect and shade / cover are prevalent. This pond will be suitable breeding habitat in very dry years.
  - Pond #2 (large; ~70-90m^2): Designed such that it dries out annually in late August to September during a year with average rainfall. Design details can include adjustments to depth and location where aspect and shade / cover are prevalent. This pond will be suitable breeding habitat in dry years.
  - Pond #3 (medium to large; ~40-70m^2): Designed such that it dries out annual in late July to early August during a year with average rainfall. Design details can include adjustments to depth and location where aspect and shade / cover are prevalent. This pond will be suitable breeding habitat in an average year.
  - Pond #4 (medium; ~30-50m^2): Designed such that it dries out annually in June during a year with average rainfall. Design details can include adjustments to depth and location where aspect and shade / cover are prevalent. This pond will be suitable breeding habitat in very wet years.

- Pond #5 (smallest; ~10-30 m^2): Designed such that it dries out annually in late July to early August during a year with average rainfall. This pond will be suitable breeding habitat in an average year.
- Breeding Pond Stepping Stones: Small breeding ponds will be creating, radiating out from the breeding pond cluster, to assist in dispersal of individuals. Each pond will be approximately 30 m^2 in size. As dispersal usually occurs during wet years, the ponds will be designed such that they dry out in early July, so they will be suitable breeding habitat in a wet year. Further discussion on the placement of the ponds is provided in the Dispersal and Translocation section below.

Engineering Considerations

Given the desired characteristics for the breeding ponds, as outlined above, the following design details are prescribed:

- Hydrology: Hydrology of the site will be studied as part of detailed design, to determine excavation depths. If there is some uncertainty regarding the hydrology of the site, it is recommended that excavation activities increase the depth of the pond. Increased depth is desirable (as opposed to creating the pond too shallow) because if the results of monitoring activities demonstrate that the hydroperiod needs to be adjusted, it is more feasible (from an engineering/contractor capability standpoint) and economical to add fill or rocks to a pond that is too deep, than it is to further excavate a pond that is too shallow. A deeper pool should be located in the south end of the pond for avoid drying (protection by a berm or shrubs from desiccation).
- Contours and microclimate: The ponds will be designed to create a warmer microclimate at one end of the pool. This is because members of the *Pseudacris* genus emerge very early in the year (often when snow is still on the ground) and they benefit from these areas, as one end will lose ice cover and warm faster in the spring. It is recommended that the design aim to produce the warm microclimate area at the north end of the pool achieved using two design techniques: (1) designing the north end to be shallower than the south end and (2) creating a bermed contour around the pool at the north (the substrate unearthed via excavation activities can be used) to create a bowl or dish structure to capture the sun and help warm the north end of the pool. This is also desired to enable southern exposure and to provide shelter from north winds.
- Substrate: The bottom of the ponds will have native soil substrates. No additions (e.g., organic matter) are recommended.
- Surrounding Features: Tall vegetation (trees or tall shrubs) will not be present at the south end of the pond as shading will impede the desired microclimate creating by the pond design as described above. All trees or shrubs can be planted at the north or west end, behind the berm, and far enough back that future canopy does not extend over our warm microclimate at the pond's edge. A few scattered low shrubs (such as *Cornus* sp., *Alnus* sp., and *Salix* sp.) can be planted outside, but in proximity to, the ponds, even in the south but at least 5-10 m from the pond. Low depressions that hold some water in the spring may also be incorporated into the design if not present naturally on the landscape, particular between new ponds and terrestrial habitat, such as through existing meadows,

if present; this would assist species movement within the local population to increase population resilience against local stressors (genetic diversification).

- Aquatic macrophytes: the restoration plan (plantings or seed mix) should enable the successful establishment of vegetation in the pond with grassy vegetation (narrow-leaved emergents such as low-lying sedges). This is recommended as the dead plant materials persist through the winter and provide cover during spring breeding which enable populations to persist over time. Tall narrow-leaved or robust emergent such as cattails or iris or large rushes will be avoided as the create shade and do not provide the desired matted vegetation close to the ground.

Locations of breeding ponds shown in **Figure 11, Appendix A** are approximate and may be refined through detailed design once hydrological conditions of the Western Chorus Frog enhancement site have been studied.

Terrestrial Habitat (including Hibernation Site Residences)

An area of 6.6 ha of terrestrial habitat (**Figure 11, Appendix A**) will be created surrounding the breeding habitat. Furthermore, the breeding habitat will be situated adjacent to 15.9 ha of existing woodland habitat, which provides suitable terrestrial habitat for Western Chorus Frog, including hibernation sites. The combined terrestrial habitat, in conjunction with the created breeding ponds, provides a much greater than 1:1 ratio of habitat replacement.

Terrestrial habitat will be comprised of lowland meadow, shrubland and wooded habitat. The created terrestrial habitat will be comprised of meadow, which will be established through seeding of grasses and forbs. Scatter thicket will be established through plantings of low shrubs (such as *Cornus sp*., *Alnus sp.,* and *Salix sp*) and occasional trees (*Ulmus sp*., *Acer sp.* and *Betula sp*.). The habitat will be augmented with suitable hibernation sites, including fallen logs, large branches and brush piles. Once shrubs and trees become established they are expected to continue to provide woody debris and leaf litter, to continue replenishing hibernation sites.

Dispersal

The 6.6 ha of created terrestrial habitat has been designed to be functional as dispersal habitat, in addition to the 15.9 ha of existing terrestrial habitat. The breeding pond cluster will be located adjacent to the existing woodland habitat, providing a large patch (over 20 ha) of enhanced habitat for Western Chorus Frog. The woodland contains existing vernal pools which may provide suitable breeding habitat in wet years, increasing dispersal opportunities.

Another large, off-site, patch of the North Oakville-Milton West Wetland Complex is less than 200m from the created terrestrial habitat and connected by a hedgerow; within dispersal distance of Western Chorus Frogs. Stepping stone breeding ponds will be created between the breeding habitat cluster and the offsite hedgerow (**Figure 11, Appendix A**), providing a dispersal linkage between the created breeding habitat and suitable offsite habitat within the North Oakville-Milton West Wetland Complex. Stepping stone

breeding ponds have been designed to be no more than 100m apart, providing, well within the annual dispersal range of Western Chorus Frog.

Monitoring

In accordance with Condition 8.10 of the Decision Statement, monitoring of the created Western Chorus Frog habitat will be completed. It is recommended that monitoring be completed to evaluate the interaction of the design with the local biotic and abiotic environment to determine if additional modification is required to support a sustainable population of Western Chorus Frog through time.

Variables to be monitored include: (1) the hydroperiod, (2) vegetation (establishment, health, growth and community dynamics) and (3) amphibian populations (call surveys).

The following monitoring program (schedule) for the four variables is recommended:

1. Hydroperiod: Monthly monitoring, or use of piezometers with dataloggers, from early April through November is recommended for a five year period. A minimum of two dataloggers will be installed in each pond; one in the deeper pool of each pond and one in a shallow area, to provide a complete understanding of the hydrology of the ponds. For the larger ponds with more complex profile and more than one deep pool, additional dataloggers will be installed to assess the hydroperiod in the more complex bathymetry. In addition to the dataloggers, an in-person surface water survey will be completed three times each year; early spring, peak breeding and later fall (e.g November), including photographic monitoring. Late fall surveys will be used to assess the retention of standing water in each pond through the winter; an indicator of the pond's ability to support predatory species.

2. Temperature: Water temperature measurements will be taken from early April through November using the dataloggers installed in each pond.

3. Vegetation: Two surveys per year during the growing season (one is spring and one in later summer or early fall) for a period of five years. The surveys will evaluate species establishment (planted vegetation and seed mix areas), health / growth and community dynamics including an evaluation of community structure (using ELC classification) and invasive species presence / encroachment, if present. Special attention to aggressive invaders known to have negative impact on Western Chorus Frog habitat such as Common Reed (Phramites australis and subspecies) and buckthorn (Rhamnus cathartica and Rhamnus frangula) is recommended to be included in the monitoring program (if present, monoculture stands should be mapped out to aid in further restoration efforts, as required). Photo monitoring stations will be established at each breeding pond and representative locations in the terrestrial habitat. Stakes will be installed at each station with identified direction, so that photos position is consistent between monitoring events. The photographic record will be collected during both the spring and fall monitoring events, throughout the 5-year monitoring period.

4. Amphibian Population: ARUs (autonomous recording units) are recommended to be used to monitor the amphibian populations. ARUs will be deployed in very early spring (by the end of March on any given year). If not feasible, amphibian call surveys throughout the amphibian breeding season that capture Western Chorus Frog and Green Frog (predator) may be used alternatively to survey the use of the ponds by amphibians to evaluated Western Chorus Frog breeding success. Minnow trapping in May will be used to assess the presence of tadpoles and fish in the ponds. Five years of monitoring is recommended.

5.2.2 Contingency

Translocation can be a means of assisted dispersal of amphibians between habitat patches. For Western Chorus Frog, assisted dispersal can greatly reduce the timeframe in which the species can find and take advantage of new habitats. In south Milton, existing Western Chorus Frog habitat patches are surrounded by residential development which is likely to impede natural dispersal. As such, assisted dispersal may be used to assist Western Chorus Frog individuals in moving from existing habitat, into the created habitat site, providing the opportunity to protect the genetics of the local population, in the local landscape.

In the event that monitoring shows the created Western Chorus Frog breeding habitat is functioning correctly (e.g., correct hydroperiods, successfully establishment of vegetation), but have not been occupied for a period of three years, translocation will be considered. A Translocation Plan will be developed and submitted to ECCC for review, input and approval. Details in the plan will include, but not limited to, capture locations, times of year, trapping method, proposed number of individuals, release sites, permitting requirements, controls of disease transmission, as well as consideration of genetics.

5.3 LITTLE BROWN MYOTIS FOLLOW-UP PROGRAM

Results of the 2020 field program have confirmed the presence of Little Brown Myotis within the PDA, as consistent with the conclusions of the EIS. The 2020 field program did not find evidence of critical habitat for Little Brown Myotis; which is also consistent with the EIS. Critical habitat, as defined by the species recovery strategy (ECCC 2018), include the hibernacula, such as caves and mines.

Residence for Little Brown Myotis would include their roosts, which can occur in large diameter trees. Such large diameter trees are rare in the PDA. Results of exit surveys at the best candidate trees did not observed evidence of roosting. However, mature trees can be found in the local landscape; specifically, the woodland at the south end of the LAA, outside of the PDA.

Foraging habitat for Little Brown Myotis is typically associated with wetlands or waterways, as well as forest edge or clearing. Open water is also important for bats as a source of drinking water. It is anticipated that activity of Little Brown Myotis observed within the PDA in 2020, was associated with foraging insect prey produced by Indian Creek or drinking from the creek itself. Survey stations with the larger number of Little Brown Myotis calls also had the largest number of calls from other bat species (which has different roosting requirements) and is further evidence that bat activity was associated with foraging and not roosting.

The proposed creation of wetland habitat within the PDA is anticipated to enhance the existing foraging and drinking habitat for Little Brown Myotis. The proposed enhanced wetlands within the PDA contain the following 4 elements:

- New creek channels for Indian Creek and Tributary A
- Retained oxbow wetland along Indian Creek

- Riparian wetlands (4 large pools along Indian Creek and 12 small pools along Tributary A)
- Floodplain meadow marsh

The enhancements will provide a net gain in wetland area (7.1 ha replacing 3.7 ha) and different wetland environments (flowing water, pools and meadow marsh), which are anticipated to increase the volume and diversity of insect prey for bats produced by wetlands in the PDA. As such, bat activity is anticipated to be maintained and potentially enhanced within the Indian Creek corridor that runs through the PDA. To further opportunity for Little Brown Myotis use of the wetland enhancement area, bat boxes will be installed to provide roosting habitat. Bat box design and installation will be consistent with Bat Conservation International guidelines (https://www.batcon.org/about-bats/bat-houses/). Bat boxes will be monitored for a period of three years to assess use by bats. Guano drop sheets will be install in the month of June to assess use. If bats are found to be using a box, ultrasonic acoustic record will be used to determine the species. Spot checks of the temperature inside the box will also be in June.

5.4 SNAPPING TURTLE, MIDLAND PAINTED TURTLE AND EASTERN MILKSNAKE FOLLOW-UP PROGRAM

In accordance with Condition 8.15 of the Decision Statement, habitat enhancements for Snapping and Painted Turtles have been designed for the PDA. The design has also considered enhancements for Eastern Milksnake.

Riparian wetlands within the project site will be enhanced and new wetlands created to provide foraging, cover, nesting and movement habitat for turtles found within the region (e.g., Snapping Turtle and Midland Painted Turtle) and snakes (e.g., Eastern Milksnake, Eastern Gartersnake) (**Figure 12A and 12B, Appendix A).** Enhancements incorporated into the design for turtles include:

- New creek channels for Indian Creek and Tributary A
  - The new channels will act as a movement corridor connecting the different created habitats on site, as well as habitats upstream and downstream of the site. These will replace movement corridor function of the current creeks. The new channels have been designed with a sequence of riffles and pools, with the use of logs and root wads to help create the riffles, and planting and log tangles to provide cover along the length of the channel for turtles moving through these habitats.
- Retained oxbow wetland along Indian Creek
  - The retained oxbow wetland will provide foraging habitat as well as opportunities for basking and cover. Existing vegetation will be retained and allowed to succeed over time as soil moisture conditions change.
- Riparian wetlands (4 large pools along Indian Creek and 12 small pools along Tributary A)
  - The riparian wetlands will include a mix of emergent and riparian native wetland plants, and open water, which will provide foraging habitat for Snapping Turtle. Plugs of emergent and floating vegetation will be planted along the wetland edges, including species such as water-plantain, wild

calla, tussock sedge, little duckweed, broad-leaved arrowhead and water smartweed. Logs for basking will be placed both in the water and along the edge.

  - Some of the riparian wetlands will be designed to provide suitable conditions for Snapping Turtle overwintering. These will be constructed to variable depths of 1 to 2 m, with a soft substrate bottom and in-water logs and root wads.

- Turtle nesting mounds.
  - Eight turtle nesting mounds will be placed adjacent to on-site aquatic features (e.g., riparian wetlands, new channel). The nesting mounds are proposed to be within the riparian area along Indian Creek and Tributary A, where turtle nesting habitat is currently limited.
  - The mounds will be constructed in a manner that will provide suitable nesting habitat for Snapping Turtle and Midland Painted Turtle, both of which prefer to nest in close proximity to wetlands or waterbodies.
  - The nesting mounds will consist of uncompacted granular material (e.g., sand and/or gravel substrates) placed to a depth of 600 mm over geotextile fabric on undisturbed topsoil to reduce weed growth.

- Floodplain Meadow Marsh
  - The floodplain meadow will provide supporting habitat for Snapping Turtle, suitable for overland movement between wetlands and nesting sites, and indirectly as habitat for amphibian prey. Log piles will be constructed in the open areas to provide additional cover.

Once construction is completed and temporary exclusion fencing is removed and permanent exclusion fencing is installed, it is anticipated that amphibians (including both turtles and snakes, among others) will naturally return to the area through the use of the Indian Creek corridor that is connected to habitat both upstream and downstream from the PDA. Amphibian relocation to the PDA is not planned.

5.4.1 Snapping Turtle and Midland Painted Turtle Monitoring

Turtle basking surveys will be conducted over a period of five years post-construction. Surveys should commence as soon as weather conditions permit (i.e., early April), and continue until mid-May (before turtles typically relocate away from overwintering ponds). Five rounds of surveys will be completed each year.

Binoculars will be used to scan shallow water habitat and watercourse channels for potential basking sites (i.e., floating logs or hummocks) for basking turtles. Surfaces of ponds will also be searched for the presence of turtles. This was especially important, since Snapping Turtles tend to bask at the water's surface, not always crawling out of the water.

Surveyors will record all species observed, along with the number of individuals of each species and behaviour.

In accordance with Condition 2.6.4 of the Decision Statement, CN will implement modified or additional mitigation measure(s), if Snapping Turtles or Midland Painted Turtles, or evidence of the turtles (e.g., eggshell fragments) are not observed in the created habitat along Indian Creek and Tributary A. In accordance with Condition 2.6.5 of the Decision Statement, a qualified biologist will review the site conditions and assess if corrective measures and/or additional monitoring are required.

5.4.2 Eastern Milksnake Monitoring

Sightings of snakes in the PDA will be reported to CN and the sightings will be recorded in monthly logs. In accordance with Conditions 8.21.2 and 8.28.1 of the Decision Statement, CN will develop an internal reporting system for onsite employees which will record and track reptile observations or collision. All observations will also be submitted to the Natural Heritage Information Centre, in accordance with Condition 8.22 of the Decision Statement.

Annual monitoring of the permanent exclusion fence will take place each spring (e.g., March or April) during operations. Repairs will be conducted as needed, immediately after the monitoring event, prior to spring reptile emergence.

The internal reporting system will be reviewed by a qualified biologist annually through construction and 5-years post-construction, to assess the effectiveness of the exclusionary fence design, in accordance with Condition 2.6.4 of the Decision Statement. If it is determined fencing modifications or additional mitigation measures are required to reduce the risk to reptiles, such measures will be developed and implemented in Accordance with Condition 2.6.5 of the Decision Statement.

5.5 MONARCH FOLLOW-UP PROGRAM

In accordance with Condition 8.24 of the Decision Statement, 18.8 hectares of replacement open Monarch butterfly habitat will be created within the PDA.

In southern Ontario, the Monarch butterfly is found primarily where milkweed and wildflowers (such as goldenrods and asters) exist (COSEWIC, 2016). Larvae occur only where milkweed exists; adults are more generalized, feeding on a variety of wildflower nectar (MNRF, 2014). This includes abandoned farmland, along roadsides, and other open spaces where these plants grow (COSEWIC, 2016).

CN has committed to the creation and protection of habitat for Monarch within the PDA, as offset for loss of Monarch residences, in addition to the area created within the Luther Marsh Wildlife Management Area. The enhancement habitat considers both breeding and nectaring requirements for Monarch (**Figure 13, Appendix A**).

The primary aim will be to plant milkweed species, which are necessary for Monarch breeding, with Swamp Milkweed (*Asclepias incarnata*) in wetland locations, and Common Milkweed (*Asclepias syriaca*) and Butterfly Milkweed (*Asclepias tuberosa*) in upland habitat. Plugs of these three milkweed species have been incorporated into the planting plan, planted in clusters of 72 plants per 500 m^2 (14 plants/100 m^2). This density was determined using guidance from the United States Department of Agriculture Conservation Stewardship Program (USDA, 2016), which recommends a density of 12 plants/100m^2, and in consideration of plant availability, as plugs are typically sold in trays of 72 plants.

Additionally, flowering plants that are suitable for nectaring by Monarchs will be planted in the enhancement area. Selected restoration seed mixes include a range of native species that flower in spring, summer, and fall, and are known to be used by Monarch, such as:

- Canada Goldenrod (*Solidago canadensis*)
- Wild Bergamot (*Monarda fistulosa*)
- New England Aster (*Aster novae-angliae*)
- Blue Vervain (*Verbena hastata*)
- Spotted Joe Pye Weed (*Eupatorium maculatum*)
- Black-eyed Susan (*Rudbeckia hirta*)

A complete list of the 18 flowering plants incorporated into the restoration seed mixes can be found on Drawing L-500.

Use of chemical herbicides will be limited in the replacement habitat, in accordance with Condition 8.24.1 of the Decision Statement.

5.5.1 On-site Vegetation Monitoring

In accordance with Condition 8.25 of the Decision Statement, follow-up monitoring will assess the effectiveness of the replacement habitat and will occur over a 5 year timeframe following planting.

Vegetation monitoring of on-site Monarch created habitat will be performed by a qualified professional. The vegetation monitoring program will be implemented to verify the installation of plant materials as per the planting plan, and to evaluate the successful propagation of native plant species. Details of the vegetation monitoring are provided in the CN Milton Logistics Hub Wetland Follow-up and Monitoring Program. The vegetation monitor will assess the establishment of vegetation establishment, including establishment of milkweed and nectaring wildflowers.

5.5.2 Off-site Vegetation Monitoring

Vegetation establishment of the off-site Monarch habitat will be monitored as part of the Bobolink and Eastern Meadowlark follow-up monitoring (20 year monitoring program), with the habitat assessment recording the cover of milkweed and nectaring wildflowers.

5.5.3 Butterfly and Caterpillar Monitoring

CN will monitor and evaluate Monarch use of the on-site compensation habitat, as well as the enhanced habitat in Luther Marsh, and share results with the relevant authorities. Annual surveys will be completed in July-September of each year. Surveys will be completed by walking transects through the Monarch habitat. The number of adults observed flying over or foraging in the fields will be recorded. Caterpillars and eggs will be surveys by examining leaves of milkweed plants encountered along the transects.

In accordance with Condition 2.6.4 of the Decision Statement, CN will implement modified or additional mitigation measure(s), if milkweed and nectaring flowers have not established or if evidence of Monarch use (adults, caterpillars or eggs) has not been identified. In accordance with Condition 2.6.5 of the Decision Statement, a qualified biologist will review the site conditions and possible causes of the habitat not attracting Monarch. Corrective measures will be prescribed by the qualified biologist and implemented by CN.

5.6 ECOPASSAGE FOLLOW-UP PROGRAM

In accordance with Conditions 8.31, 8,32 and 8.33, wildlife corridors were planned and designed to maintain connectivity based on the wildlife expected to be present within the PDA and with consideration of buffers.

Proposed habitat enhancements within the PDA along Indian Creek and Tributary A will be connected to habitats in the RAA and adjacent lands though connectivity with the Indian Creek corridor. The planned enhancements to the portion of the Indian Creek corridor within the PDA is anticipated to improve opportunities for wildlife movement. Improved aquatic, reptile and amphibian habitats are not only anticipated to support more abundant wildlife populations than existing conditions, but they will also facilitate movement along the Indian Creek corridor.

To further maintain and enhance connectivity within the RAA, ecopassages are proposed as part of the Project, as discussed below.

5.6.1 Ecopassages

The design of ecopassages have considered the Best Management Practices for Mitigating the Effects of Roads on Amphibian and Reptile Species at Risk in Ontario (MNRF 2015) and Conservation Halton's Road Ecology Quick Reference Guide (2018). Design considerations from these best management practice documents include:

- Tunnels should be as open as possible to maximize air flow and light inside the tunnel.
- Openness Ratio, calculated as the cross-sectional area of the structure entrance divided by its length (all measurements in meters), should be no less than 0.1; but ideally greater than 0.25.
  - Alternatively, tunnel can be designed with open grate at the top to increase natural light.
- Tunnel length for amphibians and reptiles should be less than 25 m.
- Provide a natural substrate (soil, sand, branches and other natural materials) on the tunnel floor.
  - For multi-species, a mixed array of structure types and sizes should be provided
- Aquatic crossing structures should not be fully submerged
- Terrestrial tunnels should be as level for length of the structure, with the entrances graded divert water away from the tunnel. For open topped tunnels, a slight grade, with the highest point in the middle, is used to allow for drainage.
- For mixed aquatic / terrestrial ecopassages, a dry bench placed above the water mark can be integrated into the tunnel.

The on-site habitat enhancements will be connected to off-site portions of the Indian Creek corridor by existing crossings under Tremaine Road (outside of the Project). Both Indian Creek crossings on Tremaine Road consist of a bridge, which achieve the design considerations of both aquatic and terrestrial ecopassages. These bridges provide open, sunlit crossings, with natural substrate and vegetation, as well as dry benches at the sides of the creek for terrestrial species. Permanent wildlife exclusion fencing, as discussed in Section 3.4, will be installed blocking wildlife from crossing Tremaine Rd. and to funnel them towards the bridges to use as an ecopassage. In addition to the existing bridges under Tremaine Rd., two wildlife ecopassages are proposed, as shown in **Figure 8 Appendix A**.

1. A wildlife passage along Tributary A is proposed for the Project's truck entrance off Britannia Road. This ecopassage will be achieved using a culvert with a natural substrate base. The proposed culvert is 20m in length, approximately 8m wide and 1.5m tall, providing an openness ratio of approximate 0.5. Permanent wildlife exclusion fencing will be used to block wildlife from crossing the truck entrance road and funnel them into the ecopassage. This ecopassage will be immediately downstream of a proposed ecopassage under Britannia Road, to be installed by the Region, facilitating movement of wildlife between the PDA and wildlife habitats in the RAA.
2. Aquatic ecopassages are proposed along Tributary A beneath the Project's pad and tracks (culverts 2A and 2B). These culverts have been redesigned to consider the passage of fish. The design option of a single culvert (as opposed to the originally planned set of smaller twin culverts) was selected. The proposed culvert will be countersunk with natural substrate, resting pools and current breaks to provide opportunities for fish movement.

5.6.2 Ecopassage Monitoring

CN will monitor the ecopassages to verify they meet the desired design. Five years of post-construction monitoring will occur annually in June. Monitoring will take place at the two ecopassages shown in **Figure 8, Appendix A**. Year 1 will focus on verifying dimensions, substrate, water depth in the ecopassages are as designed, as well as verifying installation of adjacent exclusion fencing. Years 2 to 5 will verify the installed substrates has been retained, as well as assess the water depth and vegetation composition are compatible with a functional ecopassage.

In accordance with Condition 2.6.4 of the Decision Statement, CN will implement modified or additional mitigation measure(s), if conditions in the ecopassages are not installed as designed, or conditions are not maintained through the five-year monitoring program. In accordance with Condition 2.6.5 of the Decision Statement, a qualified biologist and hydrological engineer will review the site conditions and prescribe corrective measure to re-instate the prescriptive design.

5.7 REPORTING

The data collected as part of the implementation of the WMCP as well as the monitoring activities proposed as part of the follow-up programs will be reviewed, analyzed and presented in a report to document (a) the results of the WMCP and follow-up programs and (b) to include a photographic record of conditions observed during monitoring, as described above.

A report will be prepared annually with the results provided to the relevant authorities and a summary included as a component of the annual report to IAAC.

6.0 REFERENCES

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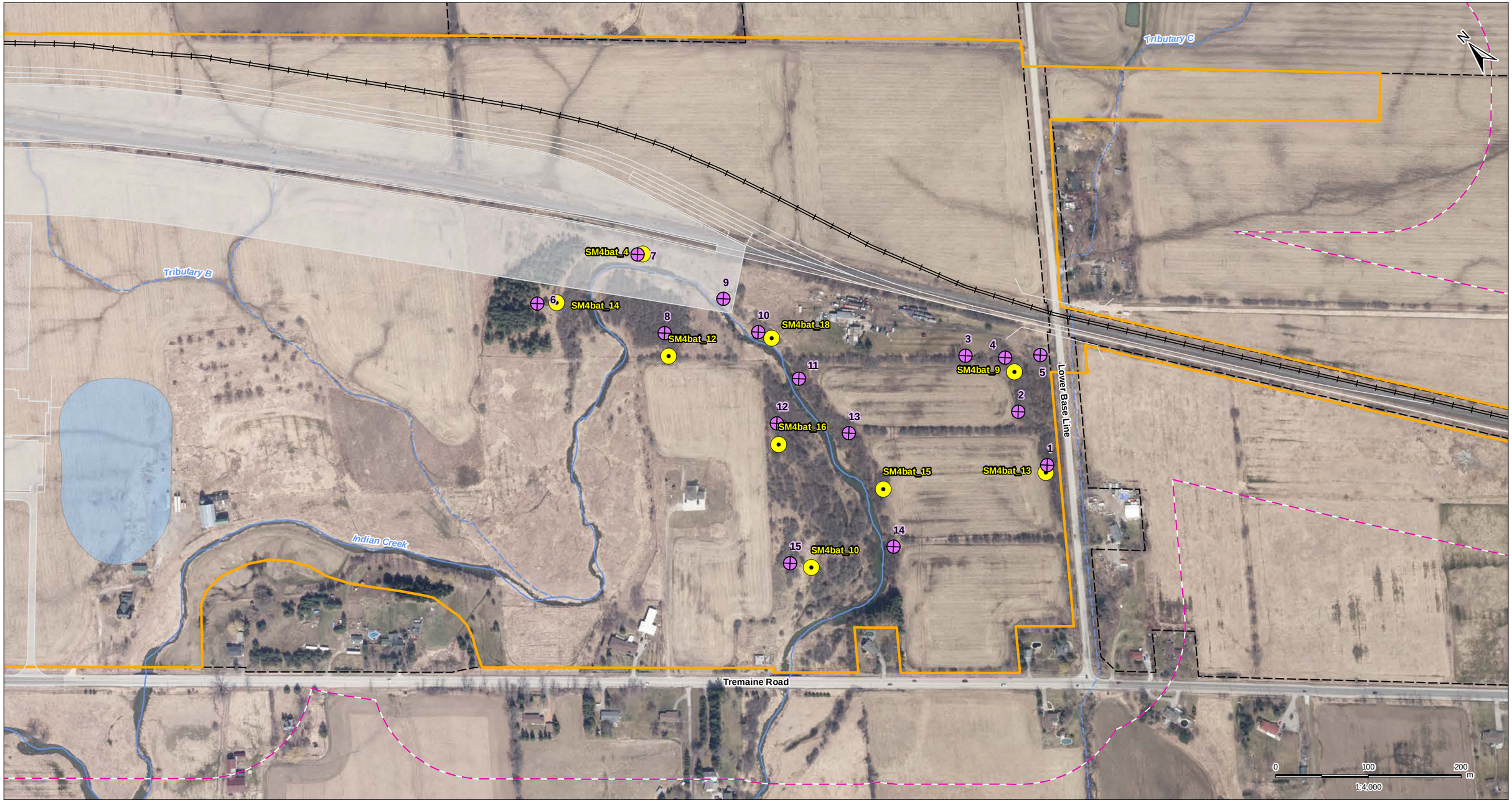
APPENDIX A
FIGURES

Figure 1 - Redacted in anticipation of posting to the public registry

Figure 2 - Redacted in anticipation of posting to the public registry



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Legend

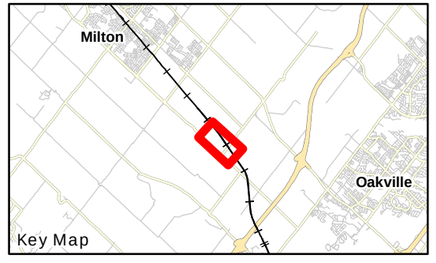
- Bat Exit Survey Location
- Automated Recording Unit Location

Project Components

- Project Development Area
- Local Assessment Area
- Existing Single Track Mainline
- Existing Double Track Mainline
- Double Track - Mainline
- Project Component
- CN-Owned Property
- SWM Pond

Existing Features

- Permanent Stream
- Intermittent Stream



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Technical Data Report - Terrestrial (Appendix E.16)

Figure No.

3

Title

2020 Bat Survey Locations

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Legend

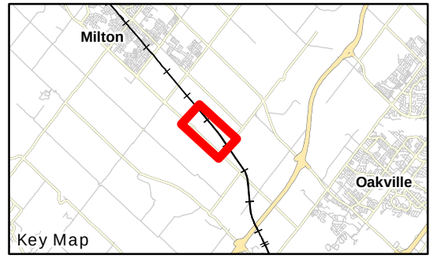
- Existing Cover Feature
- Snake Coverboard

Project Components

- Project Development Area
- Local Assessment Area
- Existing Single Track Mainline
- Existing Double Track Mainline
- Double Track - Mainline
- Project Component
- CN-Owned Property
- SWM Pond

Existing Features

- Permanent Stream
- Intermittent Stream
- Waterbody



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Technical Data Report - Terrestrial (Appendix E.16)

Figure No.
4

Title
2020 Snake Coverboard Locations

\\ Ca0220-ppfss01\01609\active\160960844\drawing\MXD\Terrestrial\Report_Figures\Wildlife_Management_Plan\160960844_Fig05_Turtle_Exclusion_Fencing_Phase1.mxd
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Legend

Project Components
- Project Development Area
- Local Assessment Area
- Existing Single Track Mainline
- Existing Double Track Mainline
- Double Track - Mainline
- Project Component
- CN-Owned Property
- SWM Pond

Exclusion Fencing
- Temporary Fence during Construction (Phase 1)

Existing Turtle Habitat
- Foraging Habitat (Watercourse)
- Foraging Habitat (Pond)
- Foraging and Overwintering Habitat

Existing Features
- Permanent Stream
- Intermittent Stream
- Waterbody

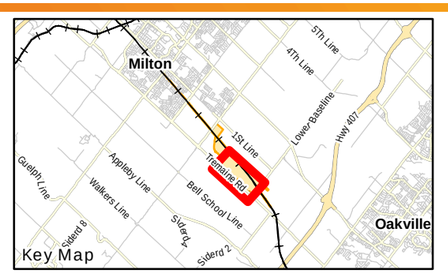

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Figure No.
5

Title
Turtle Exclusion Fencing: Construction Phase 1

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Legend

Project Components
- Project Development Area
- Local Assessment Area
- Existing Single Track Mainline
- Existing Double Track Mainline
- Double Track - Mainline
- Project Component
- CN-Owned Property
- SWM Pond

Exclusion Fencing
- Temporary Fence during Construction (Phase 2)

Habitat Enhancements
- New Channel
- Connected Riparian Wetland
- Disconnected Riparian Wetland
- Turtle Nesting Mound
- Retained Oxbow of Existing Channel
- Riparian Meadow Marsh

Existing Features
- Permanent Stream
- Intermittent Stream
- Waterbody

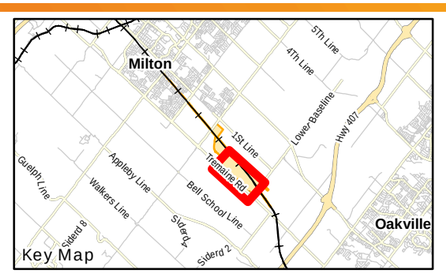

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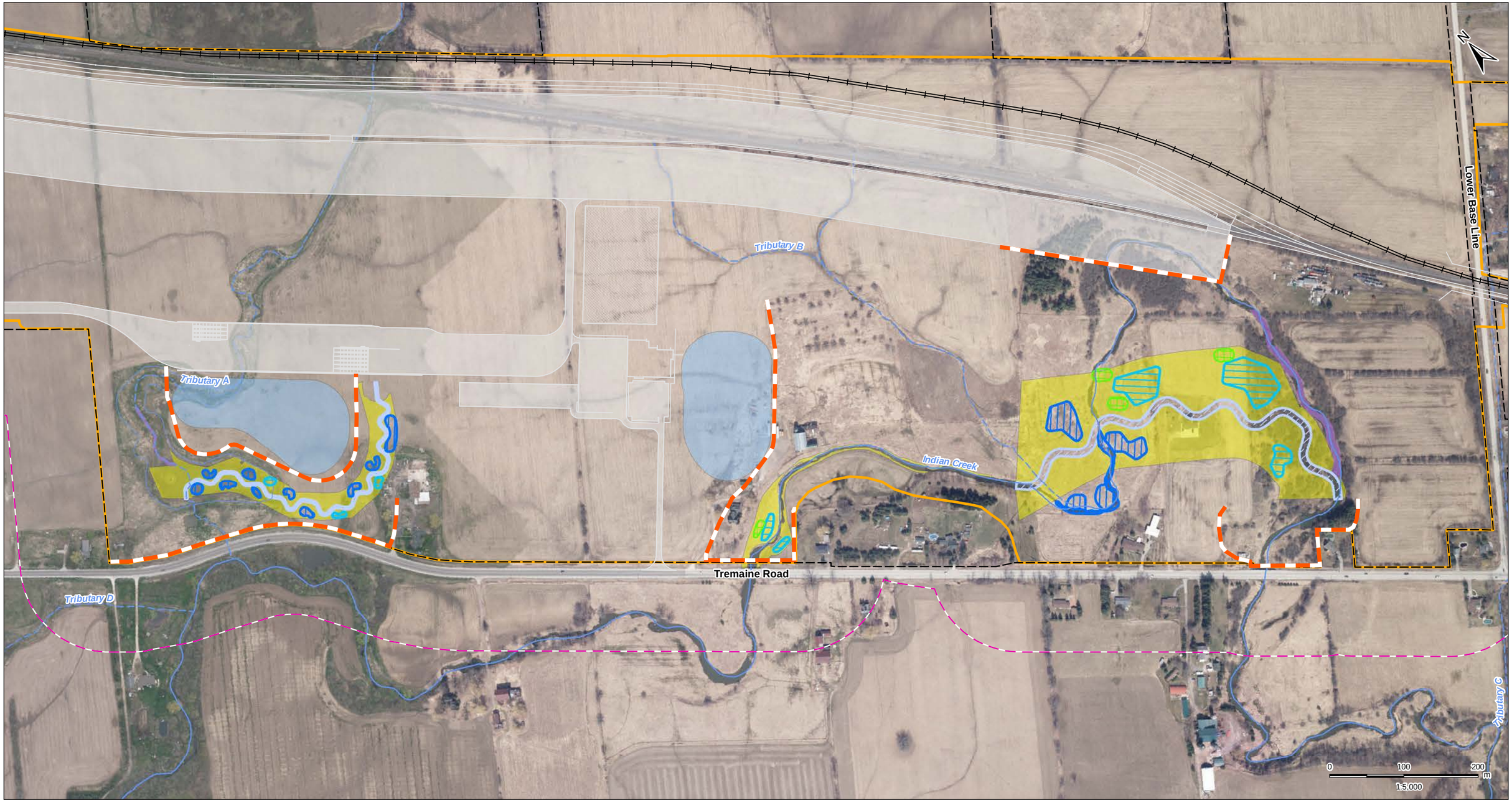
Figure No.
6

Title
Turtle Exclusion Fencing: Construction Phase 2



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Legend

Project Components
- Project Development Area
- Local Assessment Area
- Existing Single Track Mainline
- Existing Double Track Mainline
- Double Track - Mainline
- Project Component
- CN-Owned Property
- SWM Pond

Exclusion Fencing
- Permanent Fence during Operation

Habitat Enhancements
- New Channel
- Connected Riparian Wetland
- Disconnected Riparian Wetland
- Turtle Nesting Mound
- Retained Oxbow of Existing Channel
- Riparian Meadow Marsh

Existing Features
- Permanent Stream
- Intermittent Stream
- Waterbody

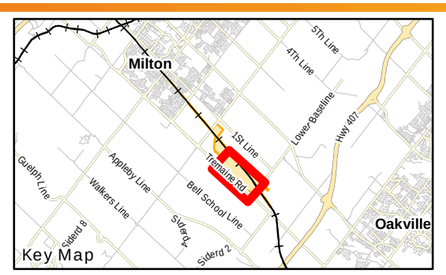

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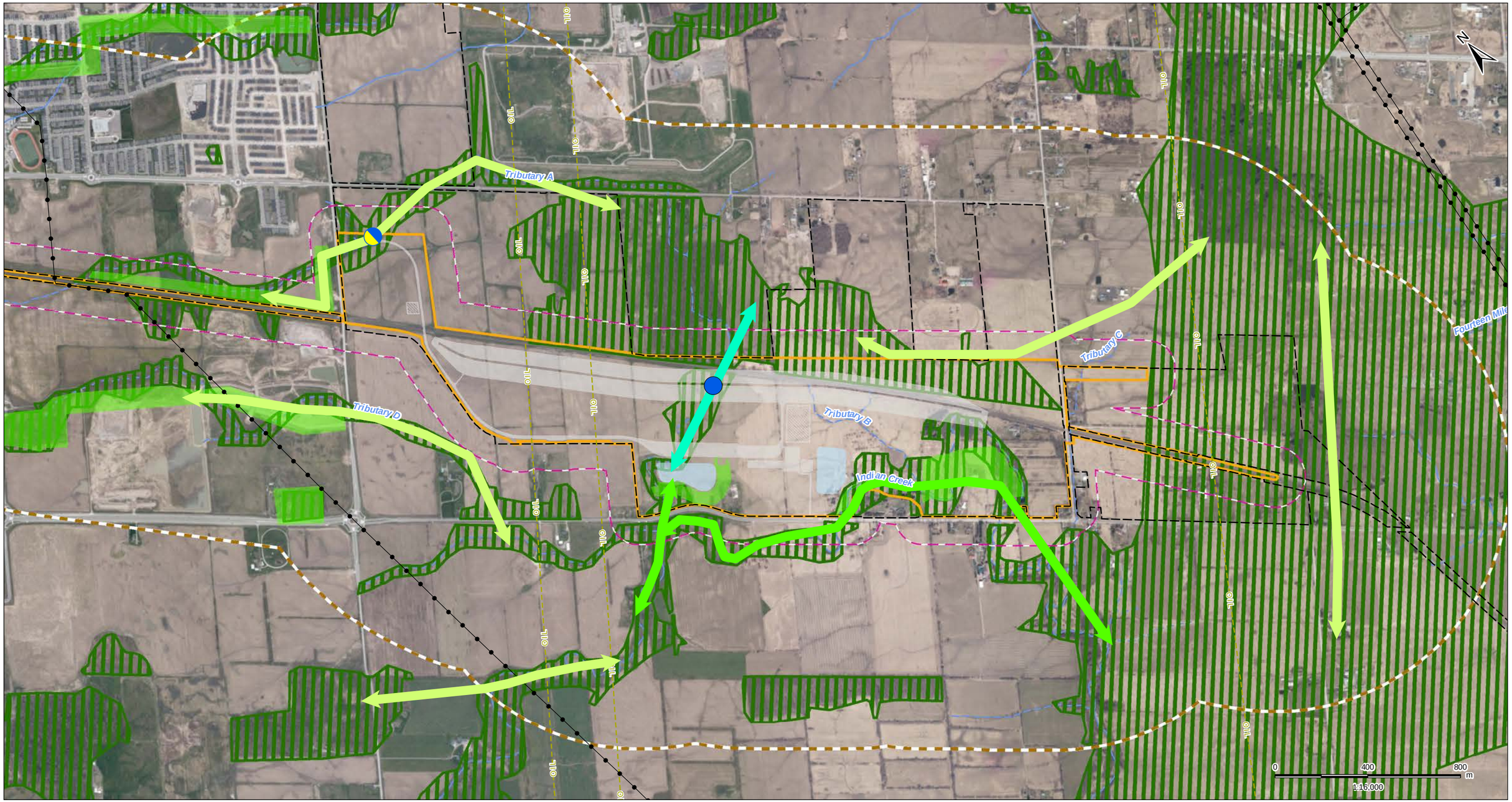
Figure No.
7

Title
Turtle Exclusion Fencing: Operation



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* The Key Features presented on this drawing represent a rough approximation of the Region of Halton's Natural Heritage System and should be considered approximate.

Legend

- Key Features (Region of Halton's Natural Heritage System)*
- Enhancement Area

Project Components

- Project Development Area
- Regional Assessment Area
- Local Assessment Area
- Existing Single Track Mainline
- Existing Double Track Mainline
- Double Track - Mainline
- Project Component
- CN-Owned Property
- SWM Pond

Existing Features

- Transmission Line
- Oil Pipeline
- Permanent Stream
- Intermittent Stream

Wildlife Corridors

- Wildlife Corridor- Retained (Aquatic)
- Wildlife Corridor- Enhanced
- Wildlife Corridor- Retained
- Proposed Ecopassage- Aquatic
- Proposed Ecopassage- Aquatic/ Terrestrial
- Proposed Ecopassage- Terrestrial

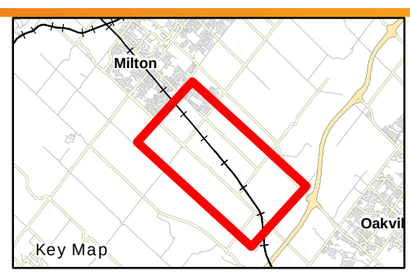

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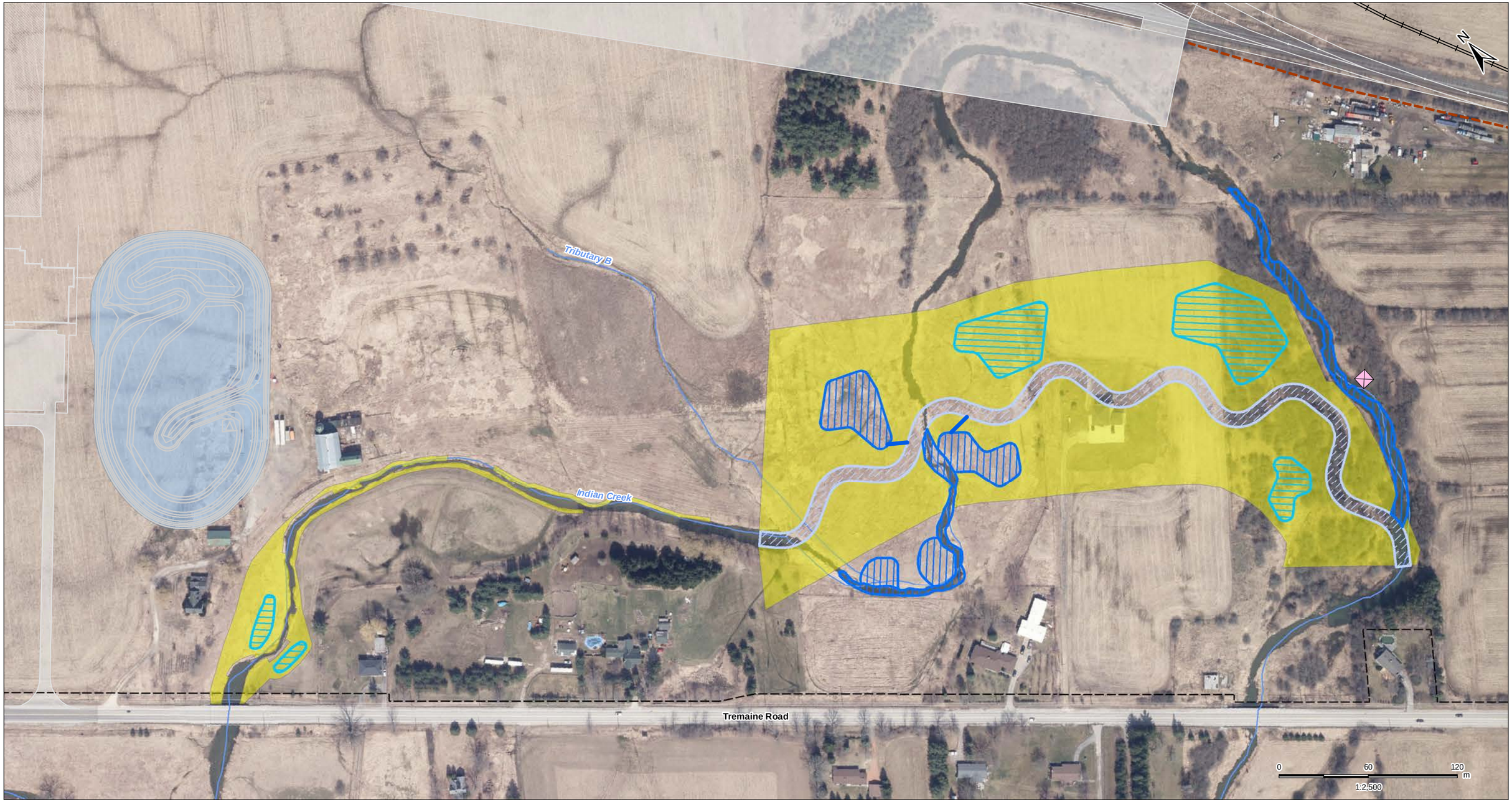
Figure No.
8

Title
Wildlife Corridors and Ecopassages



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Legend

- Existing Watercourse (MNRF/ LIO)
- Barn Swallow Structure

Wetland Migratory Bird Habitat

- New Channel
- Disconnected Riparian Wetland
- Connected Riparian Wetland
- Riparian Meadow Marsh

Project Components

- Double Track - Mainline
- Project Component
- CN-Owned Property
- Proposed Noise Berm
- SWM Pond

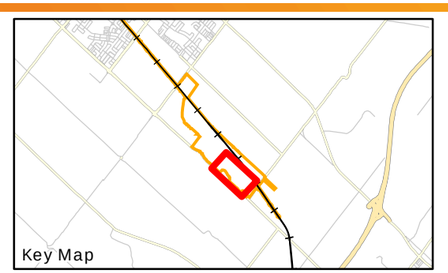

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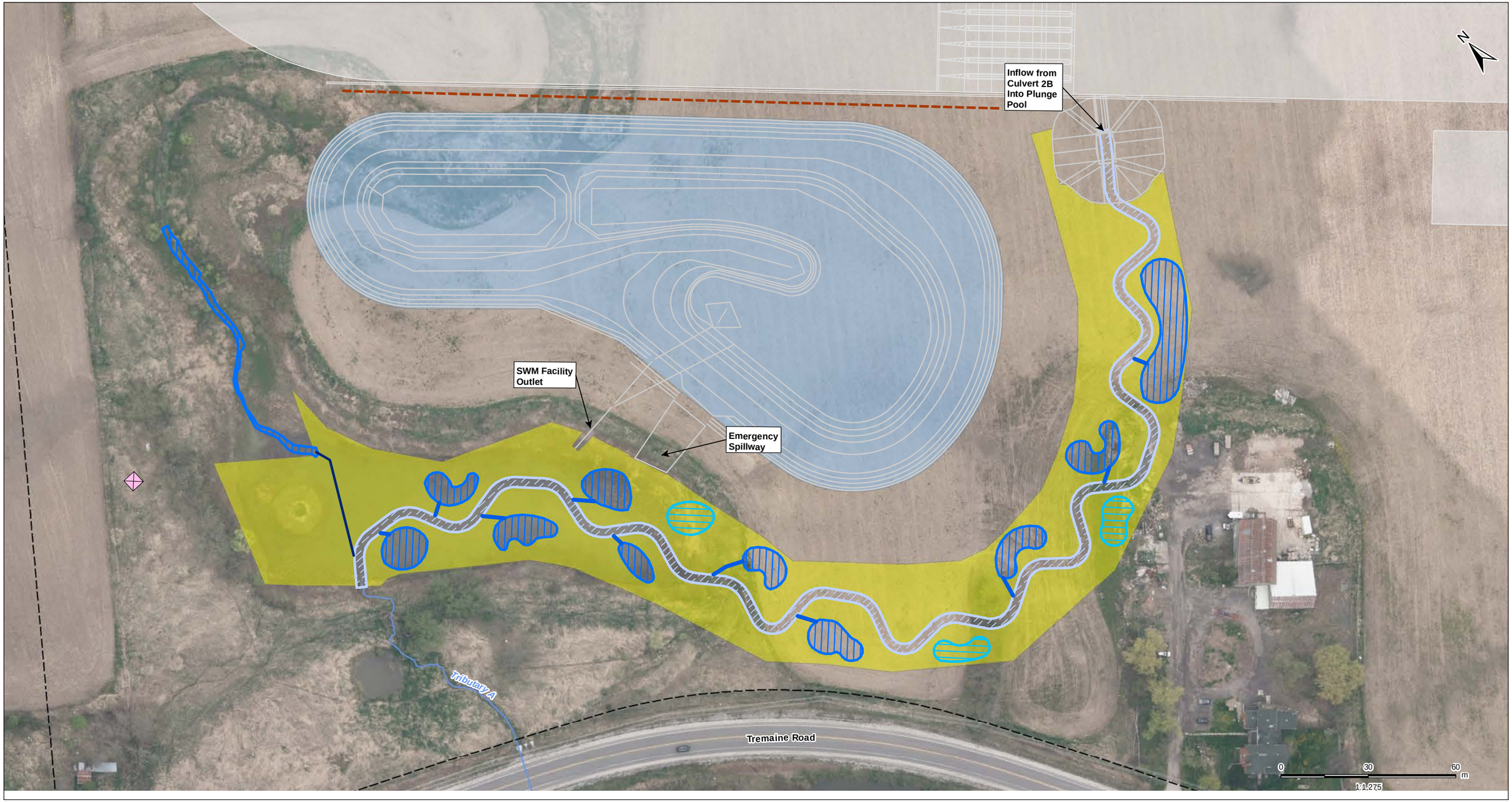
Figure No.

9-A

Title

On-Site Migratory Bird Habitat Enhancements- Indian Creek



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Legend

- Barn Swallow Structure
- Outlet Channel
- Existing Watercourse (MNRF/ LIO)

Wetland Migratory Bird Habitat

- New Channel
- Disconnected Riparian Wetland
- Connected Riparian Wetland
- Riparian Meadow Marsh

Project Components

- Project Component
- CN-Owned Property
- Proposed Noise Berm
- Concrete Pad
- SWM Pond

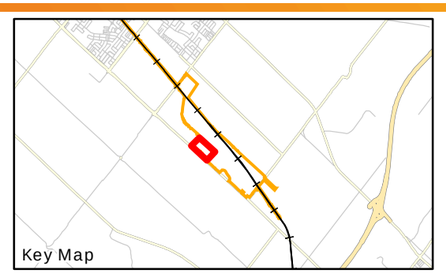

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Figure No.
9-B

Title
On-Site Migratory Bird Habitat Enhancements- Tributary A

545000 546000 547000 548000

4869000 4868000 4867000 4866000

SIDEROAD 21 & 22

Black Creek

Luther Lake

0 200 400 m

1:8,000

545000 546000 547000 548000

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Legend

- Grassland Migratory Bird and Monarch Habitat Enhancement
- Road
- Watercourse
- Waterbody

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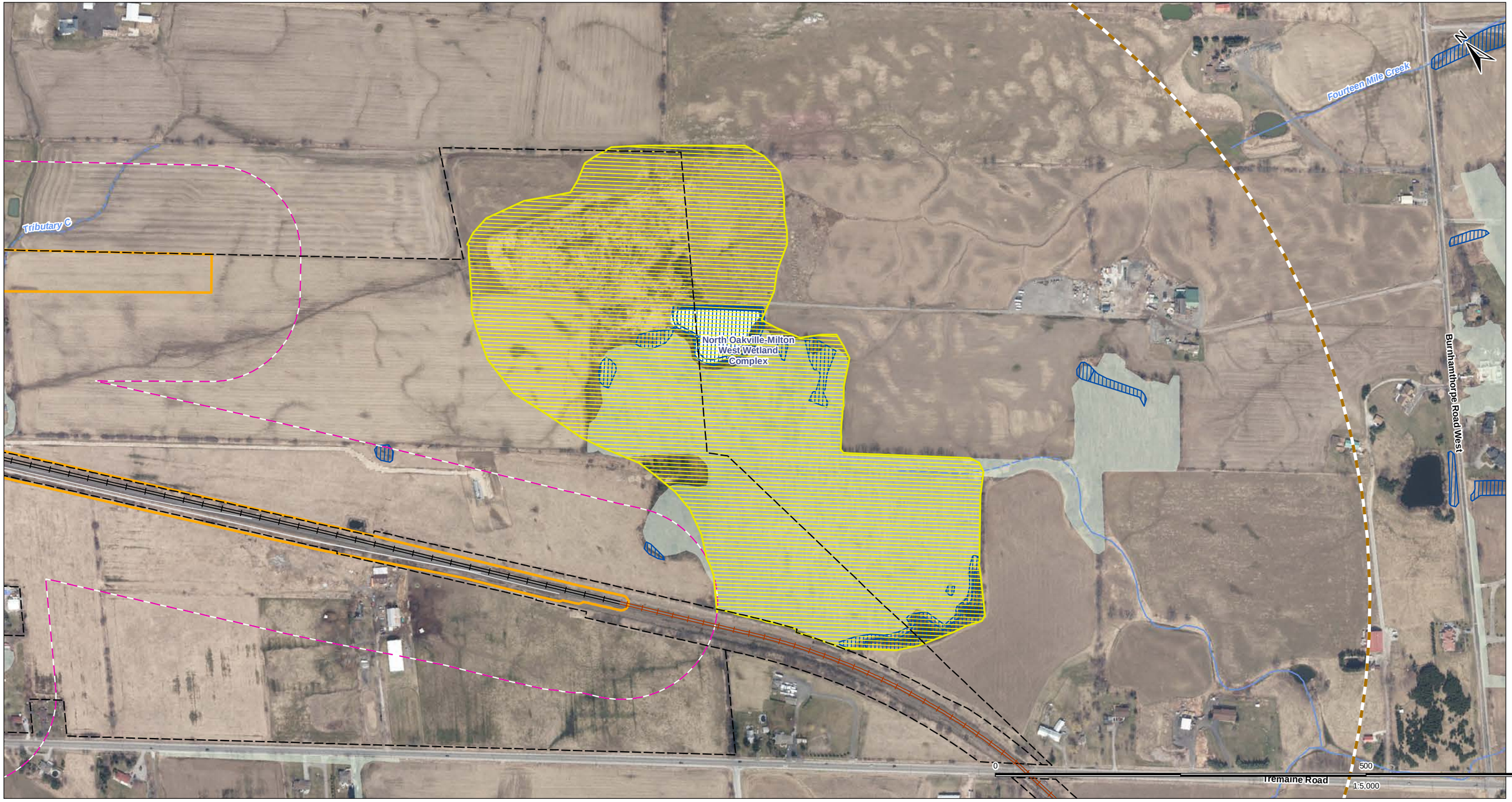
Figure No.

10

Title

Off-site Habitat Enhancements



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Legend

Project Components

- Project Development Area
- Regional Assessment Area
- Local Assessment Area
- Existing Single Track Mainline
- Existing Double Track Mainline
- Double Track - Mainline
- Project Component
- CN-Owned Property
- SWM Pond

Existing Features

- Permanent Stream
- Intermittent Stream
- Waterbody
- Wetland - Evaluated-Provincial
- Wooded Area
- Western Chorus Frog Habitat Enhancement

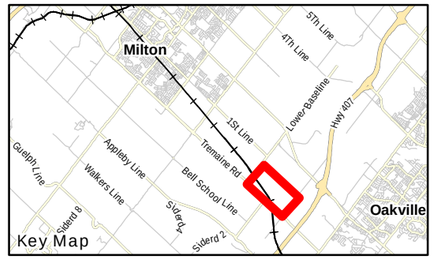

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Figure No.
11

Title
Western Chorus Frog Habitat Enhancement

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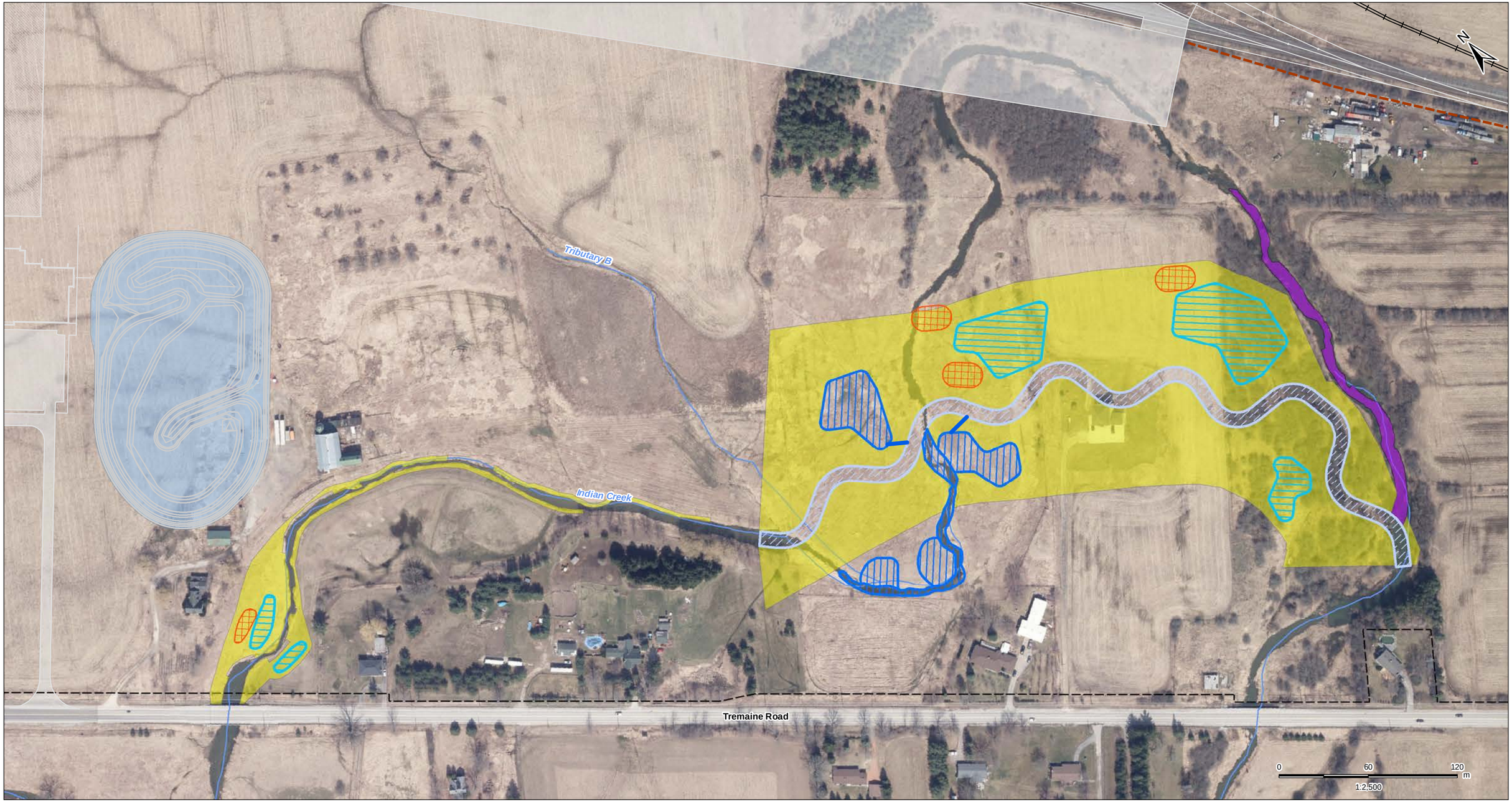

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Legend

- Existing Watercourse (MNRF/ LIO)

Turtle Habitat Enhancements
- Turtle Nesting Mound
- New Channel
- Disconnected Riparian Wetland
- Connected Riparian Wetland
- Riparian Meadow Marsh
- Retained Oxbow of Existing Channel

Project Components
- Double Track - Mainline
- Project Component
- CN-Owned Property
- Proposed Noise Berm
- SWM Pond

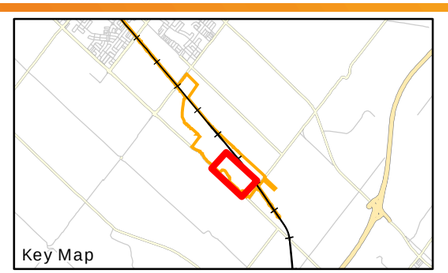

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Figure No.
12-A

Title
Turtle Habitat Enhancements- Indian Creek

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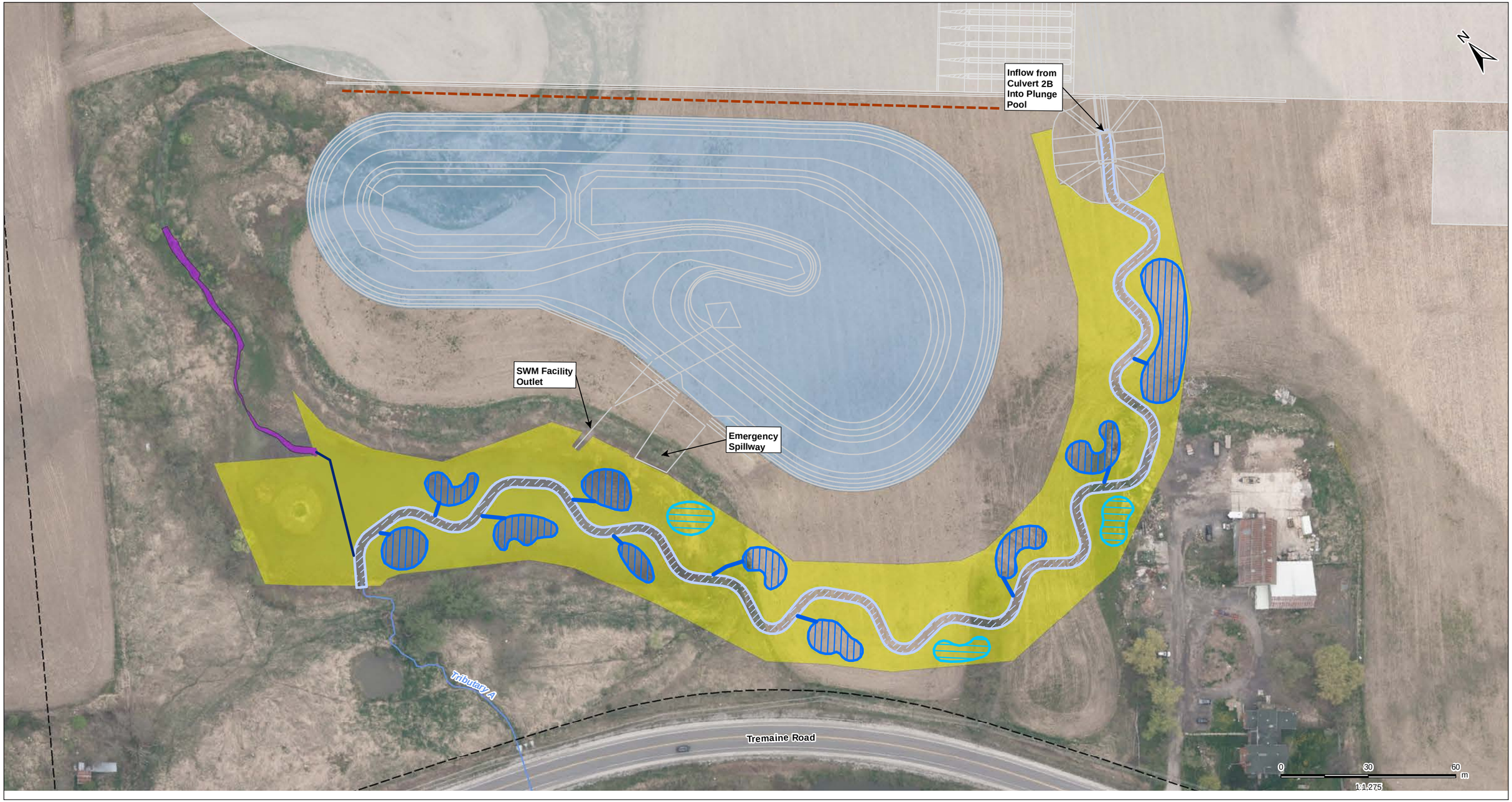
Revised: 2021-06-18 By: swen



June 2021
160960844

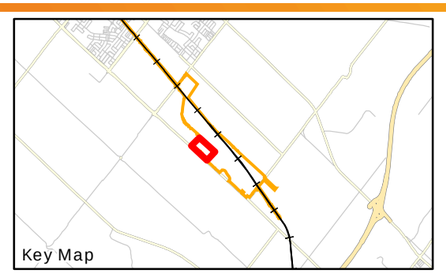
Stantec

Notes
1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021. Site layout: July 10, 2015.
3. Orthoimagery © First Base Solutions, 2021. Imagery taken in 2019.

Legend
- Outlet Channel
- Existing Watercourse (MNRF/ LIO)

Turtle Habitat Enhancements
- New Channel
- Disconnected Riparian Wetland
- Connected Riparian Wetland
- Riparian Meadow Marsh
- Retained Oxbow of Existing Channel

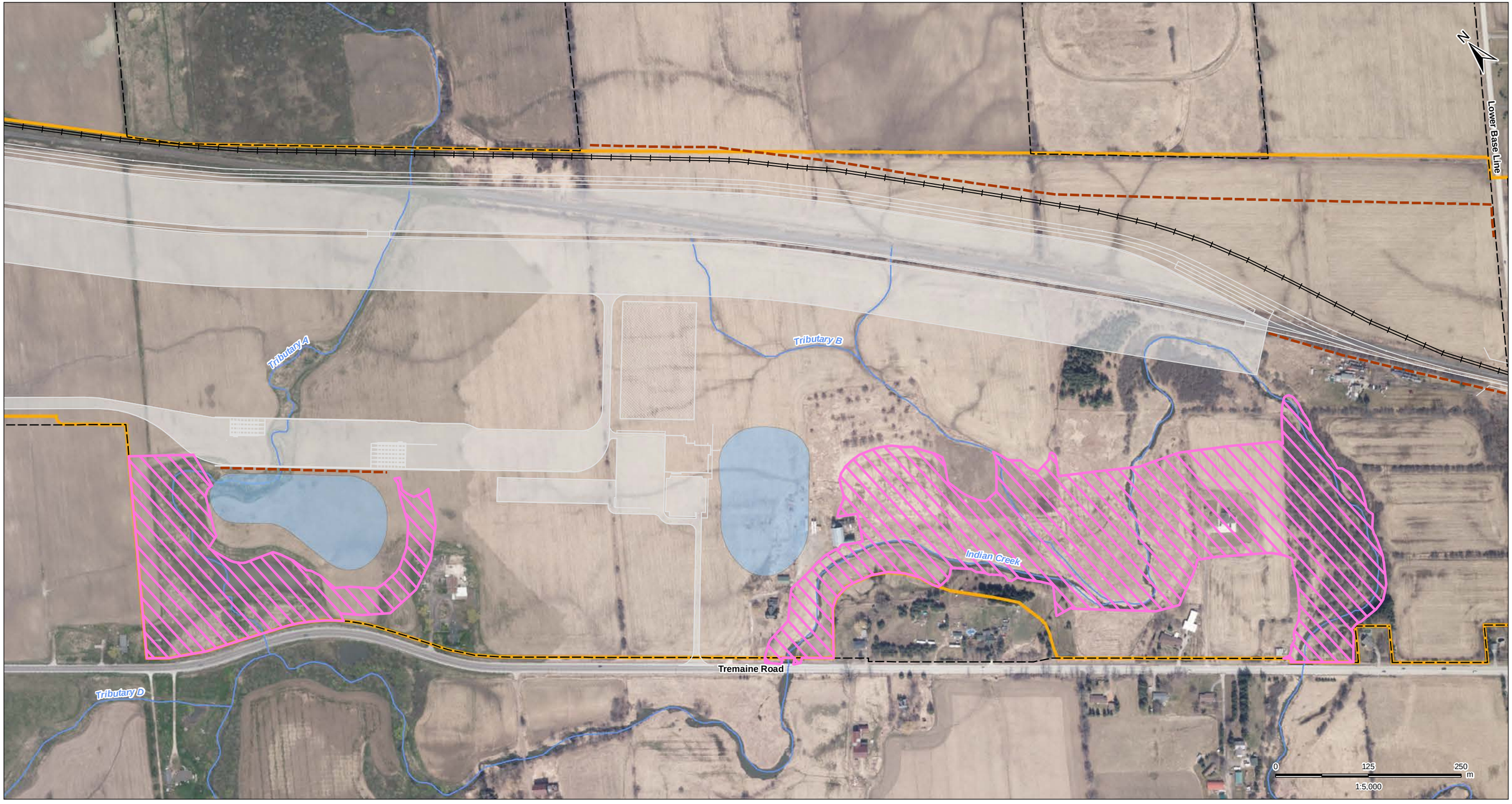
Project Components
- Project Component
- CN-Owned Property
- Proposed Noise Berm
- Concrete Pad
- SWM Pond



Client/Project
Canadian National Railway
Milton Logistics Hub

Figure No.
12-B

Title
Turtle Habitat Enhancements- Tributary A



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Revised: 2021-06-18 By: swen

June 2021
160960844

Stantec

Legend

- Existing Watercourse (MNRF/ LIO)
- Monarch Habitat Enhancement

Project Components

- Project Development Area
- Double Track - Mainline
- Project Component
- CN-Owned Property
- Proposed Noise Berm

- Concrete Pad
- Temporary Laydown Area
- SWM Pond

Key Map

Client/Project
Canadian National Railway
Milton Logistics Hub

Figure No.
13

Title
On-site Monarch Habitat Enhancements

Notes

1. Coordinate System: NAD 1983 UTM Zone 17N
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2021. Site layout: July 10, 2015.
3. Orthoimagery © First Base Solutions, 2021. Imagery taken in 2019.

APPENDIX B
PHOTO LOG

Photo 1: CHFR-1 – Looking east at the cattail marsh.

Photo 2: CHFR-1 – Unvegetated pooling water in the PDA at culvert outlet.

Photo 3: CHFR-2 – Looking north toward cattail marsh wetland habitat.

Photo 4: CHFR-2 – Looking east into meadow with sparse hawthorns.

Photo 5: CHFR-3 – Looking south into meadow with sparse tree and shrub cover. Wet depressions in the background.

Photo 6: CHFR-3 – Looking north at meadow habitat within PDA. Agricultural field in background.

Photo 7: CHFR-4 – Looking west into meadow with sparse trees and wet depressions.

Photo 8: CHFR-4 – Looking east into meadow habitat.

Photo 9: CHFR-5 – Looking southwest into meadow habitat with sparse trees and wet depressions.

Photo 10: CHFR-6 – Looking south into meadow habitat.

Photo 11: CHFR-6 – Looking north into meadow habitat with cattails along Tributary A in the background.

Photo 12: CHFR-7 – Cattails along drainage ditch.

Photo 13: CHFR-7 – Unvegetated flooded area along Britannia Rd.

Photo 14: CHFR-8 – Reed canary grass meadow marsh along Tributary A.

Photo 15: CHFR-8 – Unvegetated flooded area along Britannia Rd.

Photo 16: CHFR-9 – Reed canary grass meadow marsh along Tributary A.

Photo 17: CHFR-9 – Isolated, discontinuous pooling water along Tributary A channel.

Photo 18: CHFR-10 – Reed canary grass meadow marsh along Tributary A. Agricultural field in background.

Photo 19: CHFR-11 – Farm pond impoundment on Tributary A.

Photo 20: CHFR-12 – Reed canary grass meadow marsh along Tributary B. Dry channel in middle of photo.

Photo 21: CHFR-12 – Outlet of Tributary B into Indian Creek

Photo 22: CHFR-13 – Deciduous woodland with evidence of previous flooding in the early spring.

APPENDIX C
PICARD CV

Isabelle PICARD

Biologist, Aquatic Fauna Specialist

Isabelle Picard has in-depth knowledge of the ecology and identification of fish, amphibians, reptiles, crayfish, and molluscs (freshwater molluscs and land snails in particular) of Eastern Canada. She has also developed extensive expertise in identifying aquatic plants (characterization of aquatic plant communities), the main groups of aquatic macroinvertebrates communities (characterization of benthos) and marine invertebrates, and specific groups of terrestrial insects (odonata, lepidoptera, and orthoptera). Isabelle has been a project manager for various clients (private, ministries, cities, and nonprofit) and involved in a variety of applied research projects, inventories, ecological studies, planning, follow-up programs, applications for environmental permits and impact studies. Highly skilled at scientific and technical writing, she is also able to popularize subject matter (inventory reports, environmental impact assessments, project opinions, leaflets, proposals, grant applications, scientific opinions, research reports, scientific articles, etc.). Isabelle co-authored the *Guide d'identification des poissons d'eau douce du Québec et des maritimes* (2013) - a guide to identifying freshwater fish in Quebec and the Maritimes—covering all freshwater species of fish, mussels, and crayfish in Quebec and Maritimes. An excellent communicator, she has taken part in many continuous training sessions and regularly attends meetings of the Association of Biologists of Quebec (ABQ).

Isabelle uses the main field tools related to aquatic fauna (physicochemical probes, gillnets, bait traps, seine nets, hoop nets, kick nets, electrofishing, grab sampler, Secchi disc, GPS, underwater camera, aquascope, etc.). She also snorkels.

Her practical knowledge of protocols extends to herpetology, ichthyology, malacology, macrobenthos inventory, general aquatic habitats description with mastery of the main aquatic bioindicators (IIB, ECDI, IBS, and CABIN and EEM indicators).

EDUCATION

1998-2001 Bachelor's degree in Biology, Ecology concentration, Université de Sherbrooke

1996-1998 DCS in Pure and Applied Science, Cégep de Baie-Comeau

YEARS OF EXPERIENCE

18 years

REGISTRATIONS

Association of Biologists of Quebec (ABQ), member 3423

MEMBERSHIPS

- Board of Directors of the Quebec Council on Invasive Alien Species (CQEEE)
- American Fisheries Society member #84298
- American Malacological Society member
- Freshwater Mollusk Conservation Society member
- Canadian Herpetological Society member

PROJECT EXPERIENCE

Environmental authorizations

Hydro-Québec - Authorizations for bank stabilization (since 2019)

Plan, coordinate and carry out an aquatic habitat characterization, a delimitation of the high-water mark (HWM) and an ichthyological inventory of a section of a watercourse and a retention basin for permitting for riverbank stabilization works. This work is planned in the area of the new pylon 32 which will be built as part of the reconstruction project of the 120 kV lines between the Vignan, Templeton and Interconnection-Maclaren substations in Gatineau, Quebec.

Ville de Laval - Authorizations for biomethanization project (2019)

Plan and carry out ichthyological inventories and aquatic habitats characterization requested by the MELCC as part of an environmental authorization request.

Library and Archives Canada/PCL - Request for authorization under the Species at Risk Act of Canada (2019)

Act as an advisor to the client for the planning and design of the planting plan, construction plans and retention basins design in order to adapt them to the biological needs of the chorus frog. Write the request for authorization in English to Environment Canada under the Species at Risk Act of Canada. This request was made in response to the presence of designated critical habitats for the western chorus frog, an endangered species in Canada, on federal lands of Library and Archives Canada.

Quebec Transportation Ministry (MTQ) - Authorizations for bank stabilization (2019)

Carry out a freshwater mussels' inventory in search of hickorynut, a species with precarious status, in a sector of the Coulonges river (Outaouais) within the framework of requests for authorization for a bank stabilization project.

Ocean Group - Authorization request for dredging of an access channel (2019)

Plan the necessary mussels' inventories prior to the issuance of an authorization for dredging work planned in the access channel of the Pointe-des-Ormes pilot wharf, in Trois-Rivières. Coordinate and participate in inventories carried out using various methods: snorkeling, active search using a rake, as well as a drone and an underwater camera. Write the complete inventory report necessary for the authorization request to DFO.

T^2 Environnement – Project notice for pipeline maintenance (2018–2019)

Subcontracted as an aquatic fauna expert (fish, molluscs, benthos, amphibians, and reptiles) for a project notification for a pipeline project. Drafting of component description.

Axio Environnement / City of Deux-Montagnes- Authorizations for bank stabilization (2018)

Freshwater mussels' inventory along the banks of the Deux-Montagnes Lake in the City of Deux-Montagnes and drafting of inventory report.

Enviro-Guide AL inc.- Authorization request for industrial development (2017–2018)

Drafting of scientific advice for industrial land in La Prairie with a western chorus frog presence (2017). Drafting of scientific advice for the Bromont Scientific Park, to assess the potential presence of wood turtles, and scientific advice on implementing egg-laying sites in response to the compensation measures sought (2017–2018).

Municipality of Saint-Paul-de-l'Île-aux-Noix - Authorization request for the repair of a culvert (2017)

Drafting of scientific advice on the wildlife potential for a marsh in Saint-Paul-de-l'Île-aux-Noix, in connection with the permit application for culvert repairs.

Biodiversité Conseil/ Municipality os Saint-Lazare- Authorization request for development (2017)

Subcontract for a herpetological survey of two 38 ha woodlands along Sandmere and Oakridge streets for the city of Saint-Lazare as part of development planning. The inventories included the search for snakes under artificial and natural shelters, the auditory survey of anuran, the search for amphibian eggs and larvae in ponds and ditches, as well as the active search for stream salamanders. The mandate also included a summary characterization of watercourses and water environments and survey of fishes.

GDC Développement de Concessions inc. a/s Daniel Lefebvre - Authorizations for the expansion of the marina (2017)

Inventory of turtles, aquatic plant communities, and freshwater mussels at a marina in Venise-en-Quebec, in connection with a permit application for the marina's expansion.

Regional County Municipality of Roussillon - Authorizations for bank stabilization (2017)

Inventory and drafting of scientific advice for verifying the presence of a breeding site and range potential of the western chorus frog in La Prairie, in a sector undergoing stabilization works for the left bank of the Saint-Jacques River.

Mauricie National Park - Rehabilitation of brook trout habitat in the La Pipe lake watershed (2016–2017)

Aquatic mollusc and crayfish inventories for a sector of the Mauricie National Park prior to rotenone treatment of the watershed. Drafted scientific advice following the results obtained.

Enviro-Guide AL inc.- Authorizations for the expansion of the marina (2016)

Inventory of freshwater mussels in St-Mathias on the Richelieu River. Drafted scientific advice following the results obtained.

BC2-Groupe synergie / Quebec Transportation Ministry (MTQ) - Authorizations for bank stabilization (2016)

Inventory of freshwater mussels in a sector of the Coulonges River, and half-day training of MTQ employee.

Enviro-Guide AL inc. - Authorization request for a sand pit (2015–2016)

Monitoring of egg-laying site for the wood turtle in Montérégie and identification of eggshells. Drafted scientific advice following the results obtained.

Axio Environnement/City of Boucherville - Authorizations for bike path project (2015)

Fish inventory along the Boucherville banks for a bike path project.

Environmental Impact Assessments

Wood PLC - Deconstruction of the original Champlain Bridge: Targeted environmental analysis (2018)

Subcontracted as an aquatic invertebrates expert (freshwater mussels, crayfish, benthos), for an environmental impact assessment regarding the demolition of the former Champlain Bridge. Participation in the planning and execution of inventories, drafting of biological component descriptions.

T^2 Environnement - Impact study for a mining project (2018–2019)

Subcontracted as an aquatic fauna expert (fish, molluscs, benthos, amphibians, and reptiles) for a environmental impact assessment for a mining project. Drafting of component description and environmental impact assessment.

Municipality of Saint-Paul-de-l'Île-aux-Noix - Impact study for canal maintenance dredging (2017–2019)

Characterization of aquatic fauna and flora for the "10-year Maintenance Dredging Program for Canals in the Municipality of Saint-Paul-de-l'Île-aux-Noix" project (2017), and assistance in drafting the environmental impact assessment and answers to ministry questions (2018–2019). Drafting of scientific advice on the wildlife potential for a marsh in Saint-Paul-de-l'Île-aux-Noix, in connection with the permit application for culvert repairs (2017).

Hydro-Québec - Impact study of the construction of the 735 kV line from Chamouchouane – Bout-de-l'Île (2015)

Inventory of freshwater mussels for a sector of the Des Prairies River, analysis of results, and drafting of report. Involved a characterization study of potential unloading sites on the Des Prairies River, as part of the environmental assessment for the project to build the 735-kV Chamouchouane–Bout-de-l'Île line.

Quebec Transportation Ministry (MTQ), Outaouais Directorate - Impact study for the construction of a section of Highway 5 (2007–2008)

Herpetological inventory of the Highway 5 route between Chelsea and La Pêche in the Outaouais region and drafting of the inventory report.

Quebec Transportation Ministry (MTQ), Outaouais Directorate - Impact study for the construction of Highway 50 (2002)

Participation in the inventory of amphibians and reptiles for an environmental impact assessment of Highway 50 in Outaouais and the Laurentians.

Fauna management and compensatory project

Quebec Transportation Ministry (MTQ) - Moreau River fishway mitigation project (since 2019)

Carry out the environmental characterization for eight sites along the Moreau River, including the physical characterization of fish habitat,

watercourse and obstacles, as well as the determination of HWM, bankfull discharge water mark, and floristic characterization of banks and terrestrial accesses. This characterization aimed to complete the characterization of eight obstacles (culverts, ice jams, thresholds), to assess the free passage for American eel and brook trout and to determine the nature of intervention ensuring the free passage of fish. Write the technical note to answer questions from Fisheries and Oceans Canada (DFO). This project is part of the fish habitat loss compensation program as part of the project to improve Route 389 between Baie-Comeau and Manic-2, for which the Dessau / Cegertec and LVM consortium was mandated.

Unamen Shipu Innu Council - Unamen Shipu Shoreline Stabilization Project (since 2019)

Development of the lobster reef compensation program in Kégaska as part of a bank stabilization project in the community of Unamen Shipu. Negotiate with Fisheries and Oceans Canada (DFO) for acceptance of the compensation program. Write the detailed compensation plan as well as the DFO authorization request and the answers to the questions. Stantec Experts-conseils ltée (Stantec) was mandated in 2016 by the Innu Council of Unamen Shipu to design and obtain authorizations within the framework of riprap in the marine environment of the community's banks. The shore stabilization works and the reef installation are scheduled for Summer 2020.

City of Saint-Lazare - Bank and embankment stabilization project in Saint-Lazare-de-Vaudreuil and fish habitat mitigation project at Pine Lake, in Hudson (2018 and since 2019)

Validate the fish identifications and report review as part of the ichthyological inventories carried out in the Quinchien river in order to obtain authorizations for a bank stabilization project from various authorities (as sub-contractual in 2018). Write the fish habitat compensation plan for the project and participate in negotiations with Fisheries and Oceans in order to obtain authorization and acceptance of the Pine Lake compensation project in Hudson (2019). Carry out the initial ichthyological inventory of Pine Lake in Hudson as part of this compensation project as an establishment of the initial state and develop a monitoring program (since 2019).

Terraformex Canada – Western chorus frog pond creation projet conception (2018–2019)

Participation in, and scientific review/opinions for a concept production project aimed at the creation of breeding grounds for the western chorus frog on agricultural land in Outaouais.

CIEL et Terre - Experimental project for the creation of ponds for the chorus frog (2016–2019)

Senior scientific advisor for the plan to create breeding ponds for the western chorus frog in Boucherville so as to strengthen existing populations in the vicinity and design a corridor for natural dispersion to sectors where a decline was observed; drafting of reports (physical and biological description, tender documents, monitoring protocol), planning of permit requests and supervision of layout work.

Memphrémagog Conservation inc. - Mitigation of road mortality of amphibians (2017-2019)

Carry out an inventory of amphibian migrations on a road section of Fitch Bay and propose development solutions to the problem of road mortality.

Enviro-Guide AL inc./City of Bromont – Wood turtle mitigation projet (2017)

Act as expert scientific advisor for the establishment of spawning sites as compensation measures requested in the context of environmental authorizations for the Bromont Scientific Park

Terraformex Canada – Fish mitigation project (2017–2018)

Participation, advice, and scientific review for a project to produce the concept for the creation of a fish habitat in the Sabrevois Creek in Boucherville.

Terraformex Canada - Rehabilitation of Bertrand Creek (2016)

Supervision of the herpetological aspect (particularly snakes) for a project in Montreal. Relocated fish in a section of the Bertrand Creek.

Follow-up projects

Municipality of Laval - Environmental monitoring of reshaping and optimization of the flow conditions of the Papineau-Lavoie watercourse in Laval (since 2019)

Carry out ichthyological inventories and participate in drafting of the biological monitoring report as part of the environmental monitoring of the reprofiling works and optimization of the flow conditions of the Papineau-Lavoie watercourse between Boulevard Saint-Martin and Highway 440 in Laval. Stantec was mandated by the City of Laval to carry out environmental monitoring over 5 years (years 1, 3 and 5) provided for in the MELCC certificate of authorization. The monitoring program included monitoring of water quality, assessment of bank erosion, monitoring of resumption of riparian vegetation, delimitation and monitoring of swamp vegetation as well as fishing for monitoring of fish fauna.

CIEL et Terre – Western chorus frog monitoring program for breeding pond in Montérégie (2014–2019)

Planning, coordination, and participation in western chorus frog inventories in the Montérégie, for the purpose of producing a summary of the species 10 years later (2004–2014) and document population changes (2015–2018). Supervising teams of 5 to 8 employees and 50 volunteers during inventories. Mapping, analysis, and drafting of population reports and summaries.

Cégep de Sherbrooke / Quebec Transportation Ministry (MTQ) - Applied research project on the culvert repairing effect on fish and their habitat (2011-2018)

Co-leader of a research project on the evaluation of the effect of the reconstruction of culverts on fish (and benthos) in Eastern Township. Design the experimental protocol including the four-year monitoring of fish, benthos and their habitat (2011-2012). Participate and help coordinate inventories and follow-up before after the culvert repairs and on control sites (2011-2015). Participate in analyzes for the final report (2017-2018).

Yamaska Watershed Organization / City of Ste-Hyacinthe -- Yamaska River follow-up after the July 2016 spill (2016–2018)

Planning, supervision, and two-year monitoring of the Yamaska River following wastewater flooding, using several bioindicators (electrofishing of fish, freshwater mussels, benthos, and diatoms), and drafting of final report.

Quebec Ministry of Forestry, Wildlife and Parks (MFFP) – western chorus frog monitoring program for artificial ponds (2017)

Drafting of protocol to monitor the design of western chorus frog habitats, in collaboration with the ministry.

Renaissance Brome Lake – ichthyological survey for an fish habitat restoration project (2015–2017)

Inventory by electrofishing in a section of the Quilliams River, for monitoring before and after the fish habitat restoration works.

Friends of the Cerises River Marsh (LAMRAC) - Five-year monitoring of the biodiversity of the Cerise River marsh (2013–2015)

Planning and supervision of the terrritory's bird, fish, amphibian, reptile, odonate, and vascular plant inventories as part of a five-year monitoring. Carried out inventory of fish for this marsh, located in Magog. Drafted summary inventory reports for all taxons.

National Capital Commission - Gatineau Park biodiversity monitoring (2011)

Inventory of freshwater mussels in Gatineau Park. Helped analyze results and draft follow-up report.

Friends of the Cerises River Marsh (LAMRAC) - - Five-year monitoring of the biodiversity of the Cerise River marsh (2007–2008)

Inventory of fish, amphibians, reptiles, molluscs and dragonflies on the Cerises River marsh territory. Drafted summary inventory report for the territory, including inventoried groups as well as birds and vascular plants.

Ichthyological and aquatic fauna surveys

City of Quebec - Ecological inventories, Multiple projects, Quebec (since 2019).

Participate in the planning and carrying out of the ichthyological inventories necessary within the framework of the various ecological studies carried out on several sites in Quebec. Participate in the drafting of ecological studies reports aimed at characterizing wetlands and bodies of water, invasive alien species and species with precarious status.

Renaissance Brome Lake - Standardized diagnosis for walleye (2016–2018)

Standardized diagnosis of the walleye (2016–2017). Data capture, mapping, and drafting of report (2018).

Davignon Lake Watershed Protection Committee - Portrait of the aquatic fauna of Davignon Lake (2016–2017)

Inventory of fish and other aquatic fauna elements (molluscs, crayfish, anuran, and turtles) in Davignon Lake. Data capture, mapping, analysis of results, and drafting of report.

Nature-Action Québec - Management of L'Île-des-Sœurs natural territories (2014)

Herpetological and fish inventory along the banks of Île-des-Sœurs.

Renaissance Brome Lake – Ichthyological survey of Brome Lake (2013–2014)

Inventory of Brome Lake fish (lake sector), data capture, analysis of results, and drafting of report.

Renaissance Brome Lake - Ichthyological survey of Brome Lake (2011)

Fish inventory for certain marshes of Brome Lake. Helped analyze results and draft follow-up report.

Nature-Action Québec - Protection of the green and blue corridor of the Yamaska River (2012–2013)

Drafting of an inventory plan for freshwater mussels, fish, amphibians, and reptiles on the territory of the Yamaska River's blue and green corridor. Nest inventory for wood turtles and fish on the territory. Supervised and took part in the spring inventory of wood turtles. Drafted a report on the territory's freshwater fish.

Friends of the Saint-Joachim Peat Bog in Montérégie - Herpetological inventory of the Saint-Joachim peat bog (2005)

Inventory of peat bog herpetofauna.

Société d'histoire naturelle de la vallée du Saint-Laurent/City of Montreal - Herpetological inventories of Montreal Nature Parks (2000-2002)

Assistance with the herpetological survey of some Parcs-nature de Montréal as a technical assistant with the main technician.

Duck Illimited Canada inc. (2004)

Assistance with the herpetological survey of Rivière du Sud as a technical assistant and mapping and analysis of the results

General ecological surveys

Confidential client - Ecological inventories of two properties (since 2019)

Act as project manager for ecological studies of two properties in Beauharnois as a preliminary step in choosing a site for the possible purchase of land. Coordinate the various inventories including characterization and delimitation of wetlands and bodies of water, description of terrestrial plant communities, auditory inventory for the chorus frog, snakes inventory using artificial shelters, and identification of invasive alien species and special status species. Writing of two ecological study reports in English and synthesize the information to put the constraints of the sites into perspective.

Parks Canada - Repair of drainage infrastructure (weirs, siphons, culvert and ditch) (2019)

Act as project manager and carry out ichthyological inventories as part of this ecological study in natural and peri-urban environments near existing infrastructure (3 siphons, 3 weirs, a culvert and a ditch) along the Chambly Canal, between Chambly and Sainte-Thérèse Island. Coordinate the carrying out of other inventories including watercourses and ditches characterization, identification and delimitation of wetlands, description of terrestrial plant communities, detailed inventory of the trees present and their

state of health, auditory inventory of anurans, visual inventory of turtles and their nesting sites, inventory of snakes using artificial shelters, inventory by listening point of nesting birds and location of nests , and finally, identification of invasive alien species and special status species. Writing of the eight ecological study reports for each of the structures as a preliminary step to verify compliance with the Canadian Environmental Assessment Act.

Nature-Action Quebec - Ecological assessments of two properties (2018)

Inventory of properties in Montérégie for the western chorus frog and drafting of scientific advice.

Memphrémagog Conservation inc. - Ecological assessments of three properties (2017-2018)

Carry out ecological assessments (fauna and flora) of three properties (township of Stanstead and Magog) in order to plan voluntary conservation measures.

Memphrémagog Conservation inc. - Ecological assessments of the Cummins Bay sector and Lac Memphrémagog meadows (2016-2017)

Regular inventories of aquatic fauna for priority sectors of the Memphremagog Lake watershed. Carried out environmental assessments (multi-taxon inventories) for two properties. Drafting of two environmental assessment reports for private properties, a wildlife inventory report for the Cummins Bay sector and report on the bridle shiner in Memphremagog Lake.

Society for the Conservation of the Salmon River Natural Corridor - Salmon River Natural Corridor Project (2004)

Biological (fauna and flora) characterization of a number of lands for conservation purposes.

Committee for the Protection of the Kingsbury Marsh, Eastern Townships - Salmon River Natural Corridor Project (2000–2001)

Assistance with the inventory of invertebrates, amphibians, reptiles, mammals, and birds of the Gulf Creek and Salmon River territory, identication of invertebrates (molluscs, odonata, lepidoptera, orthoptera, and crayfish) and micromammals, and drafting of a report following the results obtained.

RAPPEL, Sherbrooke (1999)

Inventory of wetlands and identification of plants and molluscs.

ZIP Committee, North Shore of the Estuary, Baie-Comeau (1999–2000)

Assessed the biological importance of 15 shoreline environments. Helped draft the ZIP Committee's intervention guide.

Naturam Environnement inc. (now WSP), Baie-Comeau (summer 1999)

Preparation of outings and review of literature. Summary characterization of 15 shoreline environments along 360 km shore between Tadoussac and Pointe-des-Monts. Identified plants, birds, marine mammals, and invertebrates. Assessed biological potential for an intervention plan.

Invasive species management projects

Regional County Municipality of Memphremagog / Bleu Massawippi - Risk management and monitoring of the zebra mussel in the RCM Memphremagog (2019)

Writing of a scientific opinion on the risk management for the introduction of the zebra mussel to Massawippi Lake, including a portrait of the situation, an assessment of the susceptibility of the lake to introduction, as well as the proposal of a detailed monitoring plan. Give a training day in October 2019 on the counting of artificial substrates and the analysis of the results at the RCM Memphremagog and its collaborators (city of Sherbrooke, Memphrémagog Conservation Inc. and Bleu Massawippi) involved in the monitoring of the zebra mussel in the MRC Memphremagog.

Regional County Municipality of Memphremagog / City of Sherbrooke (2018–2019)

Senior scientific advisor for the Zebra Mussel Management and Monitoring Committee. Planning and participation in detection and monitoring activities for Memphremagog Lake, the Magog and Saint-François Rivers, and Massawippi Lake (snorkelling, artificial substrates, physicochemical analyses, etc.).

Renaissance Brome Lake – Experimental commercial fishing and control of invasive crayfish (2017–2018)

Participation in a project to highlight and control crayfish in Brome Lake. Organized an inventory (2017) for calculating the densities of invasive crayfish and drafted report (2018).

Quebec Wildlife and Parks Agency - Biologist responsible for the zebra mussel and other aquatic invasive species file (2001–2004)

Key contact regarding zebra mussel and invasive aquatic species in the organization. Drafted documents related to zebra mussel dispersion problem sensitization and risk analysis, and prevention methods. Developed and maintained database of invasive species records.

COSEWIC status reports

Environment Canada, Centre Saint-Laurent COSEWIC status report (2005–2006)

Drafting of a status report on the western chorus frog for COSEWIC.

COSEWIC - COSEWIC status report (2005–2010)

Co-authoring of status report on the hickorynut, a native, at-risk freshwater mussel found in Quebec and Ontario.

Endangered species management and applied research projects

City of Pointe-Claire - Inventory of natural environments in the city of Pointe-Claire (2018)

Inventory of at-risk freshwater mussels along the banks of Saint-Louis Lake.

Fisheries and Oceans Canada – Sand darter specialized survey (2017–2018)

Assessment of eastern sand darter presence in Massawippi Lake and in the Missisquoi Bay on Champlain Lake, using electrofishing and 12,5 m seine net inventories, and drafting of final report.

Nature-Action Québec – Research project on snowmobile impact on western chorus frog (2016)

Document revision, field outing, and scientific advice regarding the impact of snowmobile paths on the western chorus frog habitat.

Renaissance Brome Lake - Bridle shiner specialized survey and research project on its habitat (2014–2015)

Inventory of bridle shiner and its habitat in Brome Lake. Data capture, mapping, analysis, and drafting of report.

Plaisance National Park - Applied research project on endangered mussels (2010–2012)

Carry out an inventory of freshwater mussels (active search by aquascope) in the context of acquiring knowledge on the distribution of species with precarious status. Planify an applied research project to determine the density of pink heelspliter and fragile papershell, two species of mussel with precarious status. Coordinate and participate in snorkeling inventories using quadrats. Write the analysis report following the results.

Club Consersol Vert Cher et MRNF – Spiny softshell survey (2007–2008)

Design and plan of project on the spiny softshell turtle in the Acadie River, and assistance with report drafting and analysis of results.

St. Lawrence Valley Natural History Society / Quebec Transportation Ministry (MTQ) (2004–2006)

Setup, coordination, planning, and management of a scientific study on turtles in the Outaouais region, aimed at verifying the impact of roads on turtles. Supervised a team of 10 technicians in the field during inventories. Carried out statistical analyses, mapping, and drafting of a summary report for the project, in collaboration with another biologist.

Longueuil Environmental Information Centre (CIEL) – Complete western chorus frog breeding pond survey of Montérégie (2004–2005)

Initiation of a conservation project on the western chorus frog in Montérégie. Inventory of breeding sites for the species. Drafted inventory report and conservation plan for the species. Supervised teams of four employees and 50 volunteers during

the inventory, as well as supervising an intern in inventory techniques and biological research.

Canadian Parks and Wilderness Society, Montreal Office - Herpetological and malacological inventory of the James Bay region (2002–2003)

Planification, setup, coordination, and participation in an inventory of amphibians, molluscs, and rare micromammals in the James-Bay region. Accounting for all data gathered during the inventory in a database, and transmission thereof to the atlas. Drafting of final report.

Quebec Wildlife and Parks Agency - Biologist responsible for native freshwater mussels and endangered molluscs species (2001–2004)

Planned, coordinated, and took part in sampling of native freshwater mussels in various tributaries of Quebec and visited museum collections. Implemented and managed a database of molluscs native to Quebec. Drafted a report on the susceptibility of Quebec's native freshwater mussels and proposed conservation priorities. Assessed conservation priority levels of land snails and compiled a systematic list of Quebec's non-marine molluscs for the Quebec Natural Heritage Data Centre (CDPNQ). Prepared and gave training sessions to employees at regional offices of the Quebec Wildlife and Parks Agency (FAPAQ) to help them identify and inventory freshwater mussels. Prepared a protocol for long-term monitoring of mussels in the St. Lawrence River.

Expert taxonomical services

Association des biologistes du Québec - Training in fish, freshwater mussel and crayfish identification (2018 and 2019)

Design and give one-day training on mussels, crayfish and freshwater fish from Quebec to biologists (two training courses given in 2018 and three in 2019).

Stantec- Bank and embankment stabilization project in Saint-Lazare-de-Vaudreuil (2018)

Validation of fish identification for a banks and slopes stabilization project in Saint-Lazare-de-Vaudreuil.

SNC-Lavalin - REM and APM (2018)

Validation of freshwater mussel identification for two projects (Montreal railway [REM] and Contrecœur Port [APM]) using specimens and underwater videos.

AECOM Inc. - Trois-Rivières river crossing (2018)

Validation of freshwater mussel identification for a project (Trois-Rivières river crossing) using specimens and underwater videos.

Axio Environnement - Subcontract-Service of expert in identification (2017)

Validate the identification of mussels for a project in the Richelieu River.

Côte-du-Sud Watershed Organization (2017)

Validation of fish identifications for an inventory in the Chaudière-Appalaches.

WSP - Subcontract-Service of expert in identification (2017)

Validation of freshwater mussels specimen identification for two projects.

Côte-du-Sud Watershed Organization - ichthyological survey of the watershed (2015–2016)

Identification of fish specimens for a project. Organization and execution of one-day personalized training on potentially encountered fish fauna in the Côte-du-Sud watershed.

WSP - Subcontract-Service of expert in identification (2014)

Validation of fish specimen identifications for a project in the Eastern Townships.

Environment Canada - Development of French names for non-marine molluscs of Canada (2013–2014)

Development of French common names for Canada's freshwater and terrestrial molluscs (around 385 species).

Canadian Food Inspection Agency – invasive mollusk identification guide (2009)

Drafting of French glossary and revision of book *"Identification des escargots et des limaces terrestres au Canada : espèces introduites et genres indigènes"* (Identification of Snails and Slugs in Canada: Introduced and Native Species.)

Geography Department, Dr. Bernard Lauriol, University of Ottawa - Subcontract-Service of expert in identification (2002)

Identification of mollusc fossils found in caves in the Outaouais region.

Eastern Ontario Biodiversity Museum, Kemptville, Ontario – Malacological assistant (2001–2002)

Malacology research assistant. Classified specimens from the mollusc collection, dissected and identified terrestrial or aquatic molluscs, participated in public activities and helped volunteers, worked on the description of new land snail species, and assisted research and invertebrates curators in their day-to-day tasks.

Eastern Ontario Biodiversity Museum, Kemptville, Ontario – Malacological research assistant (summer 2000)

Malacology assistant. Organized and identified samples from the mollusc collection, participation in freshwater mussel and terrestrial mollusc inventories in eastern Ontario; dissected terrestrial molluscs, and drafted documents for lay readers.

Scientific vulgarization

Memphremagog Conservation Inc. (2017–2019)

Led a conference for the general public on at-risk aquatic species in Memphremagog Lake.

Nature Sauvage (2016)

Drafting of article for the lay community on freshwater mussels.

Friends of the Cerises River Marsh (LAMRAC) (2010)

Scientific review of texts for a future exhibition.

Plaisance National Park (2005–2006)

Supervision of a sensitization program regarding turtles in Outaouais. Drafted advertisements, newspaper articles, leaflets, and a poster. Supervised and carried out turtle observation activities.

ZIP Committee, North Shore of the Estuary, Baie-Comeau (2000–2001)

Assistance in the drafting of a training plan for stakeholders, in connection with the project to protect shoreline environments of the St. Lawrence Estuary

ZIP Committee, North Shore of the Estuary, Baie-Comeau (2000)

Helped draft the ZIP Committee's intervention guide.

Career Path

Since February 2019 Stantec Consulting Ltd., Montreal, Quebec, Canada

Biologist – Aquatic fauna / Environmental Services Quebec

2001–2019 Consulting Biologist – Aquatic fauna

Publications and Presentations

BOOK

Desroches, J.-F. and I. Picard. 2013. *Poissons d'eau douce du Québec et des Maritimes*. Éditions Michel Quintin, Waterloo. 471 p.

JOURNAL ARTICLES

Gendron, A. and Picard, I. 2017. « Le poisson et la mulette : petite histoire d'une relation houleuse ». Nature sauvage 10 (1): pp. 14-19

Picard, I. and J.-F. Ostiguy. 2016. Very late Snapping Turtle (*Chelydra serpentina*) hatching in Quebec. The Canadian Herpetologist 6 (1): 14-15.

Picard, I., J.-F. Desroches and G. Ethier. 2016. Première mention de l'hélice des bois *Arianta arbustorum* (Linné 1758) au Québec et mention anecdotique du petit-gris *Cornus aspersum* (O.F. Müller 1774). Naturaliste canadien 141 (1): 27-30.

Desroches, J.-F., L.-P. Gagnon and I. Picard. 2014. L'invasion de l'écrevisse à taches rouges

(*Orconectes rusticus*) au lac Brome, en Montérégie. Le Naturaliste canadien (2) 138: 46-49

Desroches, J.-F. and I. Picard. 2012. Précision de l'aire de répartition du necture tacheté et de 6 espèces de poissons d'eau douce dans le sud du Québec. Le Naturaliste canadien 136 (3): 80-87.

Desroches, J.-F. F.W. Schueler, I. Picard, and L.-P. Gagnon. 2010. A herpetological survey of the James Bay area of Québec and Ontario. Canadian Field-Naturalist 124(4): 299-315.

Picard, I., J.-F. Desroches, F. W. Schueler and A. L. Martel. 2009. Modern records of the Pink Heelsplitter Mussel, *Potamilus alatus* (Say, 1817), in the Ottawa River drainage, Québec and Ontario, Canada. Northeastern Naturalist 16(3): 355-364.

Desroches, J.-F, D. Pouliot, I. Picard and R. Laparé. 2008. Nouvelles mentions pour six espèces de poissons d'eau douce rares au Québec. Le Naturaliste canadien 132 (2): 62-66.

Desroches, J.-F., F. W. Schueler and I. Picard. 2007. *Eurycea bislineata* (Northern Two-lined Salamander). Coloration. Herpetological Review 38(2): 174-175.

Martel, A. J.-M. Gagnon, M. Gosselin, A. Paquet and I. Picard. 2007. Liste des noms français révisés et des noms anglais et latins mis à jour des mulettes du Canada (Bivalvia ; Familles : Margaritiféridés, Unionidés.). Le Naturaliste canadien 131 (2): 79-84.

Martel, A. L., I. Picard, N. Binnie, B. Sawchuk, J. Madill and F. Schueler. 2006. The rare olive hickorynut mussel, *Obovaria olivaria*, in the Ottawa River, eastern Canada. Tentacle 14 : 31-32.

Desroches, J.-F., I. Picard and J. E. Maunder. 2006. The Mink Frog (*Rana septentrionalis*) in Southeastern Labrador. Canadian Field-Naturalist 120(2): 239-240.

Desroches, J.-F. and I. Picard. 2006. *Rana sylvatica* (Wood Frog). Tadpole Maximum size. Herpetological Review 37(4): 449-450.

Desroches, J.-F. and I. Picard. 2006. Consulter le public pour obtenir des mentions de tortues rares. Le Naturaliste canadien 130 (2): 37-41.

Desroches, J.-F. and I. Picard. 2005. Mortalité des tortues sur les routes de l'Outaouais. Le Naturaliste canadien 129 (1): 35-41.

Paquet, A., Picard, I., Caron F. and S. Rioux. 2005. Les mulettes au Québec. Le Naturaliste canadien 129 (1): 78-85.

Desroches, J.-F. and I. Picard. 2004. Extension de l'aire de distribution connue de la musaraigne fuligineuse, *Sorex fumeus*, dans le nord-est du Québec. Canadian Field-Naturalist 118(3): 441-442.

Desroches, J.-F. and I. Picard. 2004. Pour la sauvegarde des amphibiens : la conservation et non la relocalisation. Le Naturaliste canadien 128 (2): 29-34.

Dubé, J., J-F Desroches, F. W. Schueler, R. Pariseau, D. St-Hilaire and I. Picard. 2002. Première mention de l'écrevisse *Orconectes obscurus* (Hagen) au Québec. Le Naturaliste canadien 126 (2): 48-50.

STATUS REPORTS

COSEWIC [Zanatta, D. P., A. L. Martel, J. Madill, A. Paquet and I. Picard]. 2011. COSEWIC Status report on the Olive Hickorynut (*Obovaria olivaria*) in Canada. Rapport rédigé pour le Comité sur la Situation des espèces en péril au Canada, Ottawa, xi + 52 p.

COSEWIC [Picard, I., J.-F. Desroches et F. W. Schueler]. 2008. COSEWIC Status report on the Western Chorus Frog (*Pseudacris triseriata*) in Canada. Rapport rédigé pour le Comité sur la Situation des espèces en péril au Canada.

CONFERENCES

Picard, I and M. Brisson. 2019. Création d'étangs temporaires pour la rainette faux-grillon de l'ouest. Boisé du Tremblay, Boucherville, Québec. Conference and workshop given at Congrès de l'Association des biologistes du Québec, in november 2019 at Québec.

Picard, I. 2019. La vie fascinante des escargots, limaces et moules du Québec. General public conference presented by Musée de la Nature et des Sciences de Sherbrooke in May 2019 at Sherbrooke, Québec. Canada.

Picard, I. 2019. L'inclusion des invertébrés dans le cadre des études d'impact. Conférence donnée à L'Association québécoise pour l'évaluation des impacts (AQÉI). May 2019 in Montréal, Québec, Canada.

MCI. 2018. Biodiversité au lac Memphrémagog : Nos espèces aquatiques en situation précaire. General public conference presented by Memphrémagog Conservation inc. october 2018.

Picard, I. 2018. Moules zébrées et autres espèces fauniques envahissantes : bilan des connaissances et principales menaces pour l'Estrie. Training day of RAPPEL in november 2018

Picard I. and N. Roy. 2018. Création d'étangs temporaires pour la rainette faux-grillon de l'ouest. Boisé du Tremblay, Boucherville, Québec. Canadian

Land reclamation Association (CLRA) conference, chapitre Québec september 2018.

Bouthillier L. and I. Picard. 2018 Recréer des milieux humides temporaires, un défi pour l'aménagiste – Exemples de cas en Montérégie. Canadian Land reclamation Association (CLRA) conference, chapitre Québec september 2018.

Picard, I. 2018-2019. Formation pratique sur les mulettes, écrevisses et poissons d'eau douce du Québec. Training given 2 times in 2018 and 3 times in 2019.

Picard. I. 2018. Diagnose du Doré jaune au lac Brome. Conference presented in may 2017 at Lac Brome as part of the association's Annual General Meeting.

Picard, I. 2017. Bilan de la faune aquatique du Lac Davignon. Conference presented in mars 2017 at Cowansville as part of the association's Annual General Meeting.

Picard, I. 2015. Beaver and housing as threats for chorus frog (*Pseudacris maculata*) populations in southern Quebec: 2004-2014 surveys. Conference presented at the annual conference of the Canadian Herpetology Society. september 2015 at Saint John, Nouveau-Brunswick, Canada.

Picard, I. 2015. La vie fascinante des escargots, limaces et moules du Québec. Conference presented at Salon nature de l'Estrie. April 2015 at Sherbrooke, Québec. Canada.

Picard, I. 2014. Biodiversité du territoire du marais de la rivière aux Cerises. Conference presented at conseil d'administration de L'Association du Marais-de-la-Rivière-aux-Cerises (LAMRAC), march 2014, at Magog, Qyébec, Canada.

Picard, I. 2015. La rainette faux-grillon en Montérégie : 10 ans plus tard (2004-2014). Conference given for general public in november 2014 and scientific version for Western Chorus Frog Quebec Recovery Team, March 2015. Longueuil, Quebec

Picard, I. and J.-F. Desroches. 2013. Characteristics of a painted turtle (*Chrysemys picta*) and snapping turtle (*Chelydra serpentina*) population – a nine years study. Conférence présentée au congrès annuel du Réseau canadien des amphibiens et reptiles (CHS), 15 septembre 2013 à Orford, Québec.

Desroches, J.-F. and I. Picard. 2011. Évaluation de l'incidence des routes sur les tortues en Outaouais (Québec). Conference presented at the seminar « Routes et faune terrestre: de la science aux solutions », May 2011.

Desroches, J.-F. and I. Picard. 2005. Rêver, y croire et agir pour l'environnement. 8e Colloque J'ai le goût de l'eau de la Corporation de l'aménagement de la rivière L'Assomption (CARA), october 2015 à Joliette, Québec.

Picard, I.and J.-F. Desroches. 2005. The drastic decline of the Western Chorus Frog (*Pseudacris triseriata*) in southwestern Québec. Conference presented at the Canadian amphibians and reptiles conservation network annual conference (CARCNET), september 2015 at Toronto, Ontario.

Desroches, J.-F. and I. Picard. 2005. Characteristics of turtle populations in small ponds along roads. Conference presented at the Canadian amphibians and reptiles conservation network annual conference (CARCNET), september 2015 at Toronto, Ontario. (content only, presented by JF Desroches)

Desroches, J.-F. and I. Picard. 2003. Road-killed turtles in the Outaouais region, Québec, during the nesting season. Conference presented at the Canadian amphibians and reptiles conservation network annual conference (CARCNET), september 2003 at Pelee island, Ontario. (Content only, presented by JF Desroches)

Desroches, J.-F., I. Picard, F.W. Schueler and L.-P. Gagnon. 2003. Herpetological survey of the James Bay area, Québec. Conference presented at the Canadian amphibians and reptiles conservation network annual conference (CARCNET), september 2003 at Pelee island, Ontario. (Content only, presented by JF Desroches)

Picard, I. 2003. Les moules d'eau douce du Québec. Conference for annual meeting of Diables des mers (diving association), april 2003 at Montréal.

Picard, I and A. Paquet. 2001-2002. Les moules d'eau douce du Québec. Training given many times in 2001 and 2002, all around Quebec for Quebec wildlife ministry regional offices.

KEY REPORTS BEFORE 2019 (EXCLUDING SCIENTIFIC ADVICE, ENVIRONMENTAL IMPACT ASSESSMENTS, AND CONFIDENTIAL REPORTS)

Picard, I. 2018. Inventaire routier des amphibiens du chemin Narrows, Canton de Stanstead. Étude réalisée par le Memphrémagog Conservation Inc. (MCI). 29 p. + 4 annexes.

Picard, I. 2018. Évaluation écologique sommaire l'île Charest, Magog. Étude réalisée pour Memphrémagog Conservation Inc. (MCI). 7 p. + 3 annexes

Picard, I. 2018. Avis scientifique sur la valeur écologique de la propriété Le Coz. Étude réalisée pour Memphrémagog Conservation Inc. (MCI). 15 p. + 3 annexes

Picard I. 2018. Inventaire des moules d'eau douce (Bivalves : Unionidés) à statut précaire sur les berges du lac Saint-Louis dans la Ville de Pointe-Claire. Rapport présenté à la Ville de Pointe-Claire. 11 pages + 3 annexes

Picard I. 2018. Inventaire des mulettes (Bivalves : Unionidés) à statut précaire sur les berges du lac des Deux-Montagnes dans la Ville de Deux-Montagnes. Rapport présenté à Axio Environnement et la Ville de Deux-Montagnes. 10 pages + 2 annexes

Picard, I. 2018. Estimation de la densité initiale des écrevisses au lac Brome. Inventaire réalisé dans le cadre du Projet pilote de contrôle des écrevisses à taches rouges du lac Brome et de leur valorisation dans le secteur de la Montérégie et de l'Estrie. Rapport présenté à Renaissance Lac-Brome, Sherbrooke. 21 pages + 2 annexes.

Picard, I. 2018. Suivi de la faune ichtyologique de la rivière Quilliams 2015-2017. Rapport de suivi du projet « Amélioration des habitats fauniques du ruisseau Quilliams dans une plaine agricole au lac Brome ». Rapport final présenté à Renaissance Lac-Brome, Sherbrooke. 11 pages + annexes.

Picard, I and Z. Ipina. 2018. Suivi de l'état des communautés piscicoles et de l'écosystème aquatique faisant suite au déversement d'eaux usées de la Ville de Saint-Hyacinthe survenu le 28 juin 2016. Une évaluation de la récupération de l'écosystème aquatique. Rapport final. Rapport produit par l'OBV Yamaska pour la Ville de Saint-Hyacinthe. 53 pages + 6 annexes

Picard, I. 2018. Évaluation de la présence de dard de sable dans le lac Massawippi et la baie Missisquoi. Étude réalisée pour le compte de Pêches et Océans Canada. 31 p. + 5 annexes

Picard, I. 2018. Évaluation écologique sommaire de la propriété Kakebeeke. Étude réalisée pour Memphrémagog Conservation Inc. (MCI). 8 p. + 4 annexes

Picard, I. 2017. Rapport d'inventaire herpétologique des rues Oakridge et Sandmere à Saint-Lazare. Rapport présenté dans le cadre du permis SEG 2017-05-17-2240-05-16 -GF. 7 p. + 2 annexes.

Picard, I. and M. Pelletier 2017. Inventaire de la faune aquatique et des herbiers du secteur de la Marina de Venise-en-Québec. Étude réalisée dans le cadre de l'obtention du certificat d'autorisation pour le dragage. 9 p. + annexes

Picard, I. 2017. Caractérisation de la faune et la flore aquatique des canaux de la municipalité de Saint-Paul-de-l'île- aux-Noix. Rapport présenté dans le cadre du projet « Programme décennal de dragage d'entretien des canaux de la municipalité de Saint-Paul-de-l'Île- aux-Noix ». Étude réalisée pour le compte de la municipalité de Saint-Paul-de l'Île-aux-Noix. 56 p. + 11 annexes

Bouthillier L., I Picard and L. Reyes. 2017. Protocole de suivi des aménagements d'habitats pour la rainette faux grillon de l'Ouest. Version préliminaire mars 2017. Protocole réalisé pour le ministère des Forêts, de la Faune et des Parcs du Québec. 47 pages + 4 annexes.

Desroches, J.-F. and I. Picard. 2017. Protocole pour l'identification des têtards dans les étangs faisant l'objet d'un suivi. Protocole réalisé pour Nature-Action Québec. Sherbrooke. 16 pages.

Picard I. 2017. Inventaire des mollusques d'eau douce et des écrevisses du bassin versant du lac La Pipe - Parc national de la Mauricie. Rapport présenté au parc national de la Mauricie dans le cadre du contrat de service no 7-052410. 25 p. + 2 annexes.

Picard, I. 2017. Inventaires routiers des amphibiens des secteurs de la baie Fitch et du ruisseau Tompkin. Étude réalisée pour Memphrémagog Conservation Inc. (MCI). 15 p + 2 annexes.

Picard, I. 2017. Inventaire sommaire de la faune aquatique dans la baie Fitch et le lac Memphrémagog. Étude réalisée pour Memphrémagog Conservation Inc. (MCI). 20 p. + 1 annexe.

Picard, I. 2017. Inventaire de la faune aquatique du lac Davignon. Étude réalisée pour le compte du Comité de sauvegarde du bassin versant du lac Davignon. 38 p. + 11 annexes

Picard, I. ; Porciuncula, A. *et coll*. 2017. Projet « Restaurer et améliorer les écosystèmes humides protégés de la Rive-Sud de Montréal 2016-2019 ». Portrait initial du site, évaluation des secteurs et des types d'intervention et cahier de charge. Ciel et Terre, Longueuil, 106 pages et annexes.

Picard, I. 2016. Portrait des populations de doré jaune (*Sander vitreus*) du lac Brome - Rapport d'étape. Rapport présenté à Renaissance Lac-Brome, Sherbrooke. 10 pages + annexes.

Picard, I. and S. Hamel. 2016. Inventaire du milieu biologique du secteur de la baie Cummins, Ville de de Magog Étude réalisée pour le compte de

Memphrémagog Conservation Inc. (MCI) et de la Ville de Magog. 28 p. + annexes

Picard, I. 2016. Évaluation écologique sommaire de la propriété Eakin. Étude réalisée pour Memphrémagog Conservation Inc. (MCI). 13 p. + annexes

Picard, I. 2016. Avis scientifique sur la valeur écologique de la propriété Murray. Étude réalisée pour Memphrémagog Conservation Inc. (MCI). 5 p. + annexes

Picard, I. 2016. Suivi de la faune ichtyologique de la rivière Quilliams 2015-2016. Rapport de suivi de l'an 2- post aménagement du projet « Amélioration des habitats fauniques du ruisseau Quilliams dans une plaine agricole au lac Brome ». Rapport présenté à Renaissance Lac-Brome, Sherbrooke. 7 pages.

Picard, I., A Durocher and N. Roy. 2016. Rapport d'activité de pêche et piégeage présenté dans le cadre des permis SEG 2016-09-26-2109-06 -GP (poissons, couleuvres et anoures) et SEG 2016-10-07-2115-06-GF (castor). Relocalisation faunique-Secteur Ruisseau Bertrand. 12 pages + 4 annexes.

Picard I. 2016. Projet de stabilisation d'un talus de la route 148- Inventaire des moules d'eau douce (Bivalves : Unionidés) dans la rivière Coulonge. Rapport présenté pour BC2 + Groupe Synergis au Ministère des Transports, de la Mobilité durable et de l'Électrification des transports, Direction de l'Outaouais. 10 p. + 4 annexes.

Picard, I. 2016. Protocole permettant d'évaluer l'impact des sites de motoneige sur la rainette faux-grillon de l'Ouest et son habitat à Boucherville. Protocole réalisé pour Nature-Action Québec. Sherbrooke, 16 pages + annexes.

Picard, I. and J-F. Desroches. 2016. Synthèse des connaissances sur les mulettes du parc national de Plaisance 2010-2015. Rapport réalisé pour le Parc National de Plaisance. 23 p.

WSP. 2015. Projet à 735 kV de la Chamouchouane–Bout-de-l'Île. Caractérisation des sites potentiels de débarcadère dans la rivière des Prairies. Rapport présenté à Hydro Québec Équipement et services partagés. 32 p. et annexes. (section mulettes)

Picard, I. 2015. Synthèse des inventaires fauniques et floristiques réalisés dans le cadre du suivi quinquennal du territoire du marais de la Rivière aux Cerises en 2007 et 2013. Rapport présenté à L'Association du Marais-de-la-Rivière-aux-Cerises. 25 pages.

Picard I. and J.-F. Desroches. 2015. Répartition, habitat et démographie des populations de méné d'herbe (*Notropis bifrenatus*) au lac Brome, Québec. Rapport présenté à Renaissance lac Brome, Sherbrooke. 39 pages + 6 annexes.

Picard, I. 2015. Portrait détaillé de la rainette faux-grillon en Montérégie en 2014 : 10 ans plus tard. Rapport présenté à Ciel et Terre, Longueuil, Québec. 88 pages + 8 annexes.

Picard, I. 2014. Inventaire ichtyologique et herpétologique de l'Île-des-Sœurs, septembre 2014. Rapport présenté à Nature-Action Québec, Sherbrooke, 21 pages + annexes.

Cavallin, N. and I. Picard. 2014. Inventaire floristique du territoire du marais de la rivière aux Cerises. Rapport présenté à L'Association du Marais-de-la-Rivière-aux-Cerises (LAMRAC). 46 pages + 4 annexes.

Picard, I. 2014. Portrait détaillé des populations de poissons du marais de la rivière aux Cerises. Rapport présenté à L'Association du Marais-de-la-Rivière-aux-Cerises. 51 pages + 5 annexes.

Picard, I. 2014. Portrait détaillé des milieux humides et des populations d'anoures du territoire du marais de la Rivière-aux-Cerises, été 2013. Rapport présenté à L'Association du Marais-de-la-Rivière-aux-Cerises. 35 pages.

Picard, I. 2014. Portrait des populations de tortues du marais de la rivière aux Cerises. Rapport présenté à L'Association du Marais-de-la-Rivière-aux-Cerises. 29 pages + 4 annexes.

Picard, I et S. Beaudette. 2014. Suivi ornithologique du territoire du marais de la rivière aux Cerises. Rapport présenté à L'Association du Marais-de-la-Rivière-aux-Cerises (LAMRAC). 20 pages + 6 annexes.

Picard, I. 2014. Portrait des populations de poissons du lac Brome, été 2013. Rapport présenté à Renaissance lac Brome. vii + 52 pages + 7 annexes.

Picard, I. 2013. Inventaire ichtyologique du Corridor bleu et vert de la Haute-Yamaska, été 2012. Rapport présenté à Nature-Action Québec, Sherbrooke, 14 pages.

Picard, I and J.-F. Desroches. 2012. Synthèse des connaissances sur les mulettes du parc national de Plaisance. Rapport réalisé pour le Parc national de Plaisance. 21 pages.

Picard, I. and J.-F. Desroches. 2012. Inventaire ichtyologique de quelques habitats humides du lac Brome, été 2011. Rapport présenté à Renaissance lac Brome, Sherbrooke, 24 pages.

Picard, I. and G. Préfontaine. 2011. Suivi des moules d'eau douce sur le territoire du Parc de la Gatineau. Rapport préparé par Génivar pour la Commission de la capitale nationale.

Picard, I. 2008. Inventaire herpétologique du tracé de la future autoroute 5, entre le ruisseau Meech (municipalité de Chelsea) et la route 366 (municipalité de La Pêche). Rapport présenté au ministère des Transports du Québec, Direction de l'Outaouais. 29 p. + 6 annexes.

Picard, I. and J.-F. Desroches. 2008. *Inventaire faunique et floristique du territoire du marais de la rivière aux Cerises.* Pour Les Amis du Marais de la rivière aux Cerises (LAMRAC), Sherbrooke, 41 pages + 3 annexes.

Fortin, C., G. Guay, D. Bouchard, F. Morneau, J. Deshaye, J.-F. Desroches and I. Picard. 2008. Inventaire faunique et floristique sur la propriété de la Défense nationale. Ancien champ de tir Saint-Maurice à Terrebonne. FORAMEC (division de SNC-Lavalin Environnement inc.), Lévis, 41 pages + annexes.

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Desroches, J.-F. and I. Picard. 2005. Inventaire des amphibiens et des reptiles de la tourbière de Saint-Joachim-de-Shefford. Pour Les Amis de la tourbière de Saint-Joachim-de-Shefford. 36 p. + 3 annexes.

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Picard, I. 2003. Précarité des espèces de moules indigènes du Québec et proposition de rang de conservation. Rapport préparé pour la Société de la Faune et des Parcs du Québec.

Lapierre, L., I. Picard and A. Paquet. 2002. Problématique et solutions de prévention de la dispersion des espèces aquatiques nuisibles non indigènes reliée aux piscicultures au Québec. Rapport préparé pour la Société de la Faune et des Parcs du Québec.

Desroches, J.-F. and I. Picard. 2001. Inventaire faunique de la vallée du ruisseau Gulf et de la rivière au Saumon, en Estrie. Rapport réalisé pour le Comité du marais de Kingsbury. 41 p.+ 2 annexes.

Heppell, M., I. Picard, F. Bélisle and C. Théberge. [2000] Guide d'intervention en matière de protection et de mise en valeur des habitats littoraux d'intérêt de la rive nord de l'estuaire maritime. Version finale présentée au Comité ZIP de la rive nord de l'estuaire. 7 p. + 13 fiches + annexes.

Desroches, J.-F. and I. Picard. 1999. Inventaire sommaire des poissons de l'Estrie (région 05). Sherbrooke, Québec. 48 p. + 2 annexes

OTHERS

D'Auteuil, C, L. Denis and I Picard. 2016. Recommandations sur le Projet Oléoduc Énergie Est – section québécoise ;

Milieux naturels, mesures d'urgence et processus de suivi. Mémoire réalisé pour le compte de L'Association des biologistes du Québec (ABQ) et déposé à la Commission d'enquête et d'audience publique sur le Projet Oléoduc Énergie Est de TransCanada – section québécoise. 22 p.

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Desroches, J.-F., I. Picard and J.-F. Houle. 2005. Affiche SOS tortue. Affiche réalisée par le Parc national de Plaisance pour la sensibilisation du grand public à la précarité des tortues et des moyens concrets pour les protéger. Rééditée par le

Ministère des Ressources naturelles et de la Faune du Québec.

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Cardinal, D., H.F. Ellefsen, I. Picard, S. Paré and J. Bastien. 2001. Formation en matière de protection et de mise en valeur des habitats littoraux d'intérêt de Tadoussac à Pointe-des-Monts, Québec. Document présenté au Comité ZIP de la rive nord de l'estuaire. 134 p.

Picard, I., F.W. Grimm and A. Karstad. 2001. Introduction to collecting Land Snails in Eastern Ontario. Eastern Ontario Biodiversity Museum. Brochure. 14 p.

Picard, I. and F. W. Grimm. 2001. Snail Care Manual. Eastern Ontario Biodiversity Museum. Brochure 6 p.

Professional Development

- CPR and first aid training in the workplace (2019)
- Canadian Freshwater Mussel Research Meeting (2016, 2019)
- Association of Biologists of Quebec (ABQ) Annual Conferences (2013, 2014, 2015, 2016, 2017, 2018 and 2019)
- Annual conference of Quebec impact studies association (AQÉI) (2019)
- Annual conference of Canadian Land reclamation association (CLRA) (2018)
- "Identification of Chiroptera" training offered by the ABQ (2015)
- "Municipal Conservation Plan for Natural Environments" training offered by the ABQ (2015)
- Annual conference on "Water: At the Heart of Tomorrow's Issues" given by the Université de Sherbrooke's Association of Master's Students in Environmental Studies (AMEUS) (2015)
- Canadian Amphibian and Reptile Conservation Network/Canadian Herpetological Society annual conferences (2003, 2005, 2013, and 2015)
- American Fisheries Society Annual Meeting (2014)
- "Legal Aspects of Shorelines and Wetlands" training offered by the ABQ (2013)
- Seminar on "The Mining Industry, Energy Pathway and Environmental Protection" at the Université de Sherbrooke's Faculty of Law (2013)

ORGANIZATION OF CONFERENCES AND EVENTS

- Responsible for organizing the ABQ's 2015 conference (2014–2015) and assistance in organizing the 2016, 2017, 2018 and 2019 conferences (Logistics Committee) and 2019 (Contents committee)
- Co-organizer of the 2013 CARCNET (now the Canadian Herpetological Society) Conference (2013)
- Organizer of the International Meeting of the Chorus Frog (2000)

WRITING

- Participation in the drafting of project briefs for public consultations on hydrocarbons (strategic environmental impact assessments for Anticosti and globally, and in connection with the Quebec Agency for Public Hearings on the Environment (BAPE) and Energy East pipeline)
- Authoring of a book as well as several scientific and lay articles

VOLUNTEER ACTIVITIES

Participation in Board of Directors or Associations

- Member of the Western Chorus Frog Quebec Recovery Team (2016 – 2019)
- Board member—Quebec Council on Invasive Alien Species (CQEEE) (2015 – ongoing)
- Board member (2013–2016) and active member of annual conference organization committee (2015 – ongoing) - Association of Biologists of Quebec (ABQ)

- Member of the Quebec Association of Amateur Entomologists (AEAQ) (2004–2006, 2016–2017)
- Founding member of the Quebec Biodiversity Institute (IQBIO) (founded in 2003, member until 2007)
- Board member—Jardin des Merveilles daycare (2010 – 2011, 2014)
- Breastfeeding Coach for the Fédération Nourri-Source (2009 – 2014)
- Head of Internal Affairs and eventual President of the Cégep de Baie-Comeau Students' Association (1996 – 1998)

Computer Skills

- Microsoft Office and Open Office suite, including spreadsheet (Excel) and complex database (Access) experience
- Endnote reference management software
- Statistical analysis software (SPSS)
- Basic skills in mapping software (ARCGIS [intermediate level], Google Earth, QuantumGIS)
- Proficiency in the main internet tools, data security software and utility programs