Henvey Inlet Wind LP

Henvey Inlet Wind

Transmission Line

Appendix B5. Route A Waterbodies, Fish Habitat and Aquatic Ecosystems Environmental Baseline Report

Henvey Inlet Wind LP

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Water Bodies, Fish Habitat and Aquatic Ecosystems Environmental Baseline Report Transmission Line Route A – Final Draft

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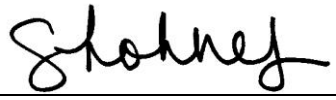

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Appendix A. Site Investigation Field Data

List of Acronyms and Glossary

AECOM .....AECOM Canada Ltd.
COSSARO .....Committee on the Status of Species at Risk in Ontario
COSEWIC .....Committee on the Status of Endangered Wildlife in Canada
CN .....Canadian National
CP .....Canadian Pacific
DFO.....Department of Fisheries and Oceans
DO.....Dissolved Oxygen
ER .....Environmental Review
ERR.....Environmental Review Report
ESA .....*Endangered Species Act*
FIT.....Feed-in-Tariff
ha .....Hectares
HIFN.....Henvey Inlet First Nation
HIFN I.R.#2 .....Henvey Inlet First Nation Reserve No. 2
HIW .....Henvey Inlet Wind LP
HIWEC .....Henvey Inlet Wind Energy Centre
HONI .....Hydro One Networks Inc.
IESO.....Independent Electrical System Operator
km .....Kilometres
km^2 .....Squared Kilometres
kV.....Kilovolts
kW .....Kilowatts
m .....Metre
mASL .....metres Above Sea Level
MNRF.....Ontario Ministry of Natural Resources and Forestry
MOECC.....Ontario Ministry of the Environment and Climate Change
MTO .....Ontario Ministry of Transportation
MW.....megawatt
NHIC .....Natural Heritage Information Centre
Nigig. .....Nigig Power Corporation
NRVIS .....Natural Resource Values Information
OEB.....Ontario Energy Board
OPA.....Ontario Power Authority
O.Reg. .....Ontario Regulation
ROW .....Right-of-way
SAR .....Species at Risk
SARA .....*Species at Risk Act*
SARO .....Species at Risk in Ontario

1. Introduction

1.1 Project Description

Nigig Power Corporation (Nigig) received a Feed-in-Tariff (FIT) Contract from the Ontario Power Authority (OPA) in 2011 for a 300 megawatt (MW) wind energy generation centre. Henvey Inlet Wind LP (HIW), a limited partnership between Pattern Renewable Holdings Canada ULC and Nigig is proposing to develop the Henvey Inlet Wind Energy Centre (HIWEC), a 300 MW facility on Henvey Inlet First Nation Reserve No. 2 (HIFN I.R. #2). The HIWEC requires a new off-Reserve Transmission Line to deliver the electricity generated by the HIWEC to the Ontario electricity grid. AECOM Canada Ltd. (AECOM) was retained by HIW to conduct the Environmental Screening Process under Ontario Regulation (O.Reg.) 116/01 for the proposed off-Reserve Transmission Line.

The purpose of this Environmental Baseline Report is to present the findings of a baseline study on water bodies, fish habitat and aquatic ecosystems on Route A. The information presented in this Report has been assembled from data collected during 2015 field studies and review of background information available at the time of publishing. This report will ultimately support the Final Environmental Review Report (ERR) and forms the baseline against which environmental effects are assessed.

1.2 Location and Study Area

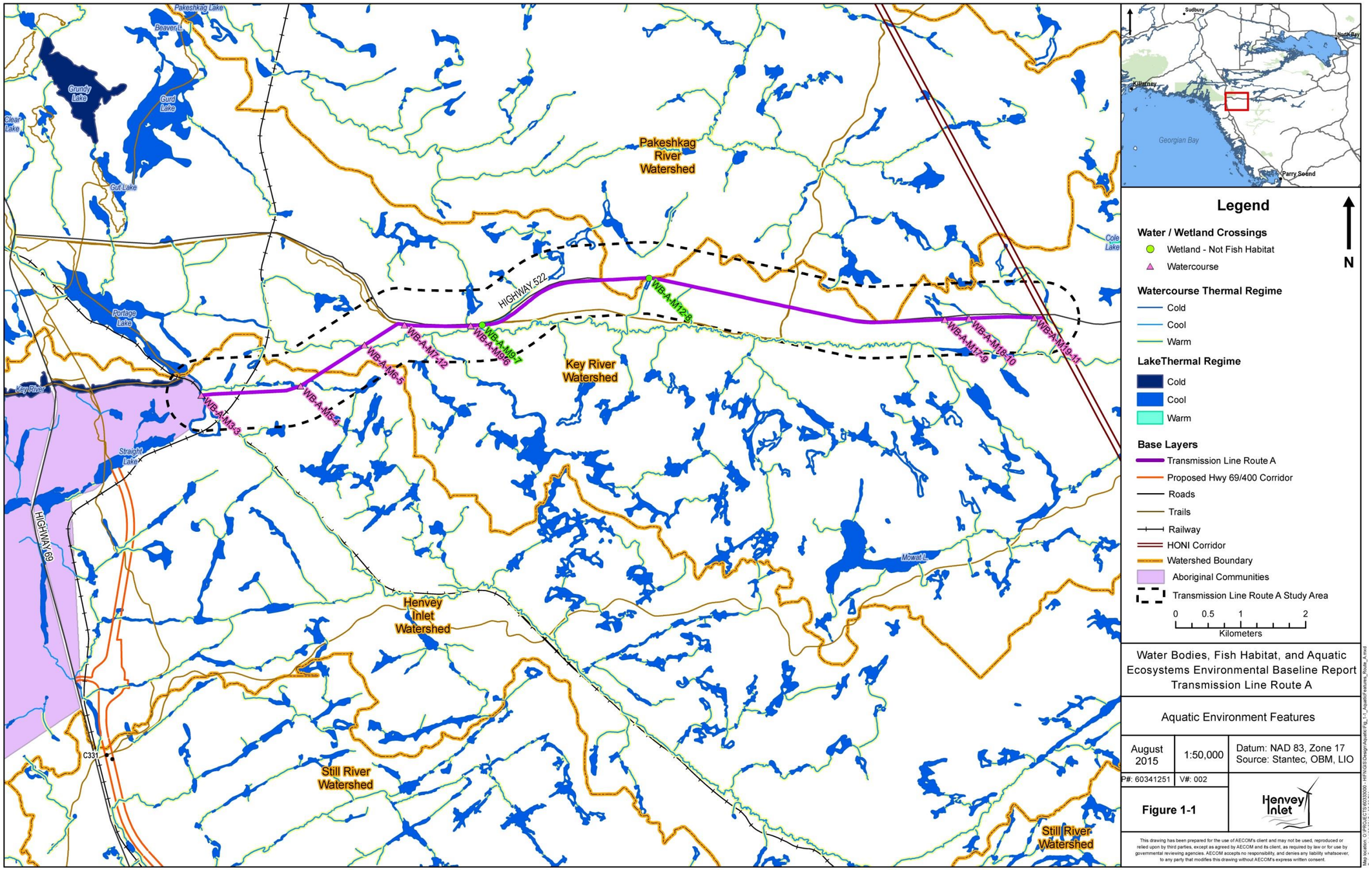
The Transmission Line study area Route A originates at the eastern edge of HIFN I.R. #2 and travels adjacent to Highway 522 for approximately 13.5 km in total before connecting to the existing 500 kV Hydro One Networks Inc. (HONI) system near its intersection with Highway 522. The total length of the Route A Transmission Line, including the portion that lies within the HIFN I.R.#2, is 15.77 km. However, only the portion of Route A outside of HIFN I.R. #2 (13.5 km) is being considered within this document. The portion of the Transmission Line within HIFN I.R.#2 is being assessed under HIFN's Land Code and associated environmental assessment requirements.

The proposed Transmission Line Route A is located within the Canadian Shield. The Shield is part of a vast horseshoe shaped area around Hudson Bay covering eastern and central Canada. The study area is characterised by exposed bedrock formations, bedrock barrens and bedrock plains with shallow soils and organic soil accumulations in low lying areas (Ecoplans, 2006). Much of the Canadian Shield rock has been carved and arranged by the last ice age, to form millions of lakes, ponds and wetlands (Wilkem, et al.).

From east of HIFN I.R.#2, the Route A study area is located within the District of Parry Sound and extends east through two (2) Unincorporated Townships: Mowat and Blair (under jurisdiction by the Archipelago Planning Board), paralleling the Highway 522 corridor and connecting to the existing HONI system.

The Route A study area is a combination of upland rock barrens scattered with wetland drainages between the rocky ridges and includes the waterbodies of the Key River and Portage Lake. These larger waterbodies are located at the northwestern limit of the Route A study area near HIFN I.R. #2 (**Figure 1-1**). Portage Lake flows into the Key River on the west side of Highway 69.

Figure 1-1: Aquatic Environment Features – Route A



2. Methods

2.1 Background Review

A background review of aquatic natural heritage features and functions located within 1 km of the proposed Route A Transmission Line was conducted using the following resources:

Interactive Mapping Tools:

- MNRF Make-a-Map: Natural Heritage Areas Application;
- MNRF NHIC Rare Species Records;
- MNRF Species At Risk (SAR) by Area Online Search Tool (2014c)
- University of Guelph *FishMAP* Online Tool (University of Guelph, 2011)

MNRF's Natural Resources and Values Information System (NRVIS) mapping from Land Information Ontario (LIO) for:

- Waterbody, watercourse, wetland layers
- Thermal regime; and,
- Fish records.

Previous studies in the vicinity of the proposed Transmission Line:

- Highway 69 Four-Laning From North of Nobel to Highway 522 Natural Heritage Background Interim Report (Ecoplans, 2006);
- Fisheries and Aquatic Habitat Ecosystems Report- Highway 69 Four-Laning From Straight Lake Northerly to 3.9 km North of Highway 522;
- Highway 69 Four-Laning From North of Nobel to Highway 522 (MTO, 2008);
- The Neegan Burnside Nigig Power Corp / Henvey Inlet Wind Project Preliminary Environmental Constraints Analysis (Neegan Burnside Ltd., 2011);
- Highway 69 Four-Laning Detail Design from 5.3 km South of Highway 529 (North Junction) northerly to 2.2 km North of Highway 529 (North Junction) Fish and Fish Habitat Report; and
- Field data provided by Tulloch Environmental (Tulloch, 2013).

A request for information was submitted to MNRF's Parry Sound District office on January 27, 2015 and February 17, 2015 for any data gaps identified during the background information review.

A request for information was submitted to Fisheries and Oceans Canada (DFO) Fisheries Protection Program office in Burlington, Ontario on March 16, 2015 for any additional fishery or SAR data.

Data collected was confirmed and supplemented during fisheries and aquatic habitat field assessments completed by AECOM in 2015. All data has been summarized herein and will be used to support the effects assessment of the ERR.

2.2 Field Investigations

Site investigations were conducted at proposed transmission line water crossings within the Study Area. Prior to conducting field surveys, a preliminary study of water bodies identified through the background review and through analysis of aerial imagery was undertaken to determine presence, composition, form and function of water bodies. All potential water crossings identified in the preliminary study were selected for field investigation and assigned a unique identifier.

2.2.1 Site Identifiers

Each location of a potential water body or watercourse crossed by the proposed Transmission Line alignment was mapped and assigned a unique identifier as shown in the example provided in Table 2–1 below.

Table 2–1: Description of Site Identifiers

	WB	A	M7	10
WB-A-M7-10	Waterbody	Transmission Line Route A	Map 7	Unique number for potential waterbody within Map 7

Each Site Feature was plotted on a map using aerial imagery for navigation by field crews. Each aquatic site was colour-coded to indicate whether the feature was identified in the background review as a water body (green), a watercourse (yellow) or a wetland (red). Additional features identified during field studies were labelled with an additional identifier. For example, WB-S-M36-53-2 where “2” represents the extra feature identified during the site visit.

2.2.2 Data Collection

An electronic field data collection form and aquatic habitat map was completed for each aquatic feature investigated using electronic tablets. A Pond/Lake Assessment Form was completed for open-water lentic habitats as well as wetlands (e.g., thickets, fens, marshes, etc.) and features identified as not likely to directly support fish. A Stream/River Assessment Form was completed for water body features, permanent or intermittent, with evidence of uni-directional flow. All data collected was filed and retained electronically, and has been provided in its complete form in **Appendix A**.

2.2.3 Co-ordination

To ensure additional detailed coverage of the entire study area, efforts were co-ordinated with the team of terrestrial ecologists conducting the terrestrial environmental baseline study for the same area of investigation. During their site investigations, any seepage areas and waterbodies were recorded. These were cross-referenced with the aquatic mapping to determine whether sites were previously identified during the background review and initial site selection. If water was noted at these sites, a full habitat assessment was conducted.

2.2.4 Water Body and Fish Habitat Assessments

Based on observations made at the time of the field visit, water bodies were identified and classified as either a permanent stream; an intermittent stream; pond; wetland; or, a seepage area. Features such as wetland complexes, open water ponds and lakes, and watercourses were delineated using aerial imagery and mapping tools.

The area of site investigation for each aquatic feature was 50 m upstream and 50 m downstream of the transmission line centreline. This approach allowed for a thorough characterization of the watercourse within the area most susceptible to impacts from the transmission line water crossing.

Information recorded included the date of assessment, field staff names, start and end time of assessment, weather conditions and location of the assessment. An overall assessment of the aquatic habitat was conducted based on a number of criteria, such as whether the watercourse was a natural or modified feature (*i.e*., channelized, straightened), as well as the type of surrounding ecological features and/or land uses.

Channel dimensions, substrate composition, channel morphology and bank stability were documented in the field. Measurements were taken at more than one location along the watercourse and mean values were calculated in the field and recorded, including:

- Mean wetted depth (MWD) (m);
- Mean wetted width (MWW) (m);
- Mean bankfull depth (MBW) (m); and,
- Mean bankfull width (MBW) (m)

Average annual high water mark data were not available from information sources contacted in the background review. Therefore, the protocol under the Fisheries and Oceans Canada (DFO) Habitat Management Program (2005) was adapted to determine the Ordinary High Water Mark. For inland waters along the transmission line route, mean bankfull width and depth were collected by taking a measurement where indicators such as the active scour mark, bank inflection points and location of perennial vegetation/hydrophilic ("*water loving*") vegetation boundaries were located, to name a few determining features. Bank height measurements and presence of mature riparian vegetation, exposed root structures, and slumping or scouring of banks were used to determine bank stability.

Stream morphology was assessed to describe habitat during the water body assessments according to the following morphological units:

Runs:..... typically deep, fast moving water with little to no turbulence of water;

Riffles:..... shallow, fast moving water typically running over rocks. Riffles provide areas of highly oxygenated waters;

Flats: ..... slow flowing water with a smooth un-agitated surface; and,

Pools:..... deep pockets of water that provide refuge habitat for fish

Substrate composition (e.g., clay, silt, sand, gravel, cobble, rock, boulder, muck and detritus) was recorded in descending order of dominance. Visual observations of water clarity, water colour, presence and type of macrophytes and algal growth, evidence of runoff, and surrounding land use, were recorded as indicators for water quality. Basic field parameters of water chemistry (pH, conductivity, dissolved oxygen and temperature) were collected using a Horiba U-22 Multimeter or a Hanna 98129.

Observations of significant or limiting habitat features which may help determine the sensitivity of the aquatic habitat and other unique habitat features, such as suitable substrate or vegetation for sport fish or aquatic SAR spawning habitat, barriers to fish passage, evidence of ongoing erosion, etc. were also recorded.

The quality and quantity of potential fish habitat was recorded, based on DFO's broad definition of fish habitat. Along with the background review, including thermal regime and species occurrence records, an assessment of the likelihood of fish presence was completed. These parameters include the availability and quality of habitat features such as in-stream and riparian covers, as well as morphological conditions and connectivity of the waterbodies to allow fish passage. As defined by the federal *Fisheries Act*, fish habitat is defined as '*spawning grounds and*

nursery, rearing, food supply, migration, and any other areas on which fish depend directly or indirectly in order to carry out their life processes'. The following characteristics were assessed and recorded for each water body and used in determination of habitat sensitivity:

In-stream cover was documented based on the percent of cover provided by:

- large woody debris (> 1.5 m long, 30 cm diameter pieces);
- boulders (>256 mm diameter) and cobble (256-64 mm diameter);
- aquatic/instream vegetation;
- overhanging vegetation; and,
- undercut banks.

In-stream cover was classified as 'High' if there was in-stream coverage between 76-100%; moderate if between 31-75%; and low if between 0-30%.

Riparian vegetation canopy cover was provided as a percentage of cover over the site of investigation. Overall canopy cover was classified as 'High' if between 61-100%; moderate if between 31-60%; and low if between 0-30%.

Obstructions to fish passage were noted within the area of site investigation, including:

- beaver dams;
- man-made structures;
- perched/blocked culverts; and,
- low-flow barriers.

Adjacent land uses were noted for potential influences or impacts to the waterbodies. This included observations of residential, agriculture uses (crops and livestock), meadows, forests and wetland features. Potential sources of pollution were recorded. These potential sources include: point-source discharges, road runoff and any other surface runoff features causing potential nutrient or sediment loading. Topography of the land located within the HIWEC study area was documented to identify areas of rolling hills or flat areas where water is more likely to accumulate in depressions versus flowing towards the watercourse.

During all site investigations, groundwater seepage areas were identified using the following indicators, as outlined in the Technical Guide to Renewable Energy Approvals (MOE, 2013):

- Occurrence of Watercress (*Nasturtium officinale*), Bittercress (*Cardamine pensylvanica*) and Water Speedwell (*Veronica anagallis-aquatica*);
- Presence of iron staining as indicated through red rust coloured soils along banks and stream beds;
- Bank seepage (as indicated by micro-erosion rills); and,
- Air bubbles in the stream bed.

Pond features were also assessed during the water assessment. Characteristics documented of any pond features included type of pond (e.g., dugout, online, agriculture) and their surrounding land use, percentage and type of habitat, estimated size of the pond and observations of wildlife and fish.

A representative photographic log and detailed fish habitat mapping were completed to provide site specific detail at each proposed water crossing investigated within the Route A study area.

2.3 Sensitivity Classification

To aid in the assessment of each waterbody and to inform the assessment of potential environmental effects and mitigation measures, a habitat sensitivity classification was designed and applied to each aquatic feature within the Route A study area. The overall objective was to assess the resiliency of the aquatic ecosystem – i.e. the ability of the system to recover from changes in environmental conditions. Each waterbody feature was classified as high, moderate or low sensitivity based on the parameters identified in **Table 2-2** below. This system provided some objectivity to the assessment process and incorporated attributes such as: species sensitivity, habitat resiliency, species dependence on habitat, and rarity of the habitat feature. Not all indicators had to be present at a single waterbody for assignment into a particular classification; waterbodies were assigned a sensitivity rating based on where the majority of indicators occurred. For example, a waterbody with a cold water regime could be classified as moderate sensitivity if it was a channelized channel with unstable banks and intermittent flow. Where there were an equal number of indicators, professional opinion and consideration of the overall site was used to assign the waterbody to one classification category.

Table 2–2: Sensitivity Classification Indicators

High Sensitivity	Moderate Sensitivity	Low Sensitivity
• Cool/cold water thermal regime • Headwater area • Permanent flow • Natural channel • Natural stream process observed (e.g., riffle/run/pool sequence and meanders) • Located in natural area (e.g., woodland, wetland) • Groundwater seepage indicators present • High quality and quantity fish habitat • No fish barriers • Water quality appears good (e.g., clear, no obvious agricultural runoff, no algae)	• Cool/warm water thermal regime • Permanent or intermittent flow • Natural or channelized channel • Natural stream process observed (e.g., riffle/run/pool sequence and meanders) • In natural or impacted areas • Groundwater seepage indicators present • Overall moderate quality and quantity fish habitat • No fish barriers • Some concern for water quality (e.g., suspended solids or algae growth)	• Warm water thermal regime • Permanent or intermittent flow • Natural or channelized channel • Uncontrolled stream processes (e.g., erosion, unstable banks) • Within highly impacted areas • No groundwater indicators present • Low quality and quantity fish habitat • Fish barriers • Concern for water quality (e.g., turbid water, high suspended solids or uncontrolled algae growth)
System is generally considered not to be resilient to environmental perturbations and cannot easily buffer change.	**System is somewhat stable and should be resilient to change and perturbation**	**System is quite stable and resilient to change and perturbation.**

3. Results

3.1 Summary of Site Investigations

Based on the aquatic field studies conducted (as outlined in **Section 2.2**), a summary of aquatic features crossed by the proposed Route A study area is documented below (**Tables 3-2 and 3-3**). These results include a description of the surrounding topography and general area, the physical features of the waterbody and the riparian zone, as well as an assessment of the sensitivity of the feature as described in **Section 2.3**. Representative photos are provided for each site. Physical characteristics were conducted on longer reaches than identified in the photos.

3.2 Water Bodies

The Route A study area is adjacent to the Henvey Inlet watershed to the east, and the Key River watershed to the west. The Key River watershed drainage basin covers an area of 121.4 km^2, and flows into the Henvey Inlet watershed near the village of Cranberry. The eastern portion of Key River, south of Highway 522, enters into Portage Lake to the west. Portage Lake drains into Key Bay, which in turn drains into the western portion of Key River, of the Henvey Inlet watershed. The Henvey Inlet watershed drainage basin covers an area of 157 km^2 and consists of two major waterbodies, the Key River and Henvey Inlet. Both waterbodies are tributaries to Georgian Bay.

The Study Area is comprised of upland rock barrens interspersed by wetland drainages between rocky ridges. The western portion of the Route A study area extends into HIFN I.R. #2 and therefore includes the waterbodies of the Key River, the Henvey Inlet, and Portage Lake. These larger water systems are located at the northwestern limit of the Route A study area near the junction of Highway 69 and Highway 522. While these larger water bodies are located outside of the study area for the Transmission Line, tributaries to these systems are located within the study area and have been summarized according to their catchment watershed in **Table 3-1**.

Table 3–1: Crossing Sites According to Watershed within the Route A Study Area

Watershed	Subwatersheds	Sites
Nineteen Georgian Bay Tributaries (02EA)	Henvey Inlet (02EA-01)	WB-A-M3-3
		WB-A-M5-4
	Key River (02EA-02)	WB-A-M6-5
		WB-A-M7-12
		WB-A-M9-6
		WB-A-M9-7
		WB-A-M12-8
		WB-A-M17-9
		WB-A-M18-10
		WB-A-M19-11

3.2.1 Tributaries to the Key River

The Key River is a relatively slow moving river that is moderately deep. It is important as a migratory route and supports warm, cool, and some cold water salmon species. Two (2) water bodies were assessed that flow into the Key River. A summary of these assessments is provided in **Table 3-2**.

Table 3–2: Site Investigation Summaries for Tributaries to the Key River

Feature ID	Investigation Date	Type of Waterbody	Description of Site	Feature Description	Feature Sensitivity		
WB-A-M3-3	May 8th, 2015	Permanent Stream	CP rail line and water crossing, black ash, bur oak swamp above right bank. Rail above left bank running along channel, crossing watercourse downstream of transmission line crossing	Channel of slow-moving flats along rail line. Unstable banks of erodible soils. Moderate flow at time of inspection but debris line and floodplain indicate the watercourse experiences significant flow. Depth from top of water approximately 1 m and debris in riparian shrubs from high flows up to approximately 1.5 m above water. Silt dominant (75) with clay and sand present. Habitat mostly provided by overhanging riparian shrubs and grasses. Rail bridge downstream provides habitat/cover via piers and accumulated woody debris. Cyprinids observed. **Fish Habitat?** Direct **MWW (m)** 10.0 **MBW (m)** 11.0 **MWD (m)** 1.5 **MBD (m)** 2.5	**Moderate**	 *Photo 1. View of downstream (north) reach looking towards crossing from approximately 30 m upstream* ↑	 *Photo 2. View of upstream reach towards crossing from approximately 35 m downstream* ↑
WB-A-M5-4	May 6th, 2015	Permanent Stream	Rock barren, forest and wetland surrounding either side of stream	Wide, shallow channel of slow moving flats. Previously dammed by beavers but currently breached and inactive. Left bank of watercourse is a steep rockbarren cliff, heavily vegetated with grass shrubs and trees. Right bank of watercourse is more flat and is vegetated with trees and shrubs. Both banks slope towards the watercourse. There is evidence of erosion on the left bank, but it is now stabilized by vegetation and bedrock. Submerged aquatic vegetation bordering thalweg. Watercourse wide within the area assessed, but narrows into a more defined channel downstream. Some trees growing in the watercourse and a few are growing on the banks providing suitable shade for fish. Banks well vegetated. Assessed at high water levels. **Fish Habitat?** Direct **MWW (m)** 25.00 **MBW (m)** 29.00 **MWD (m)** 1.0 **MBD (m)** 1.0	**Moderate**	 *Photo 1. View of upstream reach from crossing. Wide channel of slow moving flats.* ↑	 *Photo 2. View of downstream reach from crossing. Old beaver dam separates upstream and downstream reaches.* ↑

Table 3–3: Site Investigation Summaries for Tributaries to Portage Lake

<table>
<tr><th>Feature ID</th><th>Investigation Date</th><th>Type of Waterbody</th><th>Description of Site</th><th>Feature Description</th><th>Feature Sensitivity</th><th></th><th></th></tr>
<tr><td>WB-A-M6-5</td><td>May 6th, 2015</td><td>Permanent Stream</td><td>Grass and scrubland/meadow bordering channel, forest beyond.</td><td>Defined channel with (e.g., flats) low velocities, fine substrates and turbid water. Banks are unstable and eroded/slumping. Bank height approximately 0.75 to 1 m (from water's edge). Cyprinids observed; adult Ephemeroptera observed.

<table><tr><td>Fish Habitat?</td><td>Direct</td></tr><tr><td>MWW (m)</td><td>8.0</td></tr><tr><td>MBW (m)</td><td>9.0</td></tr><tr><td>MWD (m)</td><td>1.8</td></tr><tr><td>MBD (m)</td><td>2.6</td></tr></table></td><td>Moderate</td><td> 
Photo 1. View of downstream reach from crossing. Flat meadow/scrubland.</td><td> 
Photo 2. View of upstream reach from crossing. Slumping banks on LB upstream and at crossing location.</td></tr>
<tr><td>WB-A-M7-12</td><td>May 15th, 2015</td><td>Permanent Stream</td><td>Area assessed is located just south of highway 522 and just east of point where T-line splits from highway. Adjacent land use is forest and highway.</td><td>Flowing channel originates from pond upstream. Watercourse flows over an impassable series of waterfalls upstream, and seeps through highway embankment. The most significant barrier is the highway embankment; there is no crossing structure through the highway embankment. Beaver dam downstream of highway and small bedrock drop provide significant natural barriers. Riffle/run/pool sequences over mostly fine substrates through forest, flowing to river downstream. Heavy scour and sediment load at outlet pool. Fish observed in outlet pool at highway. Upstream of highway has potential to support isolated population of tolerant forage fish (i.e., Central Mudminnow).

<table><tr><td>Fish Habitat?</td><td>Direct</td></tr><tr><td>MWW (m)</td><td>1.90</td></tr><tr><td>MBW (m)</td><td>3.10</td></tr><tr><td>MWD (m)</td><td>0.18</td></tr><tr><td>MBD (m)</td><td>-</td></tr></table></td><td>Moderate</td><td> 
Photo 1. View of downstream reach from crossing and beaver dam.</td><td> 
Photo 2. View of upstream reach, looking towards crossing from approximately 30 m DS of CL</td></tr>
<tr><td>WB-A-M9-6</td><td>May 5th, 2015</td><td>Permanent Stream</td><td>Channel flows through extensive meadow. Highway 522 crossing and OFSC trail crossing.</td><td>Downstream of highway is a naturally straight channel flowing through meadow with moderate flow and is characterized as a slow run. . Like WB-A-M9-7, the assessed watercourse is a tributary to a downstream waterbody running east to west outside of the study area. Upstream of highway is drainage ditch. Channel flows to larger watercourse just over 50 m downstream.

<table><tr><td>Fish Habitat?</td><td>Indirect</td></tr><tr><td>MWW (m)</td><td>0.65</td></tr><tr><td>MBW (m)</td><td>0.50</td></tr><tr><td>MWD (m)</td><td>0.20</td></tr><tr><td>MBD (m)</td><td>0.40</td></tr></table></td><td>Low</td><td> 
Photo 1. View of downstream reach from crossing. Channel flowing through extensive meadow.</td><td> 
Photo 2. View of CSP looking upstream. Straight, narrow channel flows underneath Highway 522 to upstream drainage ditch.</td></tr>
</table>

Table 3–3: Site Investigation Summaries for Tributaries to Portage Lake

<table>
<tr><th>Feature ID</th><th>Investigation Date</th><th>Type of Waterbody</th><th>Description of Site</th><th>Feature Description</th><th>Feature Sensitivity</th><th></th><th></th></tr>
<tr>
<td>WB-A-M9-7</td>
<td>May 5th, 2015</td>
<td>Permanent Stream</td>
<td>Meadow from highway to river crossing further south. Forest bordering location >50 m away on either side of channel. OFSC trail also crosses here.</td>
<td>Channel flowing from culvert at highway. Fairly wide channel for first 12 m (~2 m wide), then narrows to 0.3 m as it flows closer to the river south of study area. Conditions on the south side of the highway similar to those on the south side. Several wetlands on the north side of the highway drain southward and there are several culverts draining the low lying area assessed north to south underneath the highway. This, in combination with the observed deep cut channel, suggests that this waterbody flows year round. Channel substrate is dominated by silt, with some detritus, clay and sand. Upstream of highway is drainage ditch (man-made). Deeply entrenched watercourse flows through large meadow heavily vegetated with grasses and some small shrubs. There is a stream running east to west downstream of the study area. The assessed channel is a tributary of the downstream waterbody. Drainage ditch upstream of highway has similar habitat/dimensions as downstream and does not directly support fish due to passage barriers (perched CSP and low-flow conditions)
<table>
<tr><td>Fish Habitat?</td><td>Indirect</td></tr>
<tr><td>MWW (m)</td><td>1.10</td></tr>
<tr><td>MBW (m)</td><td>1.40</td></tr>
<tr><td>MWD (m)</td><td>0.20</td></tr>
<tr><td>MBD (m)</td><td>-</td></tr>
</table>
</td>
<td>Low</td>
<td> 
Photo 1. View of downstream reach from top of culvert. Downstream channel serves as a tributary to larger watercourse running east-west outside of study area.</td>
<td> 
Photo 2. View of upstream reach from southern reach, looking towards Hwy 522. Deep cut channel drains wetlands through perched CSP under the highway to downstream channel.</td>
</tr>
<tr>
<td>WB-A-M12-8</td>
<td>May 4th, 2015</td>
<td>Permanent Pond</td>
<td>Meadow marsh with channel of standing water bordered by forest and highway</td>
<td>Channel of standing water through meadow marsh; no flow or fish passage from upstream of highway. No culvert; water appears to seep through boulder embankment. Potential connectivity to habitat downstream. Appears to have previously been dammed. Poorly drained. Proposed crossing location immediately south of highway; no water crossing under highway. No access for fish from north of highway. No fish observed.
<table>
<tr><td>Fish Habitat?</td><td>Indirect</td></tr>
<tr><td>Size (m)</td><td>50.00</td></tr>
<tr><td>Depth (m)</td><td>0.50</td></tr>
</table>
</td>
<td>Low</td>
<td> 
Photo 1. General view of marsh/meadow looking south from CL. Standing water channel running north-south through meadow/mash.</td>
<td></td>
</tr>
</table>

Table 3–3: Site Investigation Summaries for Tributaries to Portage Lake

<table>
<tr><th>Feature ID</th><th>Investigation Date</th><th>Type of Waterbody</th><th>Description of Site</th><th>Feature Description</th><th>Feature Sensitivity</th><th></th><th></th></tr>
<tr>
<td>WB-A-M17-9</td>
<td>May 5th, 2015</td>
<td>Intermittent Stream</td>
<td>Highway and forest. Waterbody directly south of highway 522.</td>
<td>Ephemeral swale/wetland pocket not directly supporting fish habitat in study area. Densely vegetated with grass and other water tolerant terrestrial species. Habitat conditions upstream of highway are consistent with the surveyed area downstream of highway.

<table>
<tr><td>Fish Habitat?</td><td>Indirect</td></tr>
<tr><td>MWW (m)</td><td>2.00</td></tr>
<tr><td>MBW (m)</td><td>10.00</td></tr>
<tr><td>MWD (m)</td><td>0.13</td></tr>
<tr><td>MBD (m)</td><td>-</td></tr>
</table>
</td>
<td>Low</td>
<td> 
Photo 1. View of reach downstream of culvert on south side of Hwy 522. Channel becomes more defined on south side of Highway 522.</td>
<td> 
Photo 2. View of culvert and possible drainage ditch input south of Hwy 522</td>
</tr>
<tr>
<td>WB-A-M18-10</td>
<td>May 5th, 2015</td>
<td>Permanent Stream</td>
<td>Channel bordered by meadow marsh, just south of Highway 522 Channel is bordered by Highway 522, and runs just upstream. Channel fed by upstream beaver pond.</td>
<td>Small, incised channel flowing from beaver dam through small marsh meadow. Fish passage impeded at beaver dam and highway embankment. Fish observed in beaver pond (Brook Stickleback). Meadow wet in some areas. Mean width of meadow 18 m. Morphological measurements taken where the channel was defined. Focus of assessment area is downstream of highway. Beaver dam is at crossing location; suggest moving the crossing slightly to the south to avoid beaver dam separating upstream and downstream reaches immediately at centre line

<table>
<tr><td>Fish Habitat?</td><td>Direct</td></tr>
<tr><td>MWW (m)</td><td>0.50</td></tr>
<tr><td>MBW (m)</td><td>0.60</td></tr>
<tr><td>MWD (m)</td><td>0.25</td></tr>
<tr><td>MBD (m)</td><td>-</td></tr>
</table>
</td>
<td>Low</td>
<td> 
Photo 1. View of watercourse and study area downstream of beaver dam and highway. Somewhat defined channel through meadow/marsh. Channel narrow (0.1 to 0.35 m) and deep.</td>
<td> 
Photo 2. View of reach upstream of highway crossing. Impassable downstream beaver dam separates upstream and downstream reaches.</td>
</tr>
</table>

Table 3–3: Site Investigation Summaries for Tributaries to Portage Lake

Feature ID	Investigation Date	Type of Waterbody	Description of Site	Feature Description	Feature Sensitivity		
WB-A-M19-11	May 5th, 2015	Permanent Stream	Highway 522, west of hydro corridor nearby. Trees and shrub cover dominate study area. Upstream of highway flow is along highway ditch line. Downstream channel meanders through forest.	Stream flowing from highway crossing through forest. Meandering, defined channel over mainly bedrock/sand/gravel substrate with riffle/pool sequences. Some eroded/fallen banks with undercuts. Upstream watercourse dimensions/habitat are similar (morphology, substrate etc.) other than less canopy cover and more overhanging grasses. Perched corrugated steel pipe (CSP) culvert at Highway, beaver dam and large woody debris acting as fish barriers. Eroded banks more frequent 20 m downstream from transmission line crossing. Assessment focused on watercourse downstream of highway crossing as crossing location will be located just south of Highway 522 **Fish Habitat?** Direct **MWW (m)** 0.75 **MBW (m)** 0.90 **MWD (m)** 0.15 **MBD (m)** 0.40	**Moderate**	 *Photo 1. View of stream upstream of crossing and Hwy 522. Bedrock substrate with deposits of sand and gravel.*	 *Photo 2. View of study area downstream of crossing, facing upstream. Moderate flow with good vegetation growth on banks. Some evidence of undercut banks.*

3.2.2 Tributaries to Portage Lake

The Route A study area traverses east-west following Highway 522. Along this alignment, tributaries drain into the Key River that flows west to Portage Lake at the western limits of the study area.

3.3 Fish and Fish Habitat

The major aquatic system in the Route A study area is the Key River upstream of Portage Lake and its drainage network. Portage Lake and the surrounding streams, including the Key River, support sport and bait fish communities typical of central / northern Ontario. The area is used widely for recreational sportfish anglers, with records of Largemouth and Smallmouth Bass, Northern Pike, and Walleye in Portage Lake, Black Crappie in Little Key River, and Northern Pike, Walleye and Smallmouth Bass in the Upper Key River (Georgian Bay Bass Hole, 2015; The App Door, 2015).

Known Walleye spawning habitat was reported below the CN bridge in Ludgate by the Key River Association, and Walleye are frequently caught at the outlet of Portage Lake (Smitka, J., 2013).

A summary of fish species records for study area waterbodies are presented in **Table 3-4** below.

Table 3–4: Fish Species Records for Water Bodies in the Route A Study Area

Common Name	Scientific Name	Sources
Finescale Dace	*Phoxinus neogaeus*	Tulloch Environmental, 2013; FRi, 2013.
Northern Redbelly Dace	*Chrosomus eos*	Tulloch Environmental, 2013; FRi, 2013.
Fathead Minnow	*Pimephales promelas*	Tulloch Environmental, 2013
Central Mudminnow	*Umbra limi*	Tulloch Environmental, 2013; FRi 2013
Brown Bullhead	*Ameiurus nebulosus*	Tulloch Environmental, 2013; MNRF Species Records
Brook Stickleback	*Culaea inconstans*	Tulloch Environmental, 2013; FRi, 2013; AECOM, 2015
Creek Chub	*Semotilus atromaculatus*	Tulloch Environmental, 2013; FRi, 2013
Emerald Shiner	*Notropis atherinoides*	Tulloch Environmental, 2013
Golden Shiner	*Notemigonus crysoleucas*	Tulloch Environmental, 2013
Walleye	*Sander vitreus*	Smitka, J., 2013; Flybenji, 2008;; Georgian Bay Bass Hole
Largemouth Bass	*Micropterus salmoides*	Flybenji, 2008;
Northern Pike	*Esox lucius*	Flybenji, 2008; Georgian Bay Bass Hole
Smallmouth Bass	*Micropterus dolomieu*	Georgian Bay Bass Hole; Flybenji, 2008;
Black Crappie	*Pomoxis nirgomaculatus*	Georgian Bay Bass Hole

3.3.1.1 Rare Aquatic Species

Rare species include species with designations by COSEWIC, species listed as SAR in Ontario by the Committee on the Status of Species at Risk in Ontario (COSSARO), as well as Provincially Ranked S1 to S3 species. The Make-a-map: Natural Heritage Areas Application (MNRF, 2015a) was used to search for NHIC rare species records within any of the 1 km UTM squares that intersected the Route A study area. The search resulted in a total of two (2) provincially rare species including one (1) protected species designated as Threatened (Lake Sturgeon (*Acipenser fulvescens*)). Refer to **Table 3-5** below.

Table 3–5: Rare Species Records within the Vicinity of the Transmission Line Route A Study Area

Taxon	Common Name	Scientific Name	S-Rank[1]	ESA Status	COSEWIC Status	Year Last Observed
Fish	Lake Sturgeon (Great Lakes – Upper St. Lawrence River population)	*Acipenser fulvescens*	S2	THR	THR	1990s
Fish	Deepwater Sculpin §	*Myoxocephalus thompsoni*	S3	NAR	SC	1976-04-20

Notes: For all notes pertaining to this table please see the end of Section 3.3.1.3
Species marked with "§" are considered historical records

3.3.1.2 Federal

The Deepwater sculpin is a designated at-risk fish species in Canada and is listed as a species of Special Concern under Canada's SARA. This species has historical records in the Route A study area; however, it is not expected to be currently present (COSEWIC, 2000).

The Deepwater Sculpin is a bottom-dwelling fish that is found in cold (<7°C), well-oxygenated, deep lakes. In the Great Lakes, adults usually live between 60 and 150 m in depth. Its distribution ranges from the Great Bear Lake of Canada to the Great Lakes. It is a designated at-risk fish species in Canada, listed as a species of Special Concern under SARA (COSEWIC, 2000).

While the record for Deepwater Sculpin is historical (more than 30 years old), there are no lakes being crossed by the Transmission Line Route A, and therefore this species will not be affected.

3.3.1.3 Provincial

Lake Sturgeon (Great Lakes - Upper St. Lawrence River population) is listed as a threatened species under the Ontario *ESA*, 2007.

Lake Sturgeon inhabits large rivers and lakes, inland deltas and the mouths of large rivers; however detailed habitat information for this species is limited (COSEWIC, 2000). Adults of this species are known to forage for invertebrates in aquatic habitats with depths of 5 to 10 m with substrates of mud, clay, sand or gravel (COSEWIC, 2000). Spawning habitats are fast-flowing waters that contain a fine to medium sized gravel and boulders with spawning sites often located below waterfalls, rapids, or dams (COSEWIC, 2000). Young-of-the-year are typically associated with shallower waterbodies with sand bars, fine gravel or cobble substrates (COSEWIC, 2000).

Water crossings along the Transmission Line Route A consist of slow moving watercourses, shallow flats, or wetland areas that are often dammed by beaver activity. Although Lake Sturgeon may migrate along the Key River upstream of Portage Lake, Transmission Line Route A crosses smaller tributaries with unsuitable depth for foraging by Lake Sturgeon. These tributaries do not have suitable substrates nor sufficient flow volumes for spawning or nursery habitat preferred by Lake Sturgeon.

Notes for Table 3-5

[1]S-rank:

The Natural Heritage provincial ranking system (provincial S-rank) is used by the MNRF NHIC to set protection priorities for rare species and natural communities. Definitions are as follows:

- *S1..... Extremely rare in Ontario; usually five (5) or fewer occurrences in the province or very few remaining individuals; often especially vulnerable to extirpation.*
- *S2..... Very rare in Ontario; usually between five (5) and 20 occurrences in the province or with many individuals in fewer occurrences; often susceptible to extirpation.*
- *S3..... Rare to uncommon in Ontario; usually between 20 and 100 occurrences in the province; may have fewer occurrences, but with a large number of individuals in some populations; may be susceptible to large-scale disturbances. Most species with an S3 rank are assigned to the watch list, unless they have a relatively high global rank.*
- *S4..... Common and apparently secure in Ontario; usually with more than 100 occurrences in the province.*
- *S5..... Very common and demonstrably secure in Ontario.*
- *SH..... Possibly Extirpated (Historical). Species or community occurred historically in the nation or state/province, and there is some possibility that it may be rediscovered. Its presence may not have been verified in the past 20-40 years.*
- *S#S#.....A numeric range rank (e.g., S2S3) is used to indicate any range of uncertainty about the status of the species or community.*
- *S#..... Rank uncertain.*

[2] ESA Status:

The ESA 2007 (ESA) protects species listed as Threatened and Endangered on the Species at Risk in Ontario (SARO) List on provincial and private land. The Minister lists species on the SARO list based on recommendations from the COSSARO, which evaluates the conservation status of species occurring in Ontario. The following are the categories of at risk:

- ***END** (Endangered) .....A species facing imminent extinction or extirpation in Ontario.*
- ***THR** (Threatened).....Any native species that, on the basis of the best available scientific evidence, is at risk of becoming endangered throughout all or a significant portion of its Ontario range if the limiting factors are not reversed.*
- ***SC** (Special Concern) .....A species that may become threatened or endangered due to a combination of biological characteristics and identified threats.*
- ***NAR** (Not at Risk) .....A species that has been evaluated and found to be not at risk.*

[3]COSEWIC Status:

COSEWIC evaluates a federal status ranking for all species that it assesses. Rankings include the following:

- ***END** (Endangered) .....A species facing imminent extirpation or extinction throughout its range.*
- ***THR** (Threatened).....A species likely to become endangered if nothing is done to reverse the factors leading to its extirpation or extinction*
- ***SC** (Special Concern) .....A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events, but does not include an extirpated, endangered or threatened species.*
- ***NAR** (Not at Risk) .....A species that has been evaluated and found to be not at risk.*

[4]SARA Status:

The SARA (SARA protects SAR designated as Endangered, Threatened and Extirpated listed under Schedule 1, including their habitats on federal land. Schedule 1 of SARA is the official list of wildlife SAR in Canada and includes species listed as Extirpated, Endangered, Threatened and of Special Concern. Once a species is listed on Schedule 1, they receive protection and recovery measures that are required to be developed and implemented under SARA. Species that were designated at risk by COSEWIC before SARA need to be reassessed based on the new criteria of the Act before they can be listed under Schedule 1. These species that are waiting to be listed under Schedule 1 do not receive official protection under SARA. Once the species on other schedules (2 and 3) have been reassessed, the other schedules are eliminated and the species is either listed under Schedule 1 or is not listed under the Act.

The following are definitions of the SARA status rankings assigned to each species in the tables above:

- **END (Schedule 1)**.....These *species* are listed as Endangered under Schedule 1 of SARA and receive species and habitat protection under SARA, as well as recovery strategies and action plans.
- **THR (Schedule 1)**.....These species are listed as Threatened under Schedule 1 of SARA and receive species and habitat *protection* under SARA, as well as recovery strategies and action plans.
- ***SC (Schedule 1)** .....These species are listed as Special Concern under Schedule 1 of SARA and receive management initiatives under SARA to prevent them from becoming endangered and threatened.*
- ***No Status (No schedule)**.....These species are evaluated and designated by COSEWIC but are not listed under Schedule 1 and therefore do not receive protection under SARA.*
- ***NAR (Not at Risk)**.....These species have either been assessed by COSEWIC as Not at Risk or there is not enough sufficient data to assess the status ranking of the species and therefore these are not listed on Schedule 1 nor do they receive protection under SARA.*
- ***Not Applicable (N/A)** .....These species have either been assessed by COSEWIC as Not at Risk or there is not enough sufficient data to assess the status ranking of the species and therefore these are not listed on Schedule 1 nor do they receive protection under SARA.*

3.4 Surface Water Quality

An inactive station of the Provincial Water Quality Monitoring Network (PWQMN) is located at the Key River at Highway 69, 2.5 km south of the junction of Highways 522 and 69 (MOECC, 2015). This station is located just west of the Route A study area. It was first sampled in 1973 and last sampled in 2005; therefore records from this station are not current.

In situ surface water quality data was collected at water crossings along the Transmission Line Route A during May 2015 field investigations. In general, field findings indicated that the water crossings in this study area are characterized by slightly acidic pH, low conductivity, high dissolved oxygen and clear and colourless water, which is typical of bog and fen-type environments.

A summary of water quality results are included in **Table 3-6**.

Table 3–6: Surface Water Quality Data for Transmission Line Route A Water Crossings

Site	Air Temperature (°C)	Water Temperature (°C)	pH	Conductivity (s/cm)	D.O. (mg/L)	Water Colour	Water Clarity
WB-A-M3-3	16.0	16.4	7.2	0.02	8.6	turbid	turbid
WB-A-M5-4	15.3	13.4	6.9		5.6	colourless	clear
WB-A-M6-5	22.0	17.2	6.7	0.04	7.9	turbid	turbid
WB-A-M7-12	9.0	10.8	6.5	0.03	8.9	colourless	clear
WB-A-M9-6	22.0	14.3	5.9		6.2	colourless	clear
WB-A-M9-7	18.0	15.9	5.4		6.4	colourless	clear
WB-A-M12-8	18.4	11.9	6.8	0.50	5.8	colourless	clear
WB-A-M17-9	18.0	15.7	5.1		10.4	colourless	clear
WB-A-M18-10	18.0	7.6	6.4	0.09	10.4	colourless	clear
WB-A-M19-11	9.0	8.1	6.7	0.15	11.3	colourless	clear

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Appendix A

Site Investigation Field Data

Pond Lake Assessment

Site ID	WB-A-M12-8	Field Crew	Amy Ingriselli Ami Arsenault	6
Study Area	TLINE A			

Location	WB TLINE_A-M6			
Project Number	60341251	Air Temp. (degC)	14.0	Weather Notes
Tablet	AECOM6	Wind Speed (beaufort)	4	No rain yet but forecast calling for showers
Start Date	5/4/2015 9:29:02 AM	Precipitation	0	
End Date	2015-05-04 10:20:32	Cloud Cover	90.00	

Site Features

Feature Description	30	Feature Location
General view of marsh meadow looking south from centreline		Latitude:45.907223,Longitude:-80.446894,Altitude:195.0,Speed:0.0926,Accuracy:2.1,Provider:gps,Time:05/04/2015 09:32:57 EDT

Surrounding Land Use	Forest,Meadow,Wetland
	Marsh meadow with channel of standing water bordered by forest. Highway
Type of Pond	Natural,Permanent,Online
	Channel of standing water through meadow marsh, no flow or fish passage from upstream of highway. No culvert; water appears to seep through boulder embankment. Potential connectivity to habitat downstream. Appears to have previously been dammed. Poorly d

In-Situ Water Quality

WT (deg. C)	11.9	AT (degC)	18.4	Water Quality Notes
pH	6.8	Cond. (s/cm)	0.50	
D.O. (mg/L)	5.8	Water Colour	Colourless	
Water Clarity	Clear			

Seepage Indicators	None
Fish & Wildlife Observations	Winter wren
In-Situ Habitat	Standing water choked with grasses through meadow

Execution Time 8/17/2015 10:05:47 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Pond Lake Assessment

Physical Characteristics

Estimated Size	50.00	Estimated Depth	0.50

Notes: standing water in undefined channel choked with vegetation in marsh meadow. Width of wetted area is 3 m, estimated size of marsh meadow is 50 m. Standing water in-between marsh meadow.

In-Situ Cover

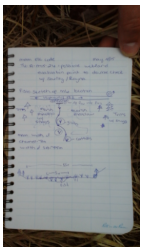
Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover
10.00			90.00		100.00

Aquatic Vegetation Species Present: Looks like flooded meadow marsh grass and algae. Channel choked with grasses. Duckweed present but scarce.

Description & Width of Riparian Vegetation: Large marsh meadow surrounding site. Riparian zone Roughly 55m wide. Snags,grasses, sedges, hummocks, cattails and raspberry.

Study Area Comments

Proposed crossing location immediately south of highway; no water crossing under highway. No access for fish from north of highway. No fish observed.



Execution Time 8/17/2015 10:05:47 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Pond Lake Assessment

Site ID	WB-A-M2-2	Field Crew	Amy Ingriselli Ami Arsenault	9
Study Area	TLINE A			

Location	T line A southwest from highway 522			
Project Number	60341251	Air Temp. (degC)	12.0	Weather Notes
Tablet	AECOM6	Wind Speed (beaufort)	1	Rain
Start Date	5/4/2015 12:51:20 PM	Precipitation	1	
End Date	2015-05-04 13:25:31	Cloud Cover	100.00	

Site Features

Feature Description	33	Feature Location
Beaver pond between bedrock slopes and at crest of slope. General view of most of study area, looking upstream from approx 25 m downstream of CL.		Latitude:45.89105,Longitude:-80.545561,Altitude:197.9,Speed:0.025722222,Accuracy:1.75,Provider:gps,Time:05/04/2015 12:55:22 EDT

Feature Description	36	Feature Location
2 beaver dams on slope. approx 20-25 m DS of centreline.		Latitude:45.891076,Longitude:-80.545606,Altitude:200.5,Speed:0.71507776,Accuracy:1.8,Provider:gps,Time:05/04/2015 01:27:35 EDT

Surrounding Land Use	Forest,Wetland
	Study area surrounded by forest

Type of Pond	Natural,Dammed,Online
	Ponded water (beaver dams) between bedrock slopes. Bedrock/boulder substrate with layer of detritus. Pond above beaver dam. Landscape slopes below first beaver dam, cluster of boulders below dam may have previously been rapids. Below dams is small (1m w

In-Situ Water Quality

WT (deg. C)	16.0	AT (degC)	13.5	Water Quality Notes
pH	6.5	Cond. (s/cm)	0.01	Questionable low conductivity
D.O. (mg/L)	8.3	Water Colour	Colourless	
Water Clarity	Clear			

Seepage Indicators	None

Execution Time 8/17/2015 10:05:47 AM

Filter Start Date 4/1/2015

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Pond Lake Assessment

Fish & Wildlife Observations	Fox scat
In-Situ Habitat	Pond. Watercourse dammed (2 beaver)

Physical Characteristics

Estimated Size	11.00	Estimated Depth	1.30
Notes	Dammed watercourse between bedrock. 2 beaver dams, trickle downstream of dam through forest.		

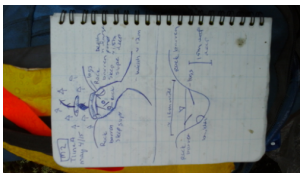
In-Situ Cover

Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover
80.00	20.00				60.00

Aquatic Vegetation Species Present	None observed
Description & Width of Riparian Vegetation	Riparian zone is bedrock slopes with minimal overhanging grasses. Mean approx 2 m.

Study Area Comments

Watercourse between bedrock slopes dammed (2 consecutive beaver dam). No fish passage and minimal flow through dams. Assessment area includes pond.



Execution Time 8/17/2015 10:05:47 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Pond Lake Assessment

Site ID	WB-A-M1-1	Field Crew	Amy Ingriselli Ami Arsenault	12
Study Area	TLINE A			

Location	500 m east of highway 69, south of Key River			
Project Number	60341251	Air Temp. (degC)	13.0	Weather Notes
Tablet	AECOM6	Wind Speed (beaufort)	4	
Start Date	5/4/2015 2:22:47 PM	Precipitation	0	
End Date	2015-05-04 14:56:18	Cloud Cover	100.00	

Site Features

Feature Description	39	Feature Location	
Large pond with abundance of old snags looking south from centreline.		Latitude:45.890023,Longitude:-80.558264,Altitude:182.4,Speed:0.14404444,Accuracy:1.8,Provider:gps,Time:05/04/2015 02:32:27 EDT	

Feature Description	42	Feature Location	
Beaver dams approximately 30m downstream of crossing. Fish passage impeded. Fish observed in pond.		Latitude:45.890005,Longitude:-80.558281,Altitude:200.5,Speed:0.10803334,Accuracy:1.75,Provider:gps,Time:05/04/2015 03:10:28 EDT	

Surrounding Land Use	Forest,Other	
	Forest and ofsc trail	

Type of Pond	Natural,Permanent,Dammed,Online	
	Large swamp with snags and aquatic vegetation. Beaver dams upstream and downstream of crossing location	

In-Situ Water Quality

WT (deg. C)	15.5	AT (degC)	13.0	Water Quality Notes
pH	6.8	Cond. (s/cm)	0.03	Questionable conductivity reading
D.O. (mg/L)	5.2	Water Colour	Colourless	
Water Clarity	Clear			

Seepage Indicators	None	

Execution Time 8/17/2015 10:05:47 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Pond Lake Assessment

Fish & Wildlife Observations	Woodpecker, muskrat lodge, muskrat scat, brook stickleback observed, spring peepers heard, GBH seen overhead. Midland painted turtle
In-Situ Habitat	Swamp with snags. Inacvtive beaver dam.

Physical Characteristics

Estimated Size	48.00	Estimated Depth	0.75
Notes	Swamp with snags. Inactive beaver dam. ATV trail downstream of crossing; perched culvert no fish passage. Layer of detritus over silt/clay/sand. Standing water.		

In-Situ Cover

Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover
40.00			60.00		80.00

Aquatic Vegetation Species Present	Yellow pond lilies, common duckweed, Richardson pond weed, coontail. Grasses and sedges
Description & Width of Riparian Vegetation	Mean Width approximately 2m. Grasses.

Study Area Comments

Large ponded study area (swamp) with abundance of snags and aquatic vegetation. Beaver ponds east and west of the swamp. Some flowing water near channel at east end. Fish passage impeded downstream by beaver dams and upstream by perched culvert at ofs

Execution Time 8/17/2015 10:05:47 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Site ID	WB-A-M19-11	Field Crew	Ami Arsenault Amy Ingriselli	15
Study Area	TLINE A			

Location	WB t line a m-08 west of hydro corridor. Crossing location is just south of highway 522			
Project Number	60341251	Air Temp. (degC)	9.0	Weather Notes
Tablet	AECOM6	Wind Speed (beaufort)	3	
Start Date	5/5/2015 7:16:11 AM	Precipitation	0	
End Date	5/5/2015 9:47:28 AM	Cloud Cover	60.00	
Upstream Endpoint	Latitude:45.901415,Longitude:-80.370918,Altitude:201.3,Speed:0.051444445,Accuracy:2.1,Provider:gps,Time:05/05/2015 09:25:41 EDT			
Downstream Endpoint	Latitude:45.901341,Longitude:-80.370826,Altitude:200.6,Speed:0.010288889,Accuracy:2.1,Provider:gps,Time:05/05/2015 09:14:54 EDT			

Site Features

Feature Description	84	Feature Location	
View of eroded and slumped banks downstream of crossing location		Latitude:45.901339,Longitude:-80.370816,Altitude:200.5,Speed:0.020577777,Accuracy:1.75,Provider:gps,Time:05/05/2015 09:13:46 EDT	

Feature Description	87	Feature Location	
View of study area downstream of crossing, facing upstream		Latitude:45.901341,Longitude:-80.370826,Altitude:200.6,Speed:0.010288889,Accuracy:2.1,Provider:gps,Time:05/05/2015 09:14:54 EDT	

Feature Description	90	Feature Location	
Beaver dam south of culvert		Latitude:45.901376,Longitude:-80.370868,Altitude:200.7,Speed:0.05658889,Accuracy:2.1,Provider:gps,Time:05/05/2015 09:24:45 EDT	

Feature Description	93	Feature Location	
Facing upstream towards Culvert at highway 522 and input from ditch		Latitude:45.901415,Longitude:-80.370918,Altitude:201.3,Speed:0.051444445,Accuracy:2.1,Provider:gps,Time:05/05/2015 09:25:41 EDT	

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Feature Description	96	Feature Location	
View of stream upstream of crossing and highway 522		Latitude:45.901578,Longitude:-80.371087,Altitude:198.3,Speed:0.12346666,Accuracy:1.5,Provider:gps,Time:05/05/2015 09:31:33 EDT	

Feature Description	99	Feature Location	
Another fish passage barrier upstream of highway, sheet flow over bedrock.		Latitude:45.901577,Longitude:-80.371046,Altitude:197.4,Speed:0.16976666,Accuracy:2.1,Provider:gps,Time:05/05/2015 09:32:44 EDT	

Surrounding Land Use	Forest,Other
	Highway. 522, hydro corridor nearby
Type of Watercourse	Permanent
	Stream flowing from highway crossing through forest. Meandering, defined channel over mainly bedrock/sand/gravel substrate. Undercut and some eroded/fallen banks. Upstream of highway flow is along highway ditchline. Upstream watercourse dimensions/habitat are similar (morphology, substrate etc.) other than less canopy cover and more overhanging grasses.
Input Description	Input from highway ditchline upstream of highway crossing
Water Body Underground / Not As Mapped?	No
Surrounding Land Topography	Even topography with slope west of watercourse to rock barren. Upstream of highway flow. Through ditchline along highway.

In-Situ Water Quality

WT (deg. C)	8.1	AT (degC)	9.0	Water Quality Notes
pH	6.7	Cond. (s/cm)	0.15	
D.O. (mg/L)	11.3	Water Colour	Colourless	
Water Clarity	Clear			

Seepage Indicators	None

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Stream Morphology

Site Length (m): 100.00

Channel Dimensions

Mean Wetted Width (m)	0.75	Mean Wetted Depth (m)	0.15
Mean Bankfull Width (m)	0.90	Mean Bankfull Depth (m)	0.40
Mean Top of Bank Width (m)	1.15	Mean Top of Bank Depth (m)	0.40

Bank Stability

Left Bank: 0.75

Right Bank: 0.90

Notes: Good vegetation growth on banks , some undercut banks, small areas with minor bank fall. Eroded and fallen banks more frequent approximately 20m from tline crossing.

Flow Description: Moderate flow not at bank width, pooling behind fish barrier structure

Habitat

Substrate Description: Bedrock with deposits of sand/gravel

Morphological Structure (%)

Pool	Riffle	Run	Flat
10.00	40.00	50.00	

Notes:

Instream Cover

Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover

Undercut Banks

Average Depth(m): 0.15 Percent Cover (%): 35.00

Aquatic Vegetation Species Present: None

Canopy Cover

Percent Closed Cover (%): 100-90%

Trees	Shrubs	Grasses	Herbaceous	Man Made	Other
70.00	30.00				

Cover Description: Structure (CSP) present but does not provide cover or suitable water depth for migration. Assessment focused on habitat downstream of highway crossing.

Left Bank Riparian Vegetation

1.0m includes grasses and small herbaceous plants shrubs and ferns

Right Bank Riparian Vegetation

0.7m includes shrubs and grasses and small herbaceous cover

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Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Overhanging Vegetation (%)	10.00
	Minor amount of overhanging grasses and shrub roots
Obstruction to Fish Passage	Man-Made
	Perched csp at highway crossing. Also to note small beaver dams along stream. Upstream of highway sheet flow over bedrock.
Barrier Height (M)	0.2

Study Area Comments

Meandering stream with pool riffle sequences. CSP, beaver dam and large woody debris acting as fish barriers. Bedrock sand gravel and silt substrate. Trees and shrub cover dominate study area. Eroded banks more frequent 20m downstream from tline crossing. Assessment focused on watercourse downstream of highway crossing.

Horizontal View of Channel

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Site ID	WB-A-M18-10	Field Crew	Amy Ingriselli Ami Arsenault	36
Study Area	TLINE A			

Location	East crossing on T line a map 7, just south of highway 522			
Project Number	60341251	Air Temp. (degC)	18.0	Weather Notes
Tablet	AECOM6	Wind Speed (beaufort)	1	
Start Date	5/5/2015 10:14:51 AM	Precipitation	0	
End Date	5/5/2015 11:43:05 AM	Cloud Cover	0.00	
Upstream Endpoint	Latitude:45.901612,Longitude:-80.383802			
Downstream Endpoint	Latitude:45.900827,Longitude:-80.383127			

Site Features

Feature Description	102	Feature Location	
Beaver dam right at crossing location; not upstream or downstream. Looking across the channel right at centreline, according to the field map		Latitude:45.901138,Longitude:-80.383315,Altitude:207.1,Speed:0.030866666,Accuracy:2.4,Provider:gps,Time:05/05/2015 10:26:53 EDT	

Feature Description	105	Feature Location	
Highway embankment with buried outlet. Water seeps through		Latitude:45.901139,Longitude:-80.383314,Altitude:207.2,Speed:0.4835778,Accuracy:2.4,Provider:gps,Time:05/05/2015 10:28:39 EDT	

Feature Description	108	Feature Location	
Small beaver pond mean width 8m depth 0.5 immediately upstream of centreline according to the field map		Latitude:45.900956,Longitude:-80.383178,Altitude:202.8,Speed:0.23664445,Accuracy:2.7,Provider:gps,Time:05/05/2015 10:30:29 EDT	

Feature Description	111	Feature Location	
View of watercourse and study area downstream of beaver dam and highway		Latitude:45.900906,Longitude:-80.383195,Altitude:203.3,Speed:0.43213335,Accuracy:2.1,Provider:gps,Time:05/05/2015 10:33:57 EDT	

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Feature Description	114	Feature Location
Upstream of highway crossing		Latitude:45.901506,Longitude:-80.384015,Altitude:209.8,Speed:0.0463,Accuracy:2.1,Provider:gps,Time:05/05/2015 11:50:56 EDT

Surrounding Land Use	Forest,Meadow,Other
	Channel bordered by marsh meadow, highway 522
Type of Watercourse	Permanent
	Small channel flowing from beaver dam through small marsh meadow
Input Description	Highway ditchline/watercourse. Upstream of highway
Water Body Underground / Not As Mapped?	No
Surrounding Land Topography	Highway embankment and foreste sloping towards watercourse

In-Situ Water Quality

WT (deg. C)	7.6	AT (degC)	18.0	Water Quality Notes
pH	6.4	Cond. (s/cm)	0.09	
D.O. (mg/L)	10.4	Water Colour	Colourless	
Water Clarity	Clear			

Seepage Indicators	None

Stream Morphology

Site Length (m)	50.00

Channel Dimensions

Mean Wetted Width (m)	0.50	Mean Wetted Depth (m)	0.25
Mean Bankfull Width (m)	0.60	Mean Bankfull Depth (m)	
Mean Top of Bank Width (m)	0.65	Mean Top of Bank Depth (m)	

Bank Stability

Left Bank	0.50
Right Bank	0.60

Notes: Heavily vegetated, flat topography in meadow

Flow Description	Somewhat defined channel through meadow marsh, moderate flow. Channel narrow and 0.1-0.35m deep. This describes the channel downstream of the beaver dam

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Habitat

Substrate Description: Silt (dominant) , clay, detritus, fine sand.

Morphological Structure (%)

Pool	Riffle	Run	Flat
	25.00	75.00	

Notes:

Instream Cover

Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover

Undercut Banks

Average Depth(m): 0.10 Percent Cover (%): 20.00

Aquatic Vegetation Species Present: No aquatic vegetation. Abundant water tolerant grasses in marsh meadow overhanging/submerged

Canopy Cover

Percent Closed Cover (%): 30-1%

Trees	Shrubs	Grasses	Herbaceous	Man Made	Other
		90.00			10.00

Cover Description: Woody debris

Left Bank Riparian Vegetation: 12 m of grasses

Right Bank Riparian Vegetation: 17m of grasses

Overhanging Vegetation (%): 40.00

Some overhanging grasses. No other cover.

Obstruction to Fish Passage: Man made

Beaver dam and highway barrier, not passable. Highway csp buried at outlet, exposed at Inlet

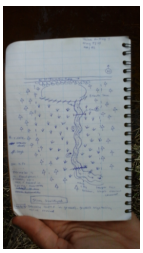
Barrier Height (M): 0.7

Execution Time: 8/17/2015 10:27:15 AM

Filter Start Date: 4/1/2015

Filter End Date: 8/17/2015

Stream/River Assessment

Study Area Comments Fish passage impeded at beaver dam and highway embankment. Fish observed in beaver pond (brook stickleback). Meadow wet in some areas. Mean width of meadow 18m. Morphological measurements taken where the channel was defined. Focus of assessment area is downstream of highway. Beaver dam is at crossing location, suggest moving slightly to the south.	
Horizontal View of Channel	

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Site ID	WB-A-M17-9	Field Crew	Amy Ingriselli Ami Arsenault	21
Study Area	TLINE A			

Location	West crossing on map 7 just south of highway 522			
Project Number	60341251	Air Temp. (degC)	20.0	Weather Notes
Tablet	AECOM6	Wind Speed (beaufort)	1	
Start Date	5/5/2015 12:05:40 PM	Precipitation	0	
End Date	5/5/2015 12:59:50 PM	Cloud Cover	15.00	
Upstream Endpoint	Latitude:45.901383,Longitude:-80.388451			
Downstream Endpoint	Latitude:45.900833,Longitude:-80.387985			

Site Features

Feature Description	117	Feature Location	
Culvert and possible ditch input south of highway 522		Latitude:45.901252,Longitude:-80.388406,Altitude:222.0,Speed:0.12346666,Accuracy:2.1,Provider:gps,Time:05/05/2015 12:32:28 EDT	

Feature Description	120	Feature Location	
Downstream from culvert on south side of hwy 522		Latitude:45.901264,Longitude:-80.388441,Altitude:222.4,Speed:0.020577777,Accuracy:2.1,Provider:gps,Time:05/05/2015 12:33:24 EDT	

Feature Description	123	Feature Location	
Looking north to culvert on south side of hwy 522		Latitude:45.901129,Longitude:-80.388368,Altitude:217.3,Speed:0.06173333,Accuracy:2.1,Provider:gps,Time:05/05/2015 12:34:49 EDT	

Feature Description	126	Feature Location	
Facing downstream toward more defined channel on south side of 522		Latitude:45.901113,Longitude:-80.388332,Altitude:216.9,Speed:0.06173333,Accuracy:2.1,Provider:gps,Time:05/05/2015 12:35:33 EDT	

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Feature Description	129	Feature Location
North of highway 522		Latitude:45.901383,Longitude:-80.388451,Altitude:217.3,Speed:0.015433333,Accuracy:2.1,Provider:gps,Time:05/05/2015 01:00:05 EDT

Surrounding Land Use	Forest,Other
	Highway and forest
Type of Watercourse	Intermittent
	Watercourse directly south of highway 522. Area does not include a very defined channel; looks more like an ephmeral wetland that could be considered a swale.
Input Description	Inputs coming from culvert and drainage ditch.
Water Body Underground / Not As Mapped?	No
Surrounding Land Topography	Fairly flat topography, with a slight slope towards ephemeral watercourse.

In-Situ Water Quality

WT (deg. C)	15.7	AT (degC)	18.0	Water Quality Notes
pH	5.1	Cond. (s/cm)		Ph pen does not seem to be taking proper conductivity measurements even though calibrated this morning
D.O. (mg/L)	10.4	Water Colour	Colourless	
Water Clarity	Clear			

Seepage Indicators	None

Stream Morphology

Site Length (m)	100.00				
Channel Dimensions					
Mean Wetted Width (m)	2.00	Mean Wetted Depth (m)	0.13	Notes	Banks are fairly undefined with abundance of grass and vegetation growth. No sloping or failed banks.
Mean Bankfull Width (m)	10.00	Mean Bankfull Depth (m)			
Mean Top of Bank Width (m)	10.00	Mean Top of Bank Depth (m)			

Bank Stability

Left Bank	2.00
Right Bank	10.00

Flow Description	Slow moving flat seeping through grasses and some small and large woody debris

Execution Time	8/17/2015 10:27:15 AM	Filter Start Date	4/1/2015
		Filter End Date	8/17/2015

Stream/River Assessment

Habitat

Substrate Description: Detritus (dominant) and some muck and silt.

Morphological Structure (%)

Pool	Riffle	Run	Flat
		30.00	70.00

Notes:

Instream Cover

Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover

Undercut Banks

Average Depth(m): Percent Cover (%):

Aquatic Vegetation Species Present: No aquatic vegetation but lots of grasses and water tolerant terrestrial species choking watercourse.

Canopy Cover

Percent Closed Cover (%): 60-30%

Trees	Shrubs	Grasses	Herbaceous	Man Made	Other
80.00		20.00			

Cover Description: Lots of pine and spruce trees dominating site beside watercourse. Grasses choking wet areas.

Left Bank Riparian Vegetation: 5m of grass curly dock and ferns

Right Bank Riparian Vegetation: 3m of grass curly dock and ferns

Overhanging Vegetation (%): 100.00

Abundant grasses and other water-tolerant terrestrial vegetation in swale, overhanging and in most of watercourse within study area

Obstruction to Fish Passage: None Observed

CSP is in water and does not pose a barrier to fish on the south side of the highway. Low water depth and choked with grasses. Suspected ephemeral watercourse; expected to be dry during warmer seasons.

Barrier Height (M):

Execution Time: 8/17/2015 10:27:15 AM

Filter Start Date: 4/1/2015

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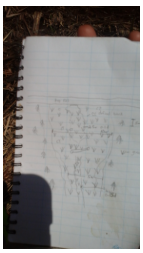
Stream/River Assessment

Study Area Comments Suspected ephemeral watercourse not directly supporting fish habitat in study area. Very choked with grass and other water tolerant terrestrial species. Habitat conditions upstream of highway are consistant with the surveyed area downstream of highway.	
Horizontal View of Channel	

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Site ID	WB-A-M9-7	Field Crew	Amy Ingriselli Ami Arsenault	24
Study Area	TLINE A			

Location	South of highway 522, eastern plot on map.			
Project Number	60341251	Air Temp. (degC)	18.0	Weather Notes
Tablet	AECOM6	Wind Speed (beaufort)	4	
Start Date	5/5/2015 2:04:47 PM	Precipitation	0	
End Date	5/5/2015 2:54:29 PM	Cloud Cover	30.00	
Upstream Endpoint	Latitude:45.901117,Longitude:-80.479777			
Downstream Endpoint	Latitude:45.900401,Longitude:-80.480174			

Site Features

Feature Description	132	Feature Location	
Facing downstream from top of culvert		Latitude:45.900945,Longitude:-80.479971,Altitude:182.4,Speed:0.05658889,Accuracy:2.1,Provider:gps,Time:05/05/2015 02:15:19 EDT	

Feature Description	135	Feature Location	
Perched culvert south of highway 522		Latitude:45.900913,Longitude:-80.479964,Altitude:183.8,Speed:0.11317778,Accuracy:1.8,Provider:gps,Time:05/05/2015 02:16:30 EDT	

Feature Description	138	Feature Location	
Facing east from channel		Latitude:45.9008,Longitude:-80.480032,Altitude:185.4,Speed:0.041155554,Accuracy:1.8,Provider:gps,Time:05/05/2015 02:40:59 EDT	

Feature Description	141	Feature Location	
Facing west from channel		Latitude:45.900799,Longitude:-80.48002,Altitude:185.0,Speed:0.030866666,Accuracy:2.1,Provider:gps,Time:05/05/2015 02:41:31 EDT	

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Feature Description	144	Feature Location	
Facing downstream from end of channel to stream		Latitude:45.90044,Longitude:-80.480146,Altitude:184.2,Speed:0.020577777,Accuracy:1.8,Provider:gps,Time:05/05/2015 02:42:57 EDT	

Feature Description	147	Feature Location	
Facing upstream from southern stream towards highway 522		Latitude:45.900452,Longitude:-80.480152,Altitude:183.8,Speed:0.03601111,Accuracy:1.8,Provider:gps,Time:05/05/2015 02:43:54 EDT	

Feature Description	150	Feature Location	
Upstream of hwy 522, culvert and drainage ditch		Latitude:45.901117,Longitude:-80.479777,Altitude:185.3,Speed:0.025722222,Accuracy:2.4,Provider:gps,Time:05/05/2015 02:54:41 EDT	

Surrounding Land Use	Meadow,Other
	Meadow from highway to river crossing further south. Forest bordering location >50m away on either side of channel. OFSC trail also crosses here.
Type of Watercourse	Permanent,Natural Channel
	Channel flowing from culvert at highway. Fairly wide channel for first 12m (~2m wide), then narrows to 0.3m as it flows closer to the river to the south of study area. Upstream of highway is drainage ditch (man made).
Input Description	Culvert and possible ditch runoff
Water Body Underground / Not As Mapped?	No
Surrounding Land Topography	Very flat meadow. Forest begins more then 50m east and west of study area.

In-Situ Water Quality

WT (deg. C)	15.9	AT (degC)	18.0	Water Quality Notes
pH	5.4	Cond. (s/cm)		Ph pen not properly calculating conductivity
D.O. (mg/L)	6.4	Water Colour	Colourless	
Water Clarity	Clear			

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Stream/River Assessment

Seepage Indicators: None

Stream Morphology

Site Length (m): 100.00

Channel Dimensions

Mean Wetted Width (m)	1.10	Mean Wetted Depth (m)	0.20	
Mean Bankfull Width (m)	1.40	Mean Bankfull Depth (m)		
Mean Top of Bank Width (m)	1.60	Mean Top of Bank Depth (m)		

Bank Stability

Left Bank: 1.10

Right Bank: 1.40

Notes: Heavily vegetated banks with grasses and small shrubs but little erosion and exposed soils were observed

Flow Description: Slow flow throughout channel

Habitat

Substrate Description: Silt (dominant), detritus clay and sand

Morphological Structure (%)

Pool	Riffle	Run	Flat
		20.00	80.00

Notes:

Instream Cover

Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover

Undercut Banks

Average Depth(m): 0.10 Percent Cover (%): 20.00

Aquatic Vegetation Species Present: Some emergent grasses

Canopy Cover

Percent Closed Cover (%): 0

Trees	Shrubs	Grasses	Herbaceous	Man Made	Other

Cover Description: Meadow dominated by grasses, no trees, small shrubs, not providing notable canopy cover to watercourse

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Stream/River Assessment

Left Bank Riparian Vegetation	Right Bank Riparian Vegetation
>50m of meadow full of grasses with some small shrubs	>50m of meadow with grasses and some small shrubs

Overhanging Vegetation (%)	70.00
	Grass overgrowth
Obstruction to Fish Passage	Man-Made
	Perched culvert (CSP)
Barrier Height (M)	0.2

Study Area Comments

Watercourse cuts through large meadow heavily vegetated with grasses and some small shrubs. There is a stream running east to west downstream of the study area. This channel connects to the stream. Focused on surveying downstream of highway. Drainage ditch upstream of highway has similar habitat/dimensions as downstream and does not directly support fish due to passage barriers.

Horizontal View of Channel

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Site ID	WB-A-M9-6	Field Crew	Amy Ingriselli Ami Arsenault	27
Study Area	TLINE A			

Location	Approximately 50m upstream and 50m downstream of crossing; assessment focuses on habitat downstream of highway 522			
Project Number	60341251	Air Temp. (degC)	22.0	Weather Notes
Tablet	AECOM6	Wind Speed (beaufort)	3	
Start Date	5/5/2015 3:04:12 PM	Precipitation	0	
End Date	5/5/2015 3:55:09 PM	Cloud Cover	5.00	
Upstream Endpoint	Latitude:45.900997,Longitude:-80.482698			
Downstream Endpoint	Latitude:45.900384,Longitude:-80.482299			

Site Features

Feature Description	153	Feature Location
Looking downstream from crossing		Latitude:45.900787,Longitude:-80.482282,Altitude:184.5,Speed:0.020577777,Accuracy:2.1,Provider:gps,Time:05/05/2015 03:37:50 EDT

Feature Description	156	Feature Location
Facing CSP looking upstream		Latitude:45.900794,Longitude:-80.482281,Altitude:182.6,Speed:0.03601111,Accuracy:1.8,Provider:gps,Time:05/05/2015 03:39:59 EDT

Feature Description	159	Feature Location
Upstream of highway. Photo taken with ami's phone		Latitude:45.900879,Longitude:-80.482296,Altitude:184.3,Speed:0.10288889,Accuracy:1.5,Provider:gps,Time:05/05/2015 03:49:11 EDT

Surrounding Land Use	Meadow,Other	
	Channel flows through extensive meadow. Highway crossing and ofsc trail crossing.	
Type of Watercourse	Permanent,Natural Channel	
	Downstream of highway is straight channel. Flowing through meadow. Upstream of highway is drainage ditch. Channel flows to larger watercourse just over 50m downstream	

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Filter End Date 8/17/2015

Stream/River Assessment

Input Description	Highway drainage ditch
Water Body Underground / Not As Mapped?	No
Surrounding Land Topography	Flat meadow

In-Situ Water Quality

WT (deg. C)	14.3	AT (degC)	22.0	Water Quality Notes
pH	5.9	Cond. (s/cm)		Conductivity not functioning, reading 0
D.O. (mg/L)	6.2	Water Colour	Colourless	
Water Clarity	Clear			

Seepage Indicators	None

Stream Morphology

Site Length (m)	60.00

Channel Dimensions

Mean Wetted Width (m)	0.65	Mean Wetted Depth (m)	0.20
Mean Bankfull Width (m)	0.50	Mean Bankfull Depth (m)	0.40
Mean Top of Bank Width (m)	0.70	Mean Top of Bank Depth (m)	0.40

Bank Stability

Left Bank	0.65
Right Bank	0.50
Notes	Very little undercut banks. Banks heavily vegetated.

Flow Description	Moderate flow, slow run

Habitat

Substrate Description	Silt (dominant), detritus, gravel, sand, clay

Morphological Structure (%)

Pool	Riffle	Run	Flat
5.00	10.00	80.00	5.00

Notes	

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Stream/River Assessment

Instream Cover

Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover

Undercut Banks

Average Depth(m) 0.50 Percent Cover (%) 10.00

Aquatic Vegetation Species Present: Some emergent grasses but wetted vegetation consists mainly of riparian grasses

Canopy Cover

Percent Closed Cover (%) 30-1%

Trees	Shrubs	Grasses	Herbaceous	Man Made	Other
		85.00		15.00	

Cover Description: CSP and shade provided by overhanging grasses

Left Bank Riparian Vegetation

Extensive (>100m) grassy meadow

Right Bank Riparian Vegetation

Extensive (>100m) grassy meadow

Overhanging Vegetation (%): 40.00

Dense riparian grasses

Obstruction to Fish Passage: None Observed

Upstream of the highway fish passage is impeded by no water flow and steep slope of channel

Barrier Height (M): 0.0

Study Area Comments

Osprey flew overhead

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Filter End Date 8/17/2015

Stream/River Assessment

Horizontal View of Channel

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Site ID	WB-A-M5-4	Field Crew	Ami Arsenault Amy Ingriselli	39
Study Area	TLINE A			

Location	southwest along t line from highway 522			
Project Number	60341251	Air Temp. (degC)	15.0	Weather Notes
Tablet	AECOM6	Wind Speed (beaufort)	2	
Start Date	5/6/2015 9:06:55 AM	Precipitation	0	
End Date	5/6/2015 10:25:52 AM	Cloud Cover	10.00	
Upstream Endpoint	Latitude:45.892660,Longitude:-80.515741			
Downstream Endpoint	Latitude:45.892698,Longitude:-80.516718			

Site Features

Feature Description	198	Feature Location	
Facing upstream from site location		Latitude:45.892658,Longitude:-80.51619,Altitude:184.7,Speed:0.010288889,Accuracy:2.1,Provider:gps,Time:05/06/2015 09:08:55 EDT	

Feature Description	201	Feature Location	
Facing downstream from site locatiin		Latitude:45.892659,Longitude:-80.516192,Altitude:184.5,Speed:0.09774444,Accuracy:2.1,Provider:gps,Time:05/06/2015 09:10:09 EDT	

Feature Description	204	Feature Location	
Facing downstream at old beaver dam		Latitude:45.892631,Longitude:-80.515913,Altitude:185.6,Speed:0.015433333,Accuracy:1.8,Provider:gps,Time:05/06/2015 09:45:24 EDT	

Feature Description	207	Feature Location	
Facing upstream towards beaver dam		Latitude:45.892752,Longitude:-80.515644,Altitude:182.0,Speed:0.010288889,Accuracy:1.8,Provider:gps,Time:05/06/2015 09:48:19 EDT	

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Feature Description	210	Feature Location
Facing downstream towards site location		Latitude:45.892749,Longitude:-80.516684,Altitude:183.0,Speed:0.020577777,Accuracy:2.4,Provider:gps,Time:05/06/2015 10:07:26 EDT

Surrounding Land Use	Forest,Wetland
	Forest and wetland surrounding either side of stream
Type of Watercourse	Permanent,Natural Channel
	Wide channel of slow moving flats. Previously dammed by beavers; breached and inactive. High bankful, evidence of previously eroded bank but now stabalized by vegetation and bedrock. Submerged water tolerant vegetation bordering thalweg.
Input Description	Online watercourse
Water Body Underground / Not As Mapped?	No
Surrounding Land Topography	Left bank of watercourse is a steep rockbarren cliff, heavily vegetated with grass shrubs and trees. Right bank of watercourse is more flat and is vegetated with trees and shrubs. Both banks slope towards the watercourse.

In-Situ Water Quality

WT (deg. C)	13.4	AT (degC)	15.3	Water Quality Notes
pH	6.9	Cond. (s/cm)		Ph pen may not be calculating conductivity properly. Was calibrated this morning.
D.O. (mg/L)	5.6	Water Colour	Colourless	
Water Clarity	Clear			

Seepage Indicators	None

Stream Morphology

Site Length (m)	100.00			Left Bank	25.00
Channel Dimensions				Right Bank	29.00
Mean Wetted Width (m)	25.00	Mean Wetted Depth (m)	1.00	Notes	Left bank stable enough to support tree and vegetation growth. Has seen erosion in the past (steep slope)
Mean Bankfull Width (m)	29.00	Mean Bankfull Depth (m)	1.00		
Mean Top of Bank Width (m)	30.00	Mean Top of Bank Depth (m)	1.00		

Bank Stability

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Flow Description	Currently slow flowing but evidence of high and fast flow conditions in the past judging by slope and bank full height on left bank. Bank full height on left bank approximately 1m across from crossing location.

Habitat

Substrate Description	Detritus (dominant), silt, muck

Morphological Structure (%)

Pool	Riffle	Run	Flat
			100.00

Notes

Instream Cover

Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover

Undercut Banks

Average Depth(m)		Percent Cover (%)	60.00

Aquatic Vegetation Species Present	Abundance of grasses and other water tolerant terrestrial species present in and surrounding site location. Some small narrow emergents

Canopy Cover

Percent Closed Cover (%)	30-1%

Trees	Shrubs	Grasses	Herbaceous	Man Made	Other
80.00		20.00			

Cover Description	A couple trees in watercourse and on banks providing shade for fish. Tall grasses could provide more shade during summer season.

Left Bank Riparian Vegetation	Right Bank Riparian Vegetation
2m of grasses, shrub and trees before rock barren begins	5m of grasses before forest

Overhanging Vegetation (%)	30.00
	Some trees overhanging banks. When grasses grow they could provide some overhanging veg
Obstruction to Fish Passage	Natural
	Some broken beaver dams downstream of site location
Barrier Height (M)	0.5

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Filter Start Date 4/1/2015

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Stream/River Assessment

Study Area Comments

Study area between rock barren and forest. Wide watercourse at site location, smaller channel downstream. Some trees growing in wetted area but not bankful. Lots of grasses growing in and around banks. Currently high water level.

Horizontal View of Channel

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Site ID	WB-A-M6-5	Field Crew	Amy Ingriselli Ami Arsenault	42
Study Area	TLINE A			

Location	walk 580 m west along the T line from Highway 522			
Project Number	60341251	Air Temp. (degC)	20.0	Weather Notes
Tablet	AECOM6	Wind Speed (beaufort)	1	
Start Date	5/6/2015 2:23:29 PM	Precipitation	0	
End Date	5/6/2015 3:35:03 PM	Cloud Cover	0.00	
Upstream Endpoint	Latitude:45.897946,Longitude:-80.502939			
Downstream Endpoint	Latitude:45.898177,Longitude:-80.504098			

Site Features

Feature Description	213	Feature Location	
Slumping banks on left bank at crossing location		Latitude:45.898041,Longitude:-80.503135,Altitude:171.5,Speed:0.05658889,Accuracy:2.4,Provider:gps,Time:05/06/2015 03:07:48 EDT	

Feature Description	216	Feature Location	
Flowing water input from forest; input on left bank, facing north from right or south bank		Latitude:45.89805,Longitude:-80.503124,Altitude:171.9,Speed:0.5504556,Accuracy:2.4,Provider:gps,Time:05/06/2015 03:08:47 EDT	

Feature Description	219	Feature Location	
Facing downstream from crossing		Latitude:45.898049,Longitude:-80.503121,Altitude:172.1,Speed:0.06173333,Accuracy:2.1,Provider:gps,Time:05/06/2015 03:09:53 EDT	

Feature Description	222	Feature Location	
Iron staining on right bank at crossing		Latitude:45.898106,Longitude:-80.503485,Altitude:173.5,Speed:0.2315,Accuracy:2.1,Provider:gps,Time:05/06/2015 03:13:52 EDT	

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Feature Description	225	Feature Location
Facing upstream from crossing		Latitude:45.898132,Longitude:-80.503472,Altitude:173.2,Speed:0.13375555,Accuracy:2.4,Provider:gps,Time:05/06/2015 03:14:30 EDT

Feature Description	228	Feature Location
Eroded right bank facing upstream		Latitude:45.898059,Longitude:-80.503209,Altitude:190.9,Speed:0.13375555,Accuracy:1.8,Provider:gps,Time:05/06/2015 03:35:49 EDT

Surrounding Land Use	Forest,Meadow
	Grass and scrubland/meadow bordering channel, forest beyond
Type of Watercourse	Permanent
	Defined channel with low velocities. Banks are unstable and eroded/slumping.
Input Description	Watercourse, in study area one small channel input from forest observed
Water Body Underground / Not As Mapped?	No
Surrounding Land Topography	Flat meadow/scrubland and flat forest

In-Situ Water Quality

WT (deg. C)	17.2	AT (degC)	22.0	Water Quality Notes
pH	6.7	Cond. (s/cm)	0.04	Conductivity meter has been producing questionable results
D.O. (mg/L)	7.9	Water Colour	Turbid	
Water Clarity	Turbid			

Seepage Indicators	Iron Staining
	Iron staining observed on right bank

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Stream Morphology

Site Length (m): 100.00

Channel Dimensions

Mean Wetted Width (m)	8.00	Mean Wetted Depth (m)	1.80
Mean Bankfull Width (m)	9.00	Mean Bankfull Depth (m)	2.60
Mean Top of Bank Width (m)	13.00	Mean Top of Bank Depth (m)	2.60

Bank Stability

Left Bank: 8.00

Right Bank: 9.00

Notes: Both banks vegetated with grasses but exposed erodible soils, slumping banks

Flow Description: Slow-moving flats, moderate flow. Mean depth over 1 m

Habitat

Substrate Description: Strongly dominated by silt with some clay and fine sand

Morphological Structure (%)

Pool	Riffle	Run	Flat
			100.00

Notes:

Instream Cover

Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover

Undercut Banks

Average Depth(m): Percent Cover (%):

Aquatic Vegetation Species Present: Richardson's pondweed, yellow pond lilly

Canopy Cover

Percent Closed Cover (%): 60-30%

Trees	Shrubs	Grasses	Herbaceous	Man Made	Other
65.00		35.00			

Cover Description: Riparian grasses are abundant but not providing significant shade at this time. Likely provides more during growing season

Left Bank Riparian Vegetation

Grasses and some shrubs 20m mean

Right Bank Riparian Vegetation

Grasses and some shrubs 10m mean

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Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Overhanging Vegetation (%)	20.00
	Riparian grasses not providing significant cover at the time of assessment but likely increases later in the growing season
Obstruction to Fish Passage	None Observed
Barrier Height (M)	

Study Area Comments

Turbid water, erodible banks and fine substrate. Height approximately 0.75-1m (from water's edge). Fish seen surfacing, cyprinids observed, adult ephemeroptera

Horizontal View of Channel

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Site ID	WB-A-M3-3	Field Crew	Amy Ingriselli Ami Arsenault	54
Study Area	TLINE A			

Location	T line a just west of CP rail tracks and south of Highway 522			
Project Number	60341251	Air Temp. (degC)	16.0	Weather Notes
Tablet	AECOM6	Wind Speed (beaufort)	3	
Start Date	5/8/2015 9:33:12 AM	Precipitation	0	
End Date	5/8/2015 10:49:32 AM	Cloud Cover	5.00	
Upstream Endpoint	Latitude:45.891004,Longitude:-80.535435			
Downstream Endpoint	Latitude:45.891809,Longitude:-80.536022			

Site Features

Feature Description	273	Feature Location	
Looking across the watercourse at the crossing location, looking east from the west (right) bank		Latitude:45.891388,Longitude:-80.535966,Altitude:176.4,Speed:0.16462222,Accuracy:2.1,Provider:gps,Time:05/08/2015 09:47:30 EDT	

Feature Description	276	Feature Location	
Facing upstream from crossing location along right bank. Slumped, unstable banks		Latitude:45.891086,Longitude:-80.535587,Altitude:175.8,Speed:0.015433333,Accuracy:2.1,Provider:gps,Time:05/08/2015 09:49:45 EDT	

Feature Description	279	Feature Location	
Input channel from wetland on right bank		Latitude:45.891078,Longitude:-80.53563,Altitude:176.2,Speed:0.015433333,Accuracy:1.8,Provider:gps,Time:05/08/2015 09:55:34 EDT	

Feature Description	282	Feature Location	
Facing downstream (north) towards crossing location from approximately 30m upstream of crossing		Latitude:45.891079,Longitude:-80.535633,Altitude:176.1,Speed:0.025722222,Accuracy:1.8,Provider:gps,Time:05/08/2015 09:56:16 EDT	

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Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Feature Description	285	Feature Location	
View of the rail embankment adjacent to watercourse, approximately 8 m from channel		Latitude:45.891068,Longitude:-80.53566,Altitude:176.9,Speed:0.0051444443,Accuracy:1.5,Provider:gps,Time:05/08/2015 10:00:10 EDT	

Feature Description	288	Feature Location	
Some sheen and slight orange staining on right bank		Latitude:45.891142,Longitude:-80.535755,Altitude:177.3,Speed:0.5761778,Accuracy:2.1,Provider:gps,Time:05/08/2015 10:02:49 EDT	

Feature Description	291	Feature Location	
Rail bridge approximately 30m downstream of tline crossing		Latitude:45.891418,Longitude:-80.536041,Altitude:183.8,Speed:0.0051444443,Accuracy:2.1,Provider:gps,Time:05/08/2015 10:49:28 EDT	

Feature Description	294	Feature Location	
Facing upstream towards tline crossing from approximately 35m downstream (north) of crossing (facing south)		Latitude:45.891481,Longitude:-80.536042,Altitude:182.4,Speed:0.0051444443,Accuracy:2.1,Provider:gps,Time:05/08/2015 10:48:56 EDT	

Surrounding Land Use	Forest,Wetland,Other
	CP rail line and water crossing, black ash, but oak swamp above right bank. Rail above left bank running along channel, crossing watercourse downstream of tline crossing
Type of Watercourse	Permanent
	Channel of slow-moving flats along rail line. Unstable banks of erodible soils.
Input Description	Overland flow from treed swamp on right bank, small channel
Water Body Underground / Not As Mapped?	No
Surrounding Land Topography	Right bank (west) flat treed Swampland. Left (east) rail embankment and bedrock mixed forest beyond

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Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

In-Situ Water Quality

WT (deg. C)	16.4	AT (degC)	16.0	Water Quality Notes
pH	7.2	Cond. (s/cm)	0.02	Conductivity readings are questionable
D.O. (mg/L)	8.6	Water Colour	Turbid	
Water Clarity	Turbid			

Seepage Indicators: Iron Staining,Bank Seepage

Sheen and slight iron stain on right bank

Stream Morphology

Site Length (m): 100.00

Channel Dimensions

Mean Wetted Width (m)	10.00	Mean Wetted Depth (m)	1.50
Mean Bankfull Width (m)	11.00	Mean Bankfull Depth (m)	2.50
Mean Top of Bank Width (m)	12.00	Mean Top of Bank Depth (m)	2.50

Bank Stability

Left Bank: 10.00

Right Bank: 11.00

Notes: Exposed erodible soils, slumped banks and point bars, slumping riparian shrubs

Flow Description: Moderate flow at time of inspection but debris line and floodplain indicate the watercourse experiences significant flow. Depth from top of water approximately 1m and debris in riparian shrubs from high flows up to approximately 1.5m above water. Mean wat

Habitat

Substrate Description: Silt dominamt (75) with clay and sand present

Morphological Structure (%)

Pool	Riffle	Run	Flat
			100.00

Notes

Instream Cover

Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover

Undercut Banks

Average Depth(m): 0.15 Percent Cover (%): 10.00

Aquatic Vegetation Species Present: Grasses

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Filter End Date 8/17/2015

Stream/River Assessment

Canopy Cover

Percent Closed Cover (%): 60-30%

Trees	Shrubs	Grasses	Herbaceous	Man Made	Other
	60.00	20.00		20.00	

Cover Description: Mostly provided by overhanging riparian shrubs and grasses. Rail bridge downstream with piers and accumulated woody debris

Left Bank Riparian Vegetation

8m flat, mostly grasses and speckled alder

Right Bank Riparian Vegetation

2 m grasses with some speckled alder

Overhanging Vegetation (%): 70.00

Overhanging grasses and overhanging speckled alder. Expect in full growing season overhanging grasses provide more cover than that observed at time of inspection

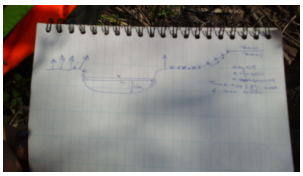
Obstruction to Fish Passage: None Observed

Barrier Height (M):

Study Area Comments

Cyprinids observed. Erodible banks

Horizontal View of Channel



Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Site ID	WB-A-M7-12	Field Crew	Amy Ingriselli Ami Arsenault	66
Study Area	TLINE A			

Location	Just south of highway 522 and just east of point where tline splits from highway. Previously unidentified assessment location.			
Project Number	60341251	Air Temp. (degC)	9.0	Weather Notes
Tablet	AECOM3	Wind Speed (beaufort)	1	
Start Date	5/15/2015 8:22:51 AM	Precipitation	0	
End Date	5/15/2015 9:48:32 AM	Cloud Cover	100.00	
Upstream Endpoint	Latitude:45.901391,Longitude:-80.495553			
Downstream Endpoint	Latitude:45.900573,Longitude:-80.495707			

Site Features

Feature Description	525	Feature Location	
Facing upstream from highway 522		Latitude:45.901073,Longitude:-80.49547,Altitude:187.8,Speed:0.23664445,Accuracy:1.75,Provider:gps,Time:05/15/2015 08:26:13 EDT	

Feature Description	528	Feature Location	
View of the highway embankment on the downstream side. No visible culvert on either side, water seeping through embankment. Heavy scour on downstream side and small beaver lodge on upstream side. Looking upstream from CL, beaver dam		Latitude:45.90107,Longitude:-80.495502,Altitude:193.0,Speed:0.025722222,Accuracy:2.1,Provider:gps,Time:05/15/2015 08:30:49 EDT	

Feature Description	531	Feature Location	
Facing downstream from CL		Latitude:45.900942,Longitude:-80.495475,Altitude:185.0,Speed:0.20577778,Accuracy:2.1,Provider:gps,Time:05/15/2015 08:40:00 EDT	

Feature Description	534	Feature Location	
Facing upstream towards CL from approximately 30m DS of CL		Latitude:45.900849,Longitude:-80.495452,Altitude:185.1,Speed:0.08231111,Accuracy:2.1,Provider:gps,Time:05/15/2015 08:54:07 EDT	

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Feature Description	537	Feature Location
Example of slightly eroded bank (RB) and fallen bank (LB) approximately 10m DS of CL		Latitude:45.900796,Longitude:-80.495457,Altitude:194.9,Speed:0.14404444,Accuracy:2.1,Provider:gps,Time:05/15/2015 09:19:13 EDT

Surrounding Land Use	Forest,Other
	Forest and highway
Type of Watercourse	Permanent,Natural Channel
	Flowing channel originates from pond upstream. Over set of falls upstream and seeps through highway embankment. Riffle/run/pool sequences over mostly fine substrates through forest, flowing to river downstream. Heavy scour and sediment load at outlet pool
Input Description	Natural channel plus input from highway ditch. Flows from pond upstream (observed on air photo)
Water Body Underground / Not As Mapped?	Waterbody not mapped. Observed by terrestrial field crew and coordinates reported to aquatics.
Surrounding Land Topography	Rolling forested bedrock sloping to channel

In-Situ Water Quality

WT (deg. C)	10.8	AT (degC)	9.0	Water Quality Notes
pH	6.5	Cond. (s/cm)	0.03	
D.O. (mg/L)	8.9	Water Colour	Colourless	
Water Clarity	Clear			

Seepage Indicators	None

Stream Morphology

Site Length (m)	100.00				
Channel Dimensions					
Mean Wetted Width (m)	1.90	Mean Wetted Depth (m)	0.18	Notes	Both banks consist of erodible materials with some evidence of erosion and fallen banks
Mean Bankfull Width (m)	3.10	Mean Bankfull Depth (m)			
Mean Top of Bank Width (m)	3.20	Mean Top of Bank Depth (m)			

Bank Stability

Left Bank	1.90
Right Bank	3.10

Flow Description	Moderate flow at this time

Execution Time 8/17/2015 10:27:15 AM

Filter Start Date 4/1/2015

Filter End Date 8/17/2015

Stream/River Assessment

Habitat

Substrate Description: Sand (dominant) plus silt, gravel and clay

Morphological Structure (%)

Pool	Riffle	Run	Flat
25.00	25.00	50.00	

Notes:

Instream Cover

Woody Debris	Boulders	Cobble	Aquatic Vegetation	Structures	Total Instream Cover

Undercut Banks

Average Depth(m): 0.15 Percent Cover (%): 15.00

Aquatic Vegetation Species Present: Marsh marigold, emergent grasses mainly at outlet pool

Canopy Cover

Percent Closed Cover (%): 100-90%

Trees	Shrubs	Grasses	Herbaceous	Man Made	Other
60.00	35.00	5.00			

Cover Description: Creek flows mainly through forest. Open canopy only within highway ROW

Left Bank Riparian Vegetation: 2m with nannyberry, ferns, grasses, speckled alder,

Right Bank Riparian Vegetation: 1m with same vegetation as LB

Overhanging Vegetation (%): 30.00

Shrubs and grasses, mainly shrubs

Obstruction to Fish Passage: Man-Made

Natural barriers as well but most significant barrier within assessment area is man made. Beaver dam downstream of highway, no crossing structure through highway embankment (no csp, etc), small bedrock drop downstream of CL ~10m and impassable set of fal

Barrier Height (M): 2.5

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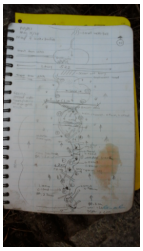
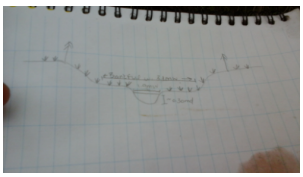
Stream/River Assessment

Study Area Comments Fish observed in outlet pool at highway. This watercourse was not previously identified and mapped, identified by terrestrial crew and reported. Upstream of highway has potential to support isolated population of tolerant fish (ie Central Mudminnow)	
Horizontal View of Channel	

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