APPENDIX C

Fish and Fish Habitat Existing Conditions and Preliminary Impact Assessment Report

REPORT

FISH AND FISH HABITAT EXISTING CONDITIONS & PRELIMINARY IMPACT ASSESSMENT REPORT

HIGHWAY 401 PLANNING STUDY FROM COLBORNE TO BRIGHTON: PRELIMINARY DESIGN AND CLASS ENVIRONMENTAL ASSESSMENT STUDY

Submitted to:

MINISTRY OF TRANSPORTATION – EASTERN REGION

GWP 4054-17-00

Submitted by:

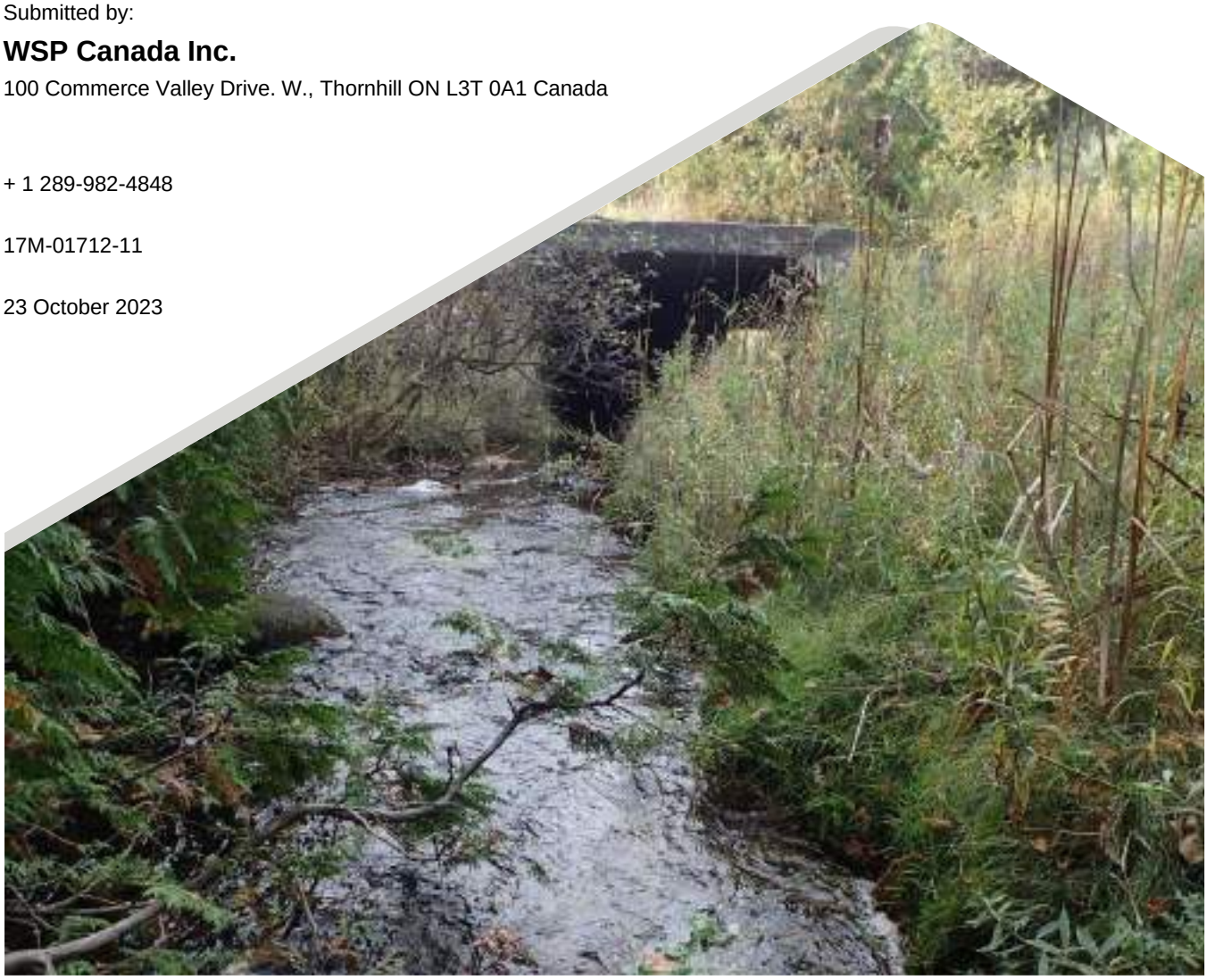
WSP Canada Inc.

100 Commerce Valley Drive. W., Thornhill ON L3T 0A1 Canada

+ 1 289-982-4848

17M-01712-11

23 October 2023



Distribution List

1 e-copy pdf: Ministry of Transportation

1 e-copy pdf: WSP Canada Inc.

October 23, 2023

Ministry of Transportation, Eastern Region
1355 John Counter Boulevard, Postal Bag 4000
Kingston, Ontario K7L 5A3

Attention: Ms. Amanda Dickson, Environmental Planner

Dear Ms. Dickson:

Subject: Draft Report Fish and Fish Habitat Existing Conditions and Preliminary Impact Assessment. Highway 401 Planning Study from Colborne to Brighton: Preliminary Design and Class Environmental Assessment Study
GWP 4015-E-0036

Please find attached this draft Fish and Fish Habitat Existing Conditions and Impact Assessment Report for your review.

Yours sincerely,

WSP CANADA Inc.

Kim LeBrun, HBSc
Senior Biologist/ Project Manager
Ecology and Environmental Impact Assessment

Leslie Keith, HBSc
Fisheries Ecologist
Ecology and Environmental Impact Assessment

cc. Christine Vazz

REVISION HISTORY

ISSUE/REVISION	FIRST ISSUE	REVISION 1	REVISION 2	REVISION 3
Remarks	Draft	Draft	Draft	Final
Date	November 27, 2020	May 03, 2023	July 18, 2023	October 23, 2023
Prepared by	Kim Mitchell	Leslie Keith	Leslie Keith	Leslie Keith
Signature	<DRAFT>	<DRAFT>	<DRAFT>	<FINAL>
Checked by	Jenny Enoae	Mark Pomeroy	Kim LeBrun	Kim LeBrun
Signature	<DRAFT>	<DRAFT>	<DRAFT>	<FINAL>
Authorised by	Christine Vazz	Christine Vazz	Christine Vazz	Christine Vazz
Signature	<DRAFT>	<DRAFT>	<DRAFT>	<FINAL>
Project number	17M-01712-11	17M-01712-11	17M-01712-11	17M-01712-11
Report number				
File reference				

CONTRIBUTORS

MINISTRY OF TRANSPORTATION – EASTERN REGION

Project Manager	Darren Cizmar
Environmental Planner	Amanda Dickson

WSP

Ecologist - Fisheries	Leslie Keith
Senior Biologist/ Project Manager	Kim LeBrun
Environmental Planner	Christine Vazz

Table of Contents

TABLES

FIGURES

APPENDICES

APPENDIX A
Photo Plates

APPENDIX B
Field Data Collection Forms

APPENDIX C
Correspondence

1.0 INTRODUCTION

The Ontario Ministry of Transportation (MTO) has retained WSP Canada Inc. (WSP) to undertake the Environmental Assessment and Preliminary Design for the replacement and rehabilitation of various structures along Highway 401 as well as establishing the future Highway 401 footprint for an interim six lanes and ultimate eight lane configuration to address current and future transportation needs, and commuter parking lot improvements. The study area extends from 0.8 km east of Percy Street to 0.4 km west of Christiani Road.

Structure rehabilitation is proposed at the three (3) following bridge structures:

- Herley Road Underpass (Site 21-294), located 1.65 km east of Percy Street, where Herley Road intersects with Highway 401; and
- Lake Road Underpass (Site 21-295), located 6.28 km east of Percy Street, where Lake Road intersects with Highway 401;
- County Road 26 Underpass (Site 21-297), located 4.94 km west of Christiani Road, where County Road 26 intersects with Highway 401;

And, at present, at the following four (4) structural culverts:

- 21-471, located 0.92 km east of the Lake Road and Highway 401 underpass;
- 21-472, located 1.46 km east of the Lake Road and Highway 401 underpass;
- 21-473, located 2.22 km east of the Lake Road and Highway 401 underpass;
- 21-474, located 3.07 km east of the Lake Road and Highway 401 underpass.

As part of the assignment, a Fish and Fish Habitat Existing Conditions Report (Existing Conditions Report) was prepared detailing the existing conditions of all watercourses / waterbodies within 30 m of Highway 401 within the current study area. In addition to the four (4) structural culverts identified above, there are eight (8) other watercourse crossings of Highway 401 and one waterbody within 30 m. Table 1 and Figure 1 below indicate the details regarding the location of the assessed water crossings, as well as the location of the proposed works within the study area. Constraint mapping has also been completed for the study area.

The purpose of the Existing Conditions Report is to use the fish habitat and fish community conditions collected through field data coupled with background data to provide fish and fish habitat sensitivities. The information presented in this report will be used as a basis for design considerations to be carried forward in the Fish and Fish Habitat Impact Assessment Report to be completed in Detail Design. The Existing Conditions Report has been conducted in accordance with the requirements of the MTO/DFO/MNRF Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings – Version 4 (2020) (Protocol) and the associated guidance provided in MTO's Interim Environmental Guide for Fisheries (2020) (Fish Guide).

Table 1: MTO Table Template D1: Location of Worktable

GWP	Waterbody ID	Culvert ID	Highway	Municipality	Location of watercourse (GPS Coordinates)
4054-17-00	Colborne Creek Tributary	C1	Highway 401	Township of Cramahe	44°2'13.41"N, 77°51'34.76"W
4054-17-00	Little Lake Tributary 1	C2	Highway 401	Township of Cramahe	44°2'40.56"N, 77°50'14.05"W
4054-17-00	Little Lake Tributary 2	C3 / 21-471	Highway 401	Township of Cramahe	44°3'11.4"N, 77°49'28.8"W
4054-17-00	Little Lake Tributary 3	n/a	Highway 401	Township of Cramahe	44°3'12.8"N, 77°49'19.5"W
4054-17-00	Biddy Creek Crossing 1	C4 / 21-472	Highway 401	Town of Brighton	44°3'19.13"N, 77°49'5.48"W
4054-17-00	Biddy Creek Crossing 2	C5 / 21-473	Highway 401	Town of Brighton	44°3'27.32"N, 77°48'34.14"W
4054-17-00	Biddy Creek Crossing 3	C6 / 21-474	Highway 401	Town of Brighton	44°3'36.88"N, 77°48'0.61"W
4054-17-00	Unknown watercourse	C7	Highway 401	Town of Brighton	44°3'39.39"N, 77°47'21.03"W
4054-17-00	Unknown watercourse within 30 m	n/a	Highway 401	Town of Brighton	44°3'49.8"N, 77°46'53.5"W
4054-17-00	Smithfield Creek Tributary	C9	Highway 401	Town of Brighton	44°5'12.38"N, 77°43'0.44"W
4054-17-00	Mayhew Creek Tributary 1	C10	Highway 401	Town of Brighton	44°6'1.73"N, 77°41'29.46"W
4054-17-00	Mayhew Creek Tributary 2	C11	Highway 401	Town of Brighton	44°6'4.79"N, 77°41'18.95"W
4054-17-00	Mayhew Creek Tributary 3	C12	Highway 401	Town of Brighton	44°6'05.2"N, 77°41'19.1"W
4054-17-00	Unknown Lake within 30 m	n/a	Highway 401	Town of Brighton	44°03'12.8"N, 77°49'19.5"W

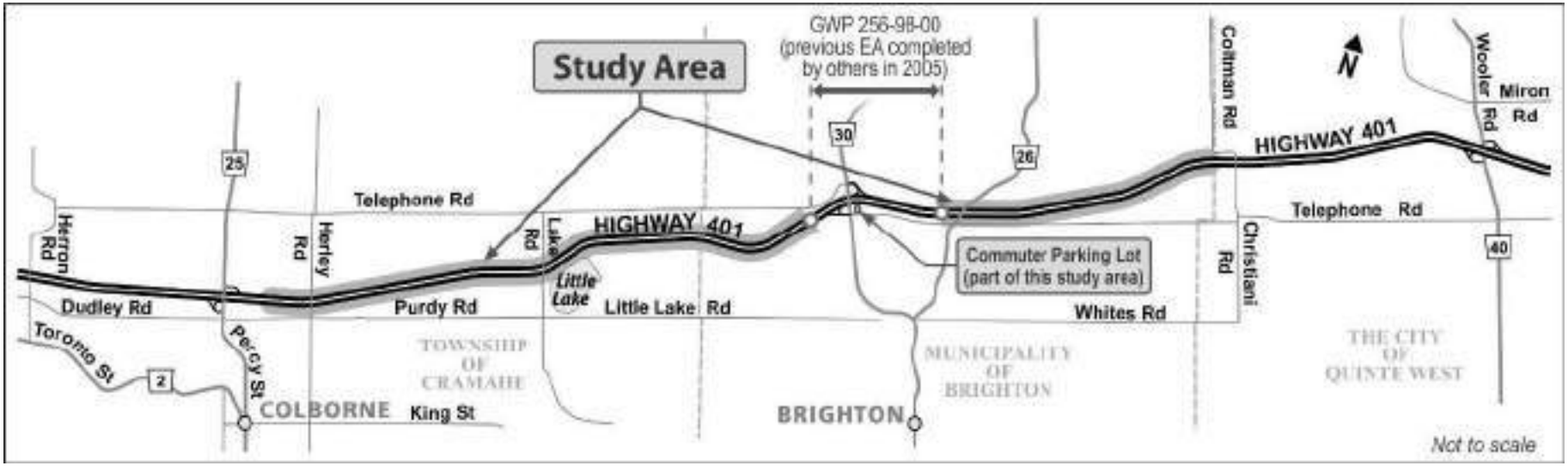


Figure 1: Key Map of Study Area

2.0 APPROACH

2.1 Background Data

Available information, including topographic maps, aerial photography, and Natural Resources Value Information System (NRVIS) and Natural Heritage Information Centre (NHIC) database information was compiled and reviewed. WSP contacted the MNRF – Peterborough District office in August of 2020 requesting information on the existing conditions and community composition for the watercourses occurring within the study area. Specifically, the information request included any available information related to fish and fish habitat, sensitive or specialized habitat functions, or known / potential for use of the area by aquatic Species at Risk (SAR). The MNRF was also asked to provide the thermal classification and the permissible in-water construction timing window for each of the watercourses within the study area.

Catherine Warren (MNRF – District Planner, pers. comm., Aug 20, 2020) identified twelve (12) watercourses and one waterbody within the study area. The twelve watercourses identified by MNRF support coldwater fish communities consisting of a variety of bait, forage, pan, sport, and predatory fish species. The one waterbody identified by the MNRF supports a warmwater fish community. Based on the MNRF recommendations, the permissible in-water construction timing window for all identified watercourses was assessed to be **Jul 1 to Sept 30** (no in-water work from Oct 1 - June 30) of any given year to protect the spring and fall spawning species. The permissible in-water construction timing window for the waterbody was assessed to be **Jul 1 to Mar 31** (no in-water work from Apr 1 to June 30) of any given year to protect the spring spawning species. Catherine Warren also provided an aquatic SAR review which indicated that there is one (1) potential record of aquatic SAR, Bridle Shiner (*Notropis bifrenatus*) (SARO status: SC, SARA status: SC) occurring in Colborne Creek. This species does not receive species or habitat protection under the Endangered Species Act (ESA) or Species at Risk Act (SARA). Fisheries and Oceans Canada (DFO), aquatic SAR mapping was assessed on November 11, 2020 and did not indicate any potential presence of federally listed SAR or critical habitat to be present in the study area. Monique Charette (MECP – Management Biologist, pers. comm., June 9, 2021) did not identify any additional aquatic species or SAR present within the study area.

All agency correspondence has been included in Appendix C.

2.1.1 Habitat

The collection of fish habitat information during the desktop review and field investigations encompassed the following parameters where information was available:

- stream channel dimensions, general gradient and profile
- bank / shoreline character (e.g., height and erosion)
- flow characteristics, including evidence of groundwater discharge
- morphology and substrates
- in-water cover opportunities (e.g., woody debris, undercut banks, boulders, vegetation)
- riparian vegetation
- presence of physical barriers to fish movement

- presence of potential critical or specialized habitat areas including potential spawning areas, good nursery cover, holding habitat (e.g., deeper refuge pools)
- disturbances and past habitat alterations (e.g., channelization, potential pollutant point sources)
- potential habitat enhancement opportunities.

2.1.2 Fish / Mussel Community

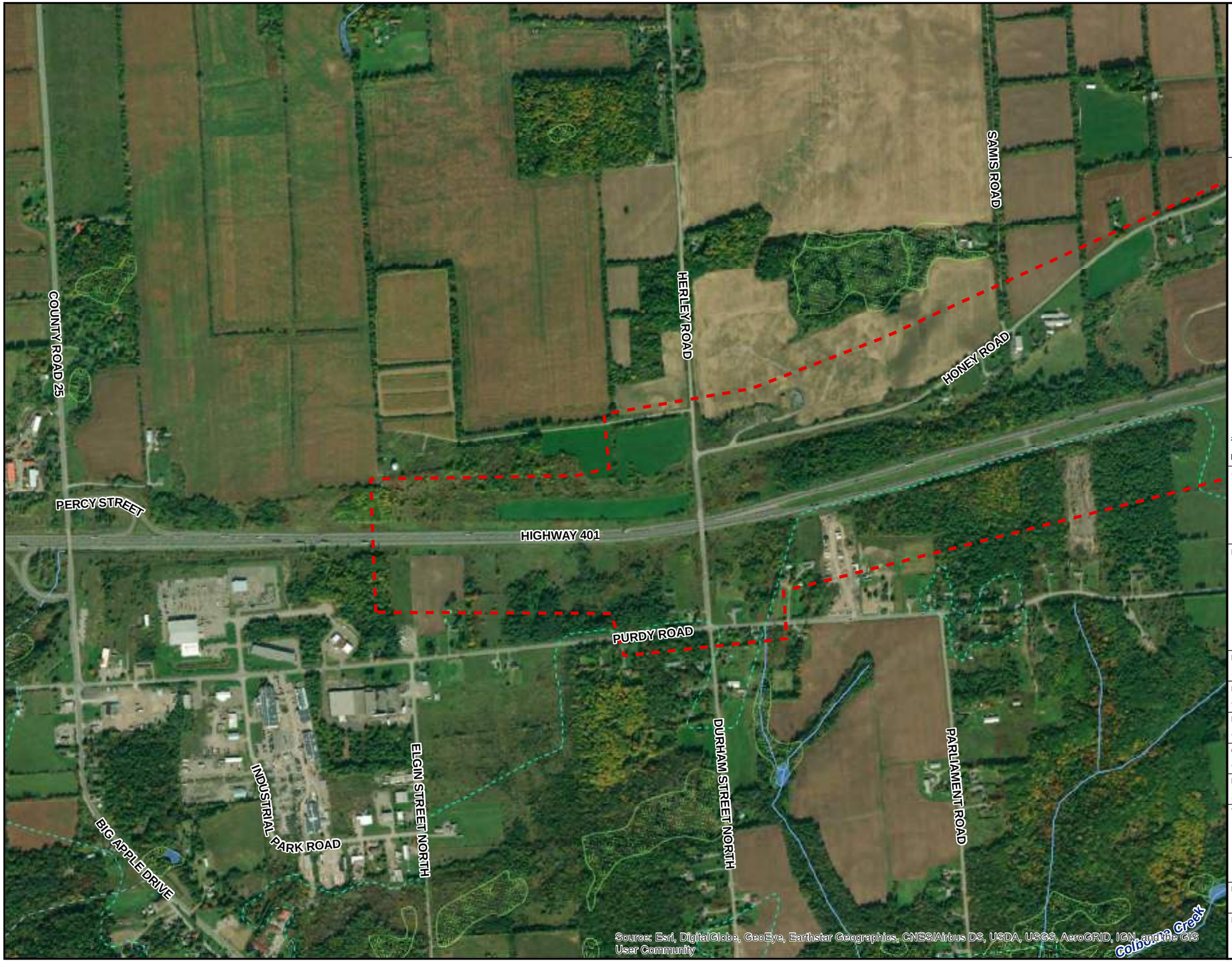
The background information provided by MNRF through agency correspondence included a detailed list of fish species present within the study area. Methods to collect fish included electrofishing and dip netting under MNRF Licence #1096716 issued on September 17, 2020. Due to the timing of field investigations occurring in the Fall, sites were reviewed visually for evidence of spawning fish and active redds prior to entering the watercourse.

Fish community for the watercourses was provided by the MNRF and supplemented with WSP's fish community surveys; refer to Table 3 in Section 3 below.

2.2 Field Investigations

Field investigations and fish community surveys were conducted by WSP Ecologists from October 14, 2020 to October 16, 2020. The field investigations were conducted in accordance with "Section 4 – Field Investigations" of MTO's Fish Guide (2020). Several watercourses was revisited in Spring 2021 to capture spring flows and determine seasonal habitat for fish.

The sites were mapped on a 1:10,000 scale air photo base and presented on a mapping plate in Figure 2. Representative photographs are provided in Appendix A, and additional photographs are on file at WSP.



126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

Legend

- Study Area
- Intermittent Watercourse (coldwater)
- Permanent Watercourse (coldwater)
- Natural Heritage System Area (LIO)
- Unevaluated Wetland (LIO)

N
W E
S

250 125 0 250 Metres

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

CLIENT:

ONTARIO MINISTRY OF TRANSPORTATION

PROJECT:

HIGHWAY 401
COLBORNE TO BRIGHTON

PROJECT NO:	DATE:
17M-01712-11	November 2020

DESIGNED BY:
-

DRAWN BY:
-

CHECKED BY:
-

FIGURE NO:	SCALE:
2	1:10,000

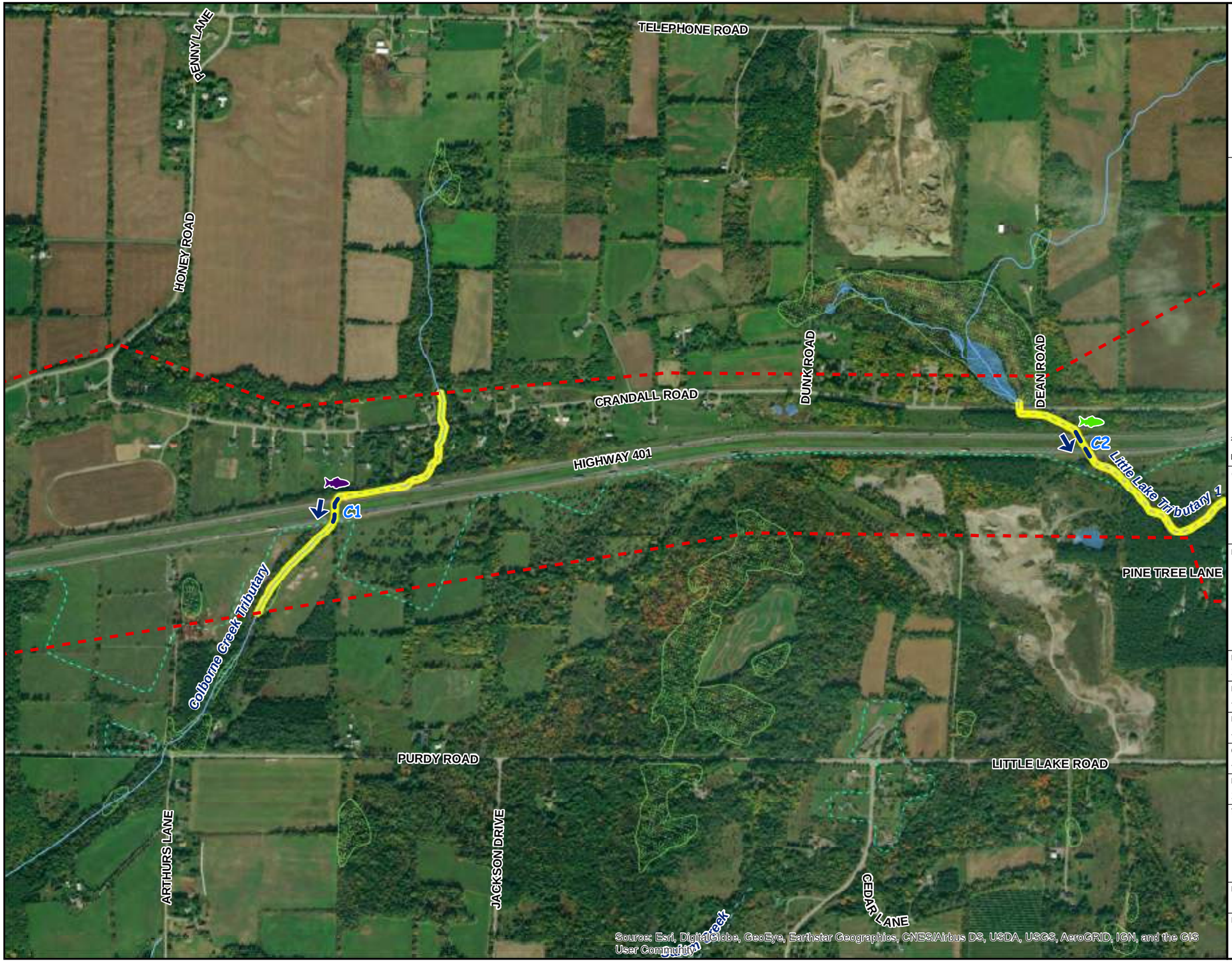
TITLE:

FIGURE 2
FISH AND FISH HABITAT
CONSTRAINT MAPPING

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: L:\Projects\2017\01712_11_Hwy401ColborneToBrighton\MXDs\01712_11_Hwy401ColborneToBrighton_AquaticFeatures_202011.mxd



126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

Legend

- Flow Direction
- Culvert
- Study Area

Fish Habitat

- Indirect Fish Habitat
- Seasonally Direct Fish Habitat

Reach Sensitivity

- Low Sensitivity
- Intermittent Watercourse (coldwater)
- Permanent Watercourse (coldwater)
- Natural Heritage System Area (LIO)
- Unevaluated Wetland (LIO)

N W E S

250 125 0 250 Metres

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

CLIENT:
ONTARIO MINISTRY OF TRANSPORTATION

PROJECT:
HIGHWAY 401
COLBORNE TO BRIGHTON

PROJECT NO:	DATE:
17M-01712-11	November 2020

DESIGNED BY: -

DRAWN BY: -

CHECKED BY: -

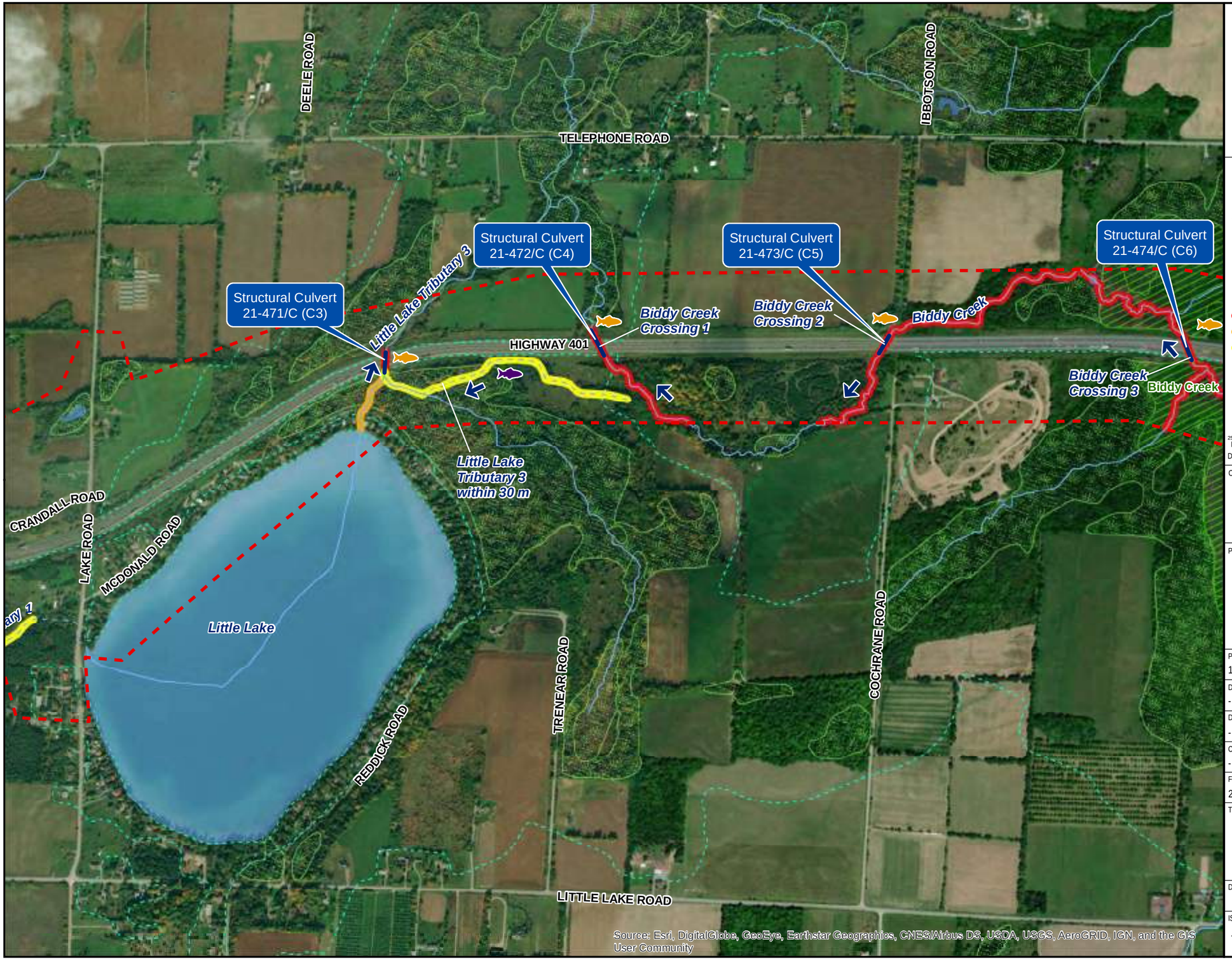
FIGURE NO:	SCALE:
2	1:10,000

TITLE:
FISH AND FISH HABITAT
CONSTRAINT MAPPING

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: L:\Projects\2017\01712_11_Hwy401ColborneToBrighton\MXDs\01712_11_Hwy401ColborneToBrighton_AquaticFeatures_202011.mxd



126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

Legend

- Flow Direction
- Culvert
- Study Area

Fish Habitat

- Direct Fish Habitat (confirmed)
- Indirect Fish Habitat

Reach Sensitivity

- High Sensitivity
- Moderate Sensitivity
- Low Sensitivity
- Permanent Watercourse (coldwater)
- Natural Heritage System Area (LIO)
- Evaluated Wetland (LIO)
- Unevaluated Wetland (LIO)

250 125 0 250 Metres

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

CLIENT:
ONTARIO MINISTRY OF TRANSPORTATION

PROJECT:
HIGHWAY 401
COLBORNE TO BRIGHTON

PROJECT NO:	DATE:
17M-01712-11	November 2020

DESIGNED BY: -

DRAWN BY: -

CHECKED BY: -

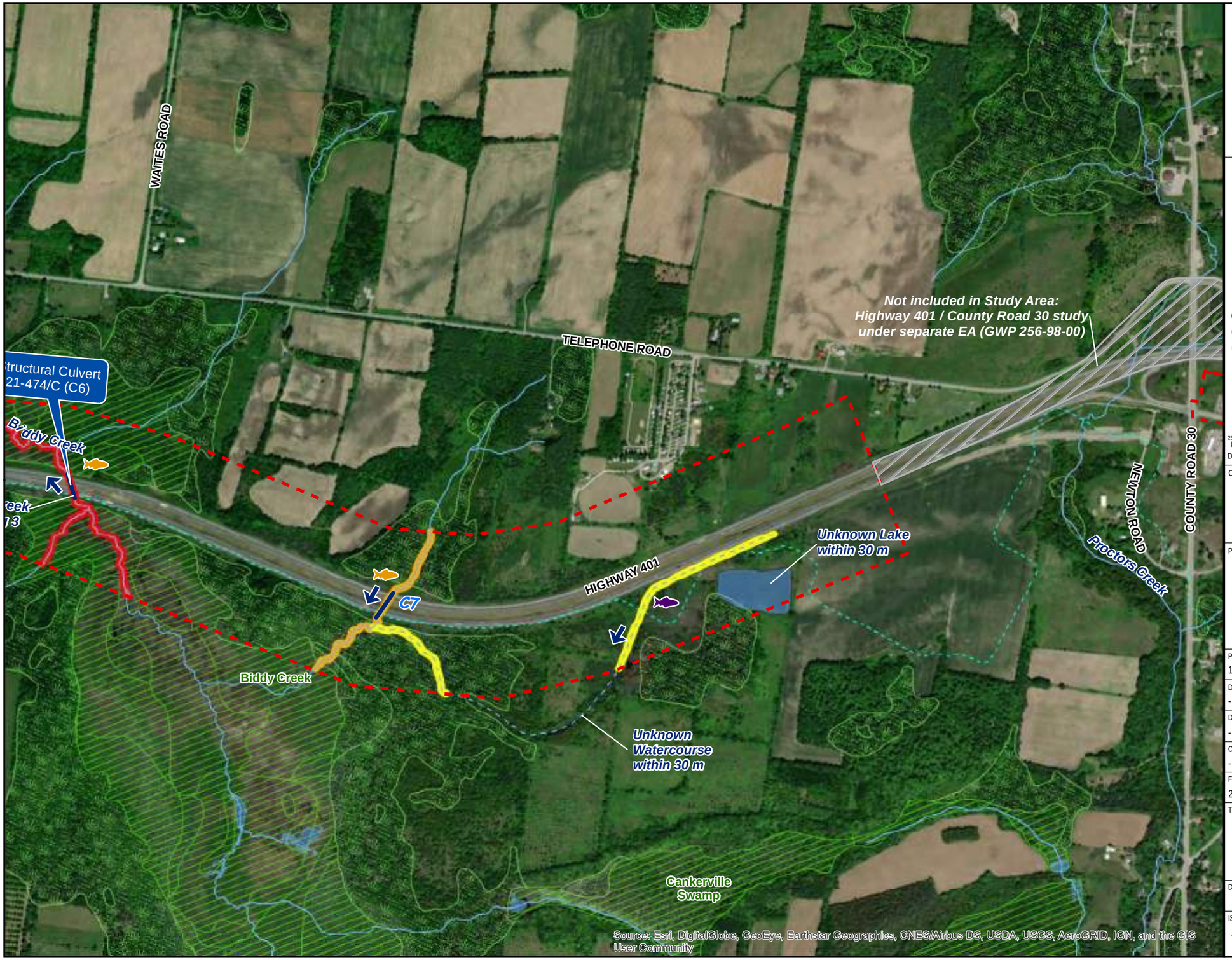
FIGURE NO:	SCALE:
2	1:10,000

TITLE:
FISH AND FISH HABITAT CONSTRAINT MAPPING

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: L:\Projects\2017\01712_11_Hwy401ColborneToBrighton\MXDs\01712_11_Hwy401ColborneToBrighton_AquaticFeatures_202011.mxd



126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

Legend

- Flow Direction
- Culvert
- Study Area

Fish Habitat

- Direct Fish Habitat (confirmed)
- Indirect Fish Habitat

Reach Sensitivity

- High Sensitivity
- Moderate Sensitivity
- Low Sensitivity
- Permanent Watercourse (coldwater)
- Natural Heritage System Area (LIO)
- Evaluated Wetland (LIO)
- Unevaluated Wetland (LIO)

250 125 0 250 Metres

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

CLIENT:
ONTARIO MINISTRY OF TRANSPORTATION

PROJECT:
HIGHWAY 401
COLBORNE TO BRIGHTON

PROJECT NO:	DATE:
17M-01712-11	November 2020

DESIGNED BY: -

DRAWN BY: -

CHECKED BY: -

FIGURE NO:	SCALE:
2	1:10,000

TITLE:
FISH AND FISH HABITAT
CONSTRAINT MAPPING

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: L:\Projects\2017\01712_11_Hwy401ColborneToBrighton\MXDs\01712_11_Hwy401ColborneToBrighton_AquaticFeatures_202011.mxd

126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

Legend

- Flow Direction
- Culvert
- Study Area

Fish Habitat

- Indirect Fish Habitat

Reach Sensitivity

- Low Sensitivity
- Area of Natural and Scientific Interest (LIO)
- Permanent Watercourse (coldwater)
- Natural Heritage System Area (LIO)
- Provincially Significant Wetland (LIO)
- Unevaluated Wetland (LIO)

250 125 0 250 Metres

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

CLIENT:
ONTARIO MINISTRY OF TRANSPORTATION

PROJECT:
HIGHWAY 401
COLBORNE TO BRIGHTON

PROJECT NO:	DATE:
17M-01712-11	November 2020

DESIGNED BY: -

DRAWN BY: -

CHECKED BY: -

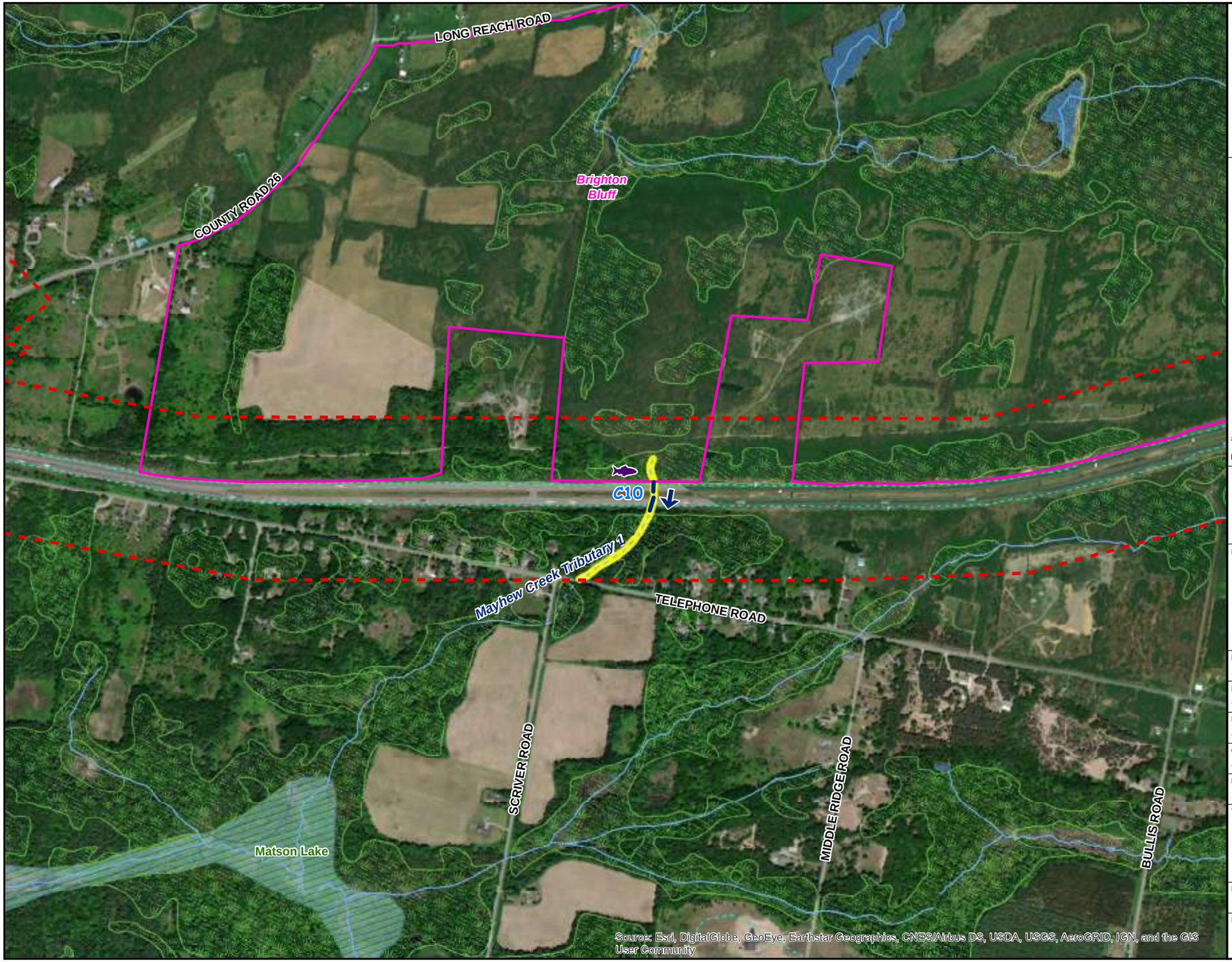
FIGURE NO:	SCALE:
2	1:10,000

TITLE:
FISH AND FISH HABITAT
CONSTRAINT MAPPING

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: L:\Projects\2017\01712_11_Hwy401ColborneToBrighton\MXDs\01712_11_Hwy401ColborneToBrighton_AquaticFeatures_202011.mxd



126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

Legend

- Flow Direction
- Culvert
- Study Area

Fish Habitat

- Indirect Fish Habitat

Reach Sensitivity

- Low Sensitivity
- Area of Natural and Scientific Interest (LIO)
- Permanent Watercourse (coldwater)
- Natural Heritage System Area (LIO)
- Provincially Significant Wetland (LIO)
- Unevaluated Wetland (LIO)

250 125 0 250 Metres

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

CLIENT:
ONTARIO MINISTRY OF TRANSPORTATION

PROJECT:
HIGHWAY 401
COLBORNE TO BRIGHTON

PROJECT NO:	DATE:
17M-01712-11	November 2020

DESIGNED BY: -

DRAWN BY: -

CHECKED BY: -

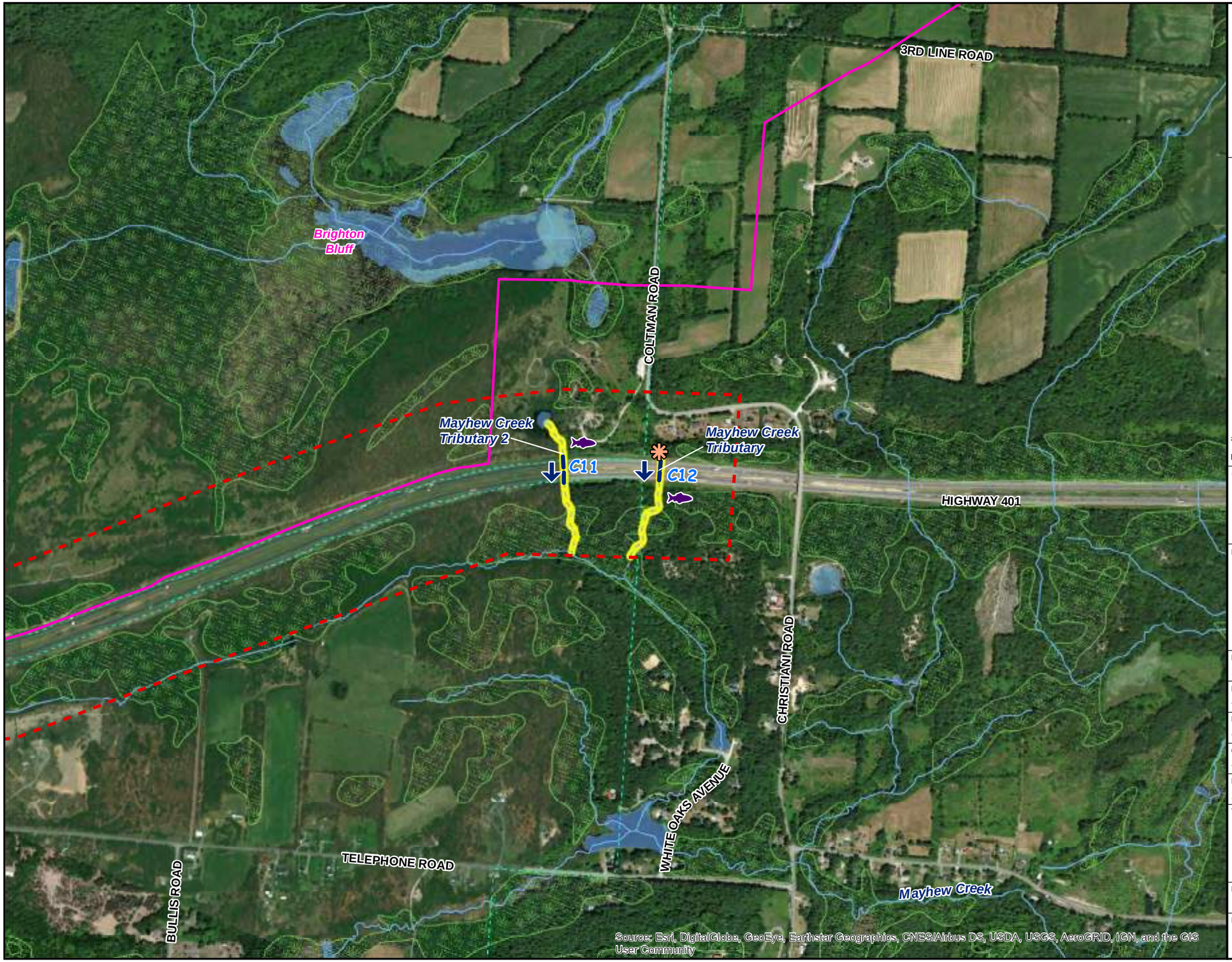
FIGURE NO:	SCALE:
2	1:10,000

TITLE:
FISH AND FISH HABITAT
CONSTRAINT MAPPING

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: L:\Projects\2017\01712_11_Hwy401ColborneToBrighton\MXDs\01712_11_Hwy401ColborneToBrighton_AquaticFeatures_202011.mxd



126 DON HILLOCK DRIVE, UNIT 2
AURORA, ONTARIO CANADA L4G 0G9
TEL.: 905-750-3080 | FAX: 905-727-0463 | WWW.WSP.COM

Legend

- Catch Basin
- Flow Direction
- Culvert
- Study Area

Fish Habitat

- Indirect Fish Habitat

Reach Sensitivity

- Low Sensitivity
- Area of Natural and Scientific Interest (LIO)
- Permanent Watercourse (coldwater)
- Natural Heritage System Area (LIO)
- Unevaluated Wetland (LIO)

N W E S

250 125 0 250 Metres

Data Source: Ministry of Natural Resources, Ontario Base Mapping, October 2016.

CLIENT:
ONTARIO MINISTRY OF TRANSPORTATION

PROJECT:
HIGHWAY 401
COLBORNE TO BRIGHTON

PROJECT NO:	DATE:
17M-01712-11	November 2020

DESIGNED BY: -

DRAWN BY: -

CHECKED BY: -

FIGURE NO:	SCALE:
2	1:10,000

TITLE:
FISH AND FISH HABITAT CONSTRAINT MAPPING

DISCIPLINE:
ENVIRONMENT

ISSUE:	REV.:
-	-

Document Path: L:\Projects\2017\01712_11_Hwy401ColborneToBrighton\MXDs\01712_11_Hwy401ColborneToBrighton_AquaticFeatures_202011.mxd

3.0 EXISTING FISH AND FISH HABITAT

This section of the report provides an overview of the existing fish and fish habitat conditions of the twelve (12) watercourse crossings of Highway 401 and one (1) waterbody located within the study area as reviewed from detailed field investigations in 2020. The watercourses are described in detail below and are followed by a description of the fish community present. The watercourses are ordered from west to east. Each watercourse crossing has been described below in one (1) Right-of-Way (ROW) reach. Permissions to Enter were not granted for properties up and downstream of the ROW.

3.1 Colborne Creek Tributary (C1)

The assessed reach of Colborne Creek Tributary conveys an intermittent surficial flow regime with a coldwater thermal regime. Headwater surficial flows are conveyed from the adjacent agricultural lands 100 m north of Highway 401 into the study area and eventually flow south into Lake Ontario. The watercourse conveys flow from the north side of Highway 401 to the south through one box concrete culvert with a span of 1.3 m and a rise of 1.3 m crossing the westbound lanes and one box culvert with a span of 1.5 m and a rise of 1.5 m crossing the eastbound lanes with an open median. The culverts may undergo rehabilitation / replacement to accommodate the widening of Highway 401 through the site.

ROW

As the watercourse enters the highway ROW, flow is conveyed within a distinct channel with defined banks. The aquatic habitat consists of dry channel (100%) with no flow at the time of survey. The reach likely has flow earlier in the year. The dry channel has a mean bankfull width of 1.9 m and a mean bankfull depth of 0.3 m. Substrate consists of sand (40%), gravel (40%), clay (10%) and cobble (10%). The left and right upstream banks have a height of 1.4 m. The banks were straightened within the ROW, had a gradual slope and were stable. Instream cover consists of instream vascular macrophytes (20%) and overhanging macrophytes (40%). Vegetation consisted of primarily grasses and meadow species. Riparian trees and shrubs were present upstream and downstream of the highway crossing, providing moderate shading to the watercourse. The median had no cover. The culvert crossing the westbound lanes was perched by 0.5 m at the outlet. Downstream of the ROW, the channel becomes undefined and densely vegetated. The lack of flow, lack of a defined channel downstream of the highway and the drop within the median likely creates barriers to fish movement within the assessed reach.

3.1.1 Fish Community

Fish community sampling was not performed at this crossing due to lack of water at the time of survey. Based on the habitat and flow regime present, the reach at C1 has been assessed to function as indirect fish habitat to mainstem Colborne Creek.

Approximately 1 km downstream of the highway, the fish community data indicates that mainstem Colborne Creek supports a fish community consisting of bait, forage and predatory fish species that include sensitive species: American Brook Lamprey (*Lethenteron appendix*), Bridle Shiner, Mottled Sculpin (*Cottus bairdii*)); and salmonid species: Brook Trout (*Salvelinus fontinalis*), Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*Oncorhynchus kisutch*), and Rainbow Trout (*Oncorhynchus mykiss*).

Given the fish community present downstream and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for Colborne Creek Tributary is from **July 1 to September 30** (no in-water works from October 1 to June 30) of any given year to protect the spring and

fall spawning species downstream. Based on the results of the field investigation and the available secondary source information, WSP classifies this watercourse within the study area as low sensitivity.

3.2 Little Lake Tributary 1 (C2)

The assessed reach of Little Lake Tributary 1 conveys an intermittent surficial flow regime with a coldwater thermal regime. Surficial flows are conveyed from an open pond wetland approximately 180 m northeast of the crossing and outlets into Little Lake 660 m downstream of the highway crossing. Little Lake is a kettle lake, a shallow sediment-filled body of water, formed by glacial action. The watercourse conveys flow north to south under Highway 401 through two concrete box culverts with a span of 2.0 m and a rise of 1.0 m and an open median. The culverts may undergo rehabilitation / replacement to accommodate the widening of Highway 401 through the site.

ROW

As the watercourse enters the highway ROW, flow is conveyed within a distinct channel with defined banks both upstream and downstream of the crossing. The aquatic habitat consists of dry channel (100%) with no flow at the time of survey. There was stagnant water inside both culverts. The reach likely has flow earlier in the year. The dry channel has a mean bankfull width of 1.2 m and a mean bankfull depth of 0.3 m. Substrate consists of clay (55%), sand (35%) and gravel (10%). The left and right upstream banks have a height of 0.6 m. The banks were natural, had a gradual slope and were stable. Instream cover consists of cobble (10%), overhanging woody debris (10%), instream vascular macrophytes (10%) and overhanging macrophytes (30%). Vegetation consists of primarily grasses and shrubs. Riparian trees and shrubs were present providing shade upstream and downstream of the crossing. The median had no cover. No permanent barriers to fish passage were evident, however low flow / dry conditions create a seasonal barrier.

3.2.1 Fish Community

Fish community sampling was not performed at this crossing due to lack of water at the time of the 2020 survey. A spring 2021 field investigation confirmed that based on the habitat and flow regime present, the reach at C2 has been assessed to function as seasonally direct fish habitat.

The background fish community data indicates that Little Lake Tributary 1 has the potential to support a fish community consisting of bait, forage and predatory fish species that are tolerant habitat generalists, with the exception of potential sensitive species such as Mottled Sculpin and migratory species: Brook Trout and Brown Trout (*Salmo trutta*). However, the conditions at the crossing are unlikely to support habitat for migration or spawning of salmonids (i.e. lack of flow, lack of substrate suitable for redds).

Given the fish community present downstream and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for Little Lake Tributary 1 is from **July 1 to September 30** (no in-water works from October 1 to June 30) of any given year to protect the spring and fall spawning species. Based on the results of the field investigation and the available secondary source information, WSP classifies this watercourse within the study area as low sensitivity.

3.3 Little Lake Tributary 2 (C3 / 21-471)

The assessed reach of Little Lake Tributary 2 conveys a permanent surficial flow regime with a coldwater thermal regime. Surficial flows are conveyed from Little Lake 170 m south of the crossing and outlets into Biddy Creek 580 m north of the highway crossing. The watercourse conveys flow south to north under

Highway 401 through a concrete box culvert with a span of 4.3 m and a rise of 1.9 m. The culvert may undergo rehabilitation / replacement to accommodate the widening of Highway 401 through the site.

ROW

As the watercourse enters the highway ROW, flow is conveyed within a distinct channel with defined banks. Flow with moderate velocity was conveyed under Highway 401 from the south to the north. The aquatic habitat consists of runs (60%) and flats (40%). Run sections have a mean wetted width of 3.0 m, a mean wetted depth of 0.1 m, a mean bankfull width of 7.0 m and a mean bankfull depth of 0.2 m. Substrate consists of silt (60%), sand (20%) and clay (20%). Flat sections have a mean wetted width of 1.3 m, a mean wetted depth of 0.2 m, a mean bankfull width of 3.0 m and a mean bankfull depth of 0.4 m. Substrate consists of silt (40%), clay (30%), sand (20%) and gravel (10%). The left upstream bank had a height of 0.9 m and the right upstream bank had a height of 0.7 m. The banks were natural, had a gradual slope and were stable. Instream cover consists of instream vascular macrophytes (30%) and overhanging macrophytes (40%). Vegetation consists of cattails (*Typha* sp.) and common reed (*Phragmites australis*). Riparian trees and shrubs were present providing shade. No permanent barriers to fish passage were evident. Evidence of groundwater upwelling was observed at the outlet of the culvert (moderate amounts of watercress).

3.3.1 Fish Community

Based on the habitat and flow regime present, the reach at C3 has been assessed to function as direct fish habitat. Presence of fish was confirmed during Fall surveys.

The fish community data indicates that Little Lake Tributary 2 supports a fish community consisting of bait, forage and predatory fish species that include potential sensitive species such as Mottled Sculpin and migratory species: Brown Trout and Brook Trout (juveniles) were collected during Fall surveys, confirming migratory and nursery / foraging habitat. However, the conditions directly within the ROW are unlikely to support habitat for spawning (i.e. fine substrates that are unsuitable for redds). There may be more suitable habitat for redds downstream of the crossing.

Given the fish community present downstream and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for Little Lake Tributary 2 is from **July 1 to September 30** (no in-water works from October 1 to June 30) of any given year to protect the spring and fall spawning species. Based on the results of the field investigation and the available secondary source information, WSP classifies the upstream reach of this watercourse within the study area as moderate sensitivity and the downstream reach as high sensitivity.

3.4 Little Lake Tributary 3 within 30 m of row

The assessed reach of Little Lake Tributary 3 conveys an ephemeral surficial flow regime with a coldwater thermal regime. Approximately 130 m of the feature was assessed visually just outside the ROW of the highway. Surficial flows are conveyed from seepage along the ROW of Highway 401. The watercourse conveys flow east to west through a wetland feature parallel to and on the south side of the highway before discharging into Little Lake Tributary 2 immediately downstream of the culvert outlet.

Instream cover consists of instream vascular macrophytes (70%) and overhanging macrophytes (20%). Vegetation consists of cattails and common reed. Given the dense vegetation, the substrates consist primarily of organic / muck substrate. Dense vegetation, undefined channel bed, and a lack of flow acts as a permanent barrier to fish passage.

3.4.1 Fish Community

Fish community sampling was not performed at this watercourse due to lack of water at the time of survey. Based on the habitat and flow regime present, the reach at Little Lake Tributary 3 has been assessed to function as indirect fish habitat.

Given the fish community present downstream in Little Lake Tributary 2 and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for Little Lake Tributary 3 is from **July 1 to September 30** (no in-water works from October 1 to June 30) of any given year to protect the spring and fall spawning species. Based on the results of the field investigation and the available secondary source information, WSP classifies this watercourse within the study area as low sensitivity.

3.5 Biddy Creek Crossing 1 (C4 / 21-472)

The assessed reaches of Biddy Creek convey a permanent surficial flow regime with a coldwater thermal regime. Surficial flows originate from the Cankerville Swamp (Provincially Significant Wetland) 2 km southeast of crossing C6, eventually outletting into the Trent River. Biddy Creek is a highly sinuous watercourse that meanders across Highway 401 three times from east to west. The channel morphological characteristics are mostly consistent between the three crossings, with C6 having more open wetland than C4 and C5. At C4, the watercourse conveys flow south to north with a skewed alignment under Highway 401: a concrete box culvert with a span of 4.2 m and a rise of 2.3 m. The culvert may undergo rehabilitation / replacement to accommodate the widening of Highway 401 through the site.

ROW

As the watercourse enters the highway ROW, flow is conveyed within a distinct channel with defined banks. Flow with moderate velocity was conveyed under Highway 401 from the south to the north. The aquatic habitat consists of runs (70%), riffles (20%) and pools (10%). Run sections have a mean wetted width of 3.4 m, a mean wetted depth of 0.2 m, a mean bankfull width of 3.5 m and a mean bankfull depth of 0.5 m. Substrate consists of cobble (40%), sand (35%), gravel (12%) and boulder (13%). Riffle sections have a mean wetted width of 3.5 m, a mean wetted depth of 0.1 m, a mean bankfull width of 4.0 m and a mean bankfull depth of 0.5 m. Substrate consists of sand (30%), gravel (30%), cobble (20%) and boulder (20%). Pool sections have a mean wetted width of 2.3 m, a mean wetted depth of 0.3 m, a mean bankfull width of 2.4 m and a mean bankfull depth of 0.5 m. Substrate consists of sand (40%), cobble (40%), boulder (10%) and silt (10%). The left upstream bank had a height of 0.9 m and the right upstream bank had a height of 5.0 m. The banks were natural, had a steep slope and were stable with minor erosion. Instream cover consists of overhanging macrophytes (30%), cobble (20%), boulders (10%), instream woody debris (10%), overhanging woody debris (10%) and undercut banks (5%). Vegetation consisted of cattails and riparian trees [Eastern Red Cedar (*Juniperus virginiana*) and mixed deciduous trees]. There was abundant forest cover. No permanent barriers to fish passage were evident. Evidence of groundwater upwelling was observed at the inlet of the culvert (moderate amounts of watercress, low amounts of iron staining).

3.5.1 Fish Community: C4, C5 and C6

The fish community of Biddy Creek at crossings C4, C5 and C6 are the same. No permanent barriers to fish passage were evident. Based on the habitat and flow regime present, the reaches at C4, C5 and C6 have been assessed to function as direct fish habitat. Presence of fish was confirmed during Fall surveys.

The fish community data indicates that Biddy Creek supports a fish community consisting of bait, forage and predatory fish species that include sensitive species such as Mottled Sculpin and migratory species: Brook Trout and Brown Trout. Brook Trout (juveniles) were collected during Fall surveys, confirming spawning and migratory habitat. The rocky substrates are suitable for potential redds.

Given the fish community present downstream and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for Biddy Creek is from **July 1 to September 30** (no in-water works from October 1 to June 30) of any given year to protect the spring and fall spawning species. Based on the results of the field investigation and the available secondary source information, WSP classifies this watercourse within the study area as high sensitivity.

3.6 Biddy Creek Crossing 2 (C5 / 21-473)

At C5, the watercourse is skewed across the highway and conveys flow north to south through a concrete box culvert with a span of 4.3 m and a rise of 1.9 m. The culvert may undergo rehabilitation / replacement to accommodate the widening of Highway 401 through the site.

ROW

As the watercourse enters the highway ROW, flow is conveyed around a steep bend within a distinct channel with defined banks. Flow with moderate velocity was conveyed under Highway 401 from the north to the south. The aquatic habitat consists of runs (40%), flats (40%) and riffles (20%). Run sections have a mean wetted width of 1.9 m, a mean wetted depth of 0.3 m, a mean bankfull width of 2.3 m and a mean bankfull depth of 0.5 m. Substrate consists of cobble (40%), sand (30%) and gravel (30%). Flat sections have a mean wetted width of 2.0 m, a mean wetted depth of 0.3 m, a mean bankfull width of 4.0 m and a mean bankfull depth of 0.5 m. Substrate consists of sand (50%) and gravel (50%). Riffle sections have a mean wetted width of 3.2 m, a mean wetted depth of 0.1 m, a mean bankfull width of 3.8 m and a mean bankfull depth of 0.4 m. Substrate consists of cobble (50%) and gravel (50%). The left upstream bank had a height of 5.7 m (due to the steep bend) and the right upstream bank had a height of 0.5 m. The banks were natural, had a steep slope and were stable with minor erosion. Instream cover consists of overhanging woody debris (20%), instream woody debris (10%), cobble (15%), undercut banks (5%) and overhanging vascular macrophytes (10%). Vegetation consisted of cattails and riparian trees (Eastern Red Cedar and mixed deciduous trees). There was abundant forest cover. No permanent barriers to fish passage were evident. Evidence of groundwater upwelling was observed at the inlet of the culvert (low amounts of watercress, low amounts of iron staining).

3.7 Biddy Creek Crossing 3 (C6 / 21-474)

The watercourse conveys flow south to north under Highway 401 with a skew through a concrete box culvert with a span of 4.3 m and a rise of 2.0 m. The culvert may undergo rehabilitation / replacement to accommodate the widening of Highway 401 through the site.

ROW

As the watercourse enters the highway ROW, flow is conveyed within a distinct channel with defined banks. Flow with moderate velocity was conveyed under Highway 401 from the south to the north. The aquatic habitat consists of flats (100%). Flat sections have a mean wetted width of 4.2 m, a mean wetted depth of 1.3 m, a mean bankfull width of 6.6 m and a mean bankfull depth of 1.6 m. Substrate consists of muck (40%), sand (25%), gravel (25%) and cobble (10%). The left and right upstream banks had a height of 2.0 m. The banks were natural, had a gradual slope and were stable with no erosion. Instream cover

consists of overhanging vascular macrophytes (40%) and instream vascular macrophytes (30%). Vegetation consisted of cattails, watercress (*Nasturtium officinale*) and duckweed (*Lemna* sp.). There was no forest cover. No permanent barriers to fish passage were evident. Evidence of groundwater upwelling was observed (large amounts of watercress).

3.8 Unknown Watercourse (C7)

The assessed reach of the unknown watercourse crossing C7 conveys a permanent surficial flow regime with a coldwater thermal regime. Surficial flows are conveyed from headwaters 700 m north of the crossing, eventually outletting into Biddy Creek 500 m downstream of the crossing. The watercourse conveys flow north to south under Highway 401 through a CSP culvert with a span of 1.4 m and a rise of 1.0 m. The culvert may undergo rehabilitation / replacement to accommodate the widening of Highway 401 through the site.

ROW

As the watercourse enters the highway ROW, flow is conveyed within a distinct channel with defined banks. Flow with low velocity was conveyed under Highway 401 from the north to the south. The aquatic habitat consists of runs (100%). Run sections have a mean wetted width of 1.2 m, a mean wetted depth of 0.1 m, a mean bankfull width of 2.0 m and a mean bankfull depth of 0.3 m. Substrate consists of cobble (50%), gravel (20%), sand (15%) and clay (15%). The left upstream bank had a height of 0.8 m and the right upstream bank had a height of 1.7 m. The banks were natural, had a gradual slope and were stable with no erosion. Instream cover consists of overhanging vascular macrophytes (30%) and instream vascular macrophytes (30%). Vegetation consisted of cattails and grasses. Riparian trees and shrubs provided some cover. No permanent barriers to fish passage were evident. Evidence of groundwater upwelling was observed (iron staining, oily sheen, watercress).

3.8.1 Fish Community

Based on the habitat and flow regime present, the reach at C7 has been assessed to function as direct fish habitat. Presence of fish was confirmed during Fall surveys.

The fish community data indicates that the unknown watercourse supports a fish community consisting of bait, forage and predatory fish species that are primarily tolerant habitat generalists. The assessed reach is unlikely to support sensitive or migratory salmon and trout due to the very low levels of flow and small size of the watercourse; however, these sensitive species may be present downstream near the confluence of the watercourse with Biddy Creek located approximately 500 m downstream.

Given the fish community present and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for the unknown watercourse is from **July 1 to September 30** (no in-water works from October 1 to June 30) of any given year to protect the spring and fall spawning species. Based on the results of the field investigation and the available secondary source information, WSP classifies this watercourse within the study area as moderate sensitivity.

3.9 Unknown Watercourse within 30 m of ROW

The assessed reach of the unknown watercourse within 30 m of the ROW of Highway 401 conveys an intermittent surficial flow regime with a coldwater thermal regime. Surficial flows begin from ditch flow parallel to the highway on the south side, eventually outletting into Biddy Creek 1.8 km downstream of the highway. The watercourse conveys southwesterly flow.

ROW

As the watercourse flows along the highway ROW, flow is conveyed within a distinct channel with defined banks. The aquatic habitat consists of stagnant water (100%). Stagnant sections have a mean wetted width of 0.8 m, a mean wetted depth of 0.1 m, a mean bankfull width of 1.0 m and a mean bankfull depth of 0.2 m. Substrate consists of muck (100%). The left and right upstream banks had a height of 1.0 m. The banks were manmade and straightened, had a gradual slope and were stable with no erosion. Instream cover consists of overhanging vascular macrophytes (40%) and instream vascular macrophytes (40%). Vegetation consisted of cattails. Riparian trees and shrubs provided some cover. Dense vegetation and a lack of flow creates a permanent and season barrier to fish passage.

3.9.1 Fish Community

Fish community sampling was performed at this watercourse; however, no fish were caught. Based on the habitat and flow regime present, the reach at unknown watercourse has been assessed to function as indirect fish habitat.

Given the fish community present downstream in Biddy Creek and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for the unknown watercourse is from **July 1 to September 30** (no in-water works from October 1 to June 30) of any given year to protect the spring and fall spawning species. Based on the results of the field investigation and the available secondary source information, WSP classifies this watercourse within the study area as low sensitivity.

3.10 Unknown Lake within 30 m of ROW

WSP Ecologists were unable to assess the lake during Fall surveys due to lack of property access. Aerial observations determine the width of the lake to be 100 m and the length to be 190 m. The land use surrounding the lake is agricultural and woodland. The lake has a warmwater thermal regime.

3.10.1 Fish Community

Fish community sampling was not performed due to lack of property access. Based on the background data, the lake is determined to be direct fish habitat for bait, forage and predatory fish species that are primarily tolerant habitat generalists, except for sensitive species such as Brown Trout.

Given the fish community present in the unknown lake and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for the unknown lake is from **July 1 to March 31** (no in-water works from April 1 to June 30) of any given year to protect the spring spawning species.

3.11 Smithfield Creek Tributary (C9)

The assessed reach of Smithfield Creek Tributary conveys an intermittent surficial flow regime with a coldwater thermal regime. Surficial flows are conveyed from headwaters 200 m north of the crossing, eventually outletting into Smithfield Creek 2.0 km downstream of the crossing. The watercourse conveys flow north to south under Highway 401 through a concrete box culvert with a span of 1.3 m and a rise of 1.3 m. On the north side of the highway, there are gabion baskets around the inlet of the culvert which appear to be in good condition. It is unknown at this time, if the culvert is within the study limits of the project or if the recommended plan may require culvert works.

ROW

As the watercourse enters the highway ROW, flow is conveyed within a distinct flow path through a relatively dry wetland, at the time of survey. Grasses and other vegetation present within the channel at

the culvert inlet indicate that water received through this tributary does not typically pool. Pooled, sediment-laden water was present in the culvert outlet. The aquatic habitat consists of stagnant water (100%). Stagnant sections have a mean wetted width of 2.4 m, a mean wetted depth of 0.1 m, a mean bankfull width of 2.7 m and a mean bankfull depth of 0.3 m. Substrate consists of clay (30%), sand (30%), silt (20%) and cobble (20%). In the downstream ROW, the left upstream bank had a height of 2.5 m and the right upstream bank had a height of 2.0 m. The banks were manmade and straightened, had a steep slope and were stable with no erosion. Instream cover consists of overhanging vascular macrophytes (30%) and instream vascular macrophytes (20%). Vegetation consisted of cattails and grasses. Riparian trees and shrubs provided some cover. Downstream of Telephone Road (50 m to the south), the watercourse has a very steep gradient, which acts as a permanent barrier to fish passage.

3.11.1 Fish Community

Fish community sampling was performed; however, no fish were caught. Based on the habitat and flow regime present, the reach at C9 has been assessed to function as indirect fish habitat.

Given the fish community present downstream in Smithfield Creek and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for the unknown watercourse is from **July 1 to September 30** (no in-water works from October 1 to June 30) of any given year to protect the spring and fall spawning species. Based on the results of the field investigation and the available secondary source information, WSP classifies this watercourse within the study area as low sensitivity.

3.12 Mayhew Creek Tributary 1 (C10)

The assessed reach of Mayhew Creek Tributary 1 conveys an intermittent surficial flow regime with a coldwater thermal regime. Headwater surficial flows are conveyed from ditch flow immediately north of the crossing, eventually outletting into Mayhew Creek 1.5 km south of the highway. The watercourse conveys flow north to south under Highway 401 through two HDPE culverts with a span of 0.8 m and a rise of 0.8 m with an open median. The culverts may undergo rehabilitation / replacement to accommodate the widening of Highway 401 through the site.

ROW

As the watercourse enters the highway ROW, flow is conveyed within a distinct channel with defined banks from north to south. Rain runoff had contributed to flow at the time of survey. The aquatic habitat consists of runs (100%). Run sections have a mean wetted width of 0.7 m, a mean wetted depth of 0.02 m, a mean bankfull width of 1.3 m and a mean bankfull depth of 0.2 m. Substrate consists of gravel (60%), clay (20%) and sand (20%). The left upstream bank had a height of 1.7 m and the right upstream bank had a height of 0.4 m. The banks were manmade and straightened, had a steep slope and were stable with no erosion. Instream cover consists of instream vascular macrophytes (30%), overhanging vascular macrophytes (20%), cobble (20%) and boulders (10%). Vegetation consisted of cattails and horsetail (*Equisetum arvense*). Riparian trees and shrubs provided some cover. The culvert outlet of the eastbound lanes is perched by approximately 0.1 m. The outlet pool consists of riprap followed by a significant 10 m drop over a 20-m distance consisting of a steep channel of riprap and large boulders. The lack of resting pools within this drop and the relatively steep gradient acts as a permanent barrier to fish passage. The gradient of the watercourse is generally steep downstream of the drop.

3.12.1 Fish Community

Fish community sampling was performed; however, no fish were caught. Based on the habitat and flow regime present, the reach at C10 has been assessed to function as indirect fish habitat.

Given the fish community present downstream in Mayhew Creek and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for the unknown watercourse is from **July 1 to September 30** (no in-water works from October 1 to June 30) of any given year to protect the spring and fall spawning species. Based on the results of the field investigation and the available secondary source information, WSP classifies this watercourse within the study area as low sensitivity.

3.13 Mayhew Creek Tributary 2 (C11)

The assessed reach of Mayhew Creek Tributary 2 conveys an intermittent surficial flow regime with a coldwater thermal regime. Headwater surficial flows are conveyed from seepage and ditch flow immediately north of the crossing, eventually outletting into Mayhew Creek 230 m south of the highway. The watercourse conveys flow north to south under Highway 401 through one concrete box culvert with a span of 1.9 m and a rise of 1.8 m crossing the eastbound lanes and one concrete box culvert with a span of 1.9 m and a rise of 1.2 m crossing the westbound lanes with an open median. The culverts may undergo rehabilitation / replacement to accommodate the widening of Highway 401 through the site.

ROW

As the watercourse enters the highway ROW, laminar flow is conveyed within a distinct channel with defined banks from north to south. Rain runoff had contributed to flow at the time of survey. Minor amounts of substrate have been deposited within both culverts. The aquatic habitat consists of runs (100%). Run sections have a mean wetted width of 0.8 m, a mean wetted depth of 0.02 m, a mean bankfull width of 2.0 m and a mean bankfull depth of 0.3 m. Substrate consists of sand (40%), boulder (25%), cobble (25%), gravel (5%) and clay (5%). The left upstream bank had a height of 1.2 m and the right upstream bank had a height of 0.3 m. The banks were manmade and straightened, had a steep slope and were stable with no erosion. Instream cover consists of instream vascular macrophytes (20%), overhanging vascular macrophytes (30%), cobble (10%) and boulders (20%). Vegetation consisted of common reed (*Phragmites australis*) and grasses. Riparian trees and shrubs provided some cover. Downstream of the crossing, the watercourse has a very steep gradient with several drops ranging between 0.5 to 1.0 m over a distance of 50 m. These drops act as a permanent barrier to fish passage through the ROW. Evidence of groundwater is present at the inlet of the culvert (low amounts of iron staining).

3.13.1 Fish Community

Fish community sampling was performed; however, no fish were caught. Based on the habitat and flow regime present, the reach at C11 has been assessed to function as indirect fish habitat.

Given the fish community present downstream in Mayhew Creek and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for the unknown watercourse is from **July 1 to September 30** (no in-water works from October 1 to June 30) of any given year to protect the spring and fall spawning species. Based on the results of the field investigation and the available secondary source information, WSP classifies this watercourse within the study area as low sensitivity.

3.14 Mayhew Creek Tributary 3 (C12)

The assessed reach of Mayhew Creek Tributary 3 conveys an intermittent surficial flow regime with a coldwater thermal regime. Headwater surficial flows are conveyed from ditch flow immediately north of the crossing, eventually outletting into Mayhew Creek 280 m south of the highway. The watercourse conveys flow north to south under Highway 401 through a catch basin on the north side of the westbound lanes,

outletting to a CSP culvert across the eastbound lanes with a span of 1.0 m and a rise of 1.0 m with an open median. The culvert appears to have been previously inserted with a liner; it may undergo rehabilitation / replacement to accommodate the widening of Highway 401 through the site.

ROW

North of the westbound lanes, there is no distinct channel. Vegetation is dominated by a wetland pocket that was dry at the time of survey. After snow melt and periods of heavy precipitation, water likely sits within the wetland and then is drained via the catch basin to the south side of the highway. There was nominal pooled water and no substrates within the culvert outlet of the eastbound lanes. In the downstream reach, the aquatic habitat consists of dry channel (100%). Dry channel sections have a mean bankfull width of 2.0 m and a mean bankfull depth of 0.3 m. Substrate consists of sand (50%) and clay (50%). The left upstream bank had a height of 1.3 m and the right upstream bank had a height of 0.8 m. The banks were manmade and straightened, had a steep slope and were stable with no erosion. Instream cover consists of instream vascular macrophytes (20%), overhanging vascular macrophytes (30%). Vegetation consisted of common reed and grasses. Riparian trees and shrubs provided some cover. Downstream of the crossing, the watercourse has a very steep gradient with a drop of approximately 5.0 m, which also acts as a permanent barrier for fish movement through the ROW.

3.14.1 Fish Community

Fish community sampling was not performed at this crossing due to lack of water at the time of survey. Based on the habitat and flow regime present, the reach at C12 has been assessed to function as indirect fish habitat.

Given the fish community present downstream in Mayhew Creek and MNRF guidelines, the MNRF indicated that the permissible in-water construction timing window for the unknown watercourse is from **July 1 to September 30** (no in-water works from October 1 to June 30) of any given year to protect the spring and fall spawning species. Based on the results of the field investigation and the available secondary source information, WSP classifies this watercourse within the study area as low sensitivity.

3.15 Habitat Summary Tables

Tables 2 and Table 3 (MTO Table Templates D2A and D2B) provide a summary of the habitat conditions as documented from background sources and field surveys.

Table 2: MTO Table Template D2A: Existing Fish Habitat Conditions Summary Table

Waterbody ID	Date	Flow	Thermal Regime	Fish Habitat*	Substrate Type	Channel Morphology	Vegetation	Constraints & Opportunities	Significant Fish Habitat
Colborne Creek Tributary (C1)	Oct 14, 2020	Intermittent	Cold	Indirect	Sand (40%) Gravel (40%) Cobble (10%) Clay (10%)	Dry	Riparian: Grasses Forbs In-water: Grasses	– Dense vegetation and undefined channel provide a permanent barrier. Design Considerations: – If Spring surveys determine there are fish present, removal of the perch at the outlet of the north culvert to provide fish passage will be beneficial.	Bridle Shiner (SC) 1 km downstream in mainstem Colborne Creek
Little Lake Tributary 1 (C2)	Oct 14, 2020	Intermittent	Cold	Seasonally Direct	Clay (55%) Sand (35%) Gravel (10%)	Dry	Riparian: Grasses Forbs In-water: Grasses	– Fluctuating water levels and dense vegetation provide seasonal barriers. – Pooled water inside of culvert, potentially stranding fish. Design Considerations: – If culvert requires replacement, consider meeting MTO WC-12 Design Considerations for Passage of Fish through Culverts	None
Little Lake Tributary 2 (C3 / 21-471)	Oct 14, 2020	Permanent	Cold	Direct	Runs: Silt (60%) Clay (20%) Sand (20%) Flats: Silt (40%) Clay (30%) Sand (20%) Gravel (10%)	Runs Flats	Riparian: Cattails Common Reed In-water: Cattails Common Reed Watercress	– Presence of Brook Trout and spawning / migratory habitat. – Groundwater upwellings present. Design Considerations: – The designer should avoid any infilling, and culvert rehabilitation works should avoid debris and material falling into the water. – Critical environmentally sensitive areas (spawning habitat) to be avoided. – Groundwater upwelling should be protected. – If culvert requires replacement, consider meeting MTO WC-12 Design Considerations for Passage of Fish through Culverts. Build replacement culverts on the same alignment as existing to avoid unnecessary realignments to tie the culverts into the channel.	Brook Trout spawning / migratory habitat (downstream of C3 into Biddy Creek)
Little Lake Tributary 3 (no culvert)	Oct 14, 2020	Ephemeral	Cold	Indirect	Not assessed (no PTE)	Undefined	Riparian: Cattails Common Reed In-water: Cattails Common Reed	– Dense vegetation and undefined channel acts as a permanent barrier to fish passage. – Avoid highway improvements that requirement realignment of this feature.	None
Biddy Creek Crossing 1	Oct 14, 2020	Permanent	Cold	Direct	Runs:	Runs Pools	Riparian: Cattails	– Presence of Brook Trout and spawning / migratory habitat. – Groundwater upwellings present.	Brook Trout spawning /

Waterbody ID	Date	Flow	Thermal Regime	Fish Habitat*	Substrate Type	Channel Morphology	Vegetation	Constraints & Opportunities	Significant Fish Habitat
(C4 / 21-472)					Cobble (40%) Sand (35%) Gravel (12%) Boulder (13%) <u>Pools:</u> Sand (40%) Cobble (40%) Boulder (10%) Silt (10%) <u>Riffles:</u> Sand (30%) Gravel (30%) Cobble (20%) Boulder (20%)	Riffles	Shrubs Forbs Cedar <u>In-water:</u> Cattails Watercress	<u>Design Considerations:</u> – The designer should avoid any infilling, and culvert rehabilitation works should avoid debris and material falling into the water. – Critical environmentally sensitive areas (spawning habitat) to be avoided. – Groundwater upwelling should be protected. – If culvert requires replacement, consider meeting MTO WC-12 Design Considerations for Passage of Fish through Culverts. Build replacement culverts on the same alignment as existing to avoid unnecessary realignments to tie the culverts into the channel.	migratory habitat
Biddy Creek Crossing 2 (C5 / 21-473)	Oct 14, 2020	Permanent	Cold	Direct	<u>Runs:</u> Cobble (40%) Sand (30%) Gravel (30%) <u>Riffles:</u> Gravel (50%) Cobble (50%) <u>Flats:</u> Sand (50%) Gravel (50%)	Runs Riffles Flats	<u>Riparian:</u> Cattails Shrubs <u>In-water:</u> Cattails Watercress	– Presence of Brook Trout and spawning / migratory habitat. – Groundwater upwellings present. <u>Design Considerations:</u> – The designer should avoid any infilling, and culvert rehabilitation works should avoid debris and material falling into the water. – Critical environmentally sensitive areas (spawning habitat) to be avoided. – Groundwater upwelling should be protected. – If culvert requires replacement, consider meeting MTO WC-12 Design Considerations for Passage of Fish through Culverts. Build replacement culverts on the same alignment as existing to avoid unnecessary realignments to tie the culverts into the channel.	Brook Trout spawning / migratory habitat
Biddy Creek Crossing 3 (C6 / 21-474)	Oct 14, 2020	Permanent	Cold	Direct	Muck (40%) Sand (25%) Gravel (25%) Cobble (10%)	Flats	<u>Riparian:</u> Cattails Shrubs <u>In-water:</u> Cattails Watercress	– Presence of Brook Trout and spawning / migratory habitat. – Groundwater upwellings present. <u>Design Considerations:</u> – The designer should avoid any infilling, and culvert rehabilitation works should avoid debris and material falling into the water. – Critical environmentally sensitive areas (spawning habitat) to be avoided. – Groundwater upwelling should be protected. – If culvert requires replacement, consider meeting MTO WC-12 Design Considerations for Passage of Fish through Culverts. Build replacement culverts on the same alignment	Brook Trout spawning / migratory habitat

Waterbody ID	Date	Flow	Thermal Regime	Fish Habitat*	Substrate Type	Channel Morphology	Vegetation	Constraints & Opportunities	Significant Fish Habitat
								as existing to avoid unnecessary realignments to tie the culverts into the channel.	
Unknown Watercourse (C7)	Oct 15, 2020	Permanent	Cold	Direct	Cobble (50%) Gravel (20%) Sand (15%) Clay (15%)	Runs	Riparian: Cattails Grasses Forbes Shrubs In-water: Cattails Grasses Watercress	– Fluctuating water levels and dense vegetation provide seasonal barriers. Design Considerations: – If culvert requires replacement, consider meeting MTO WC-12 Design Considerations for Passage of Fish through Culverts.	None
Unknown watercourse within 30 m (no culvert)	Oct 15, 2020	Intermittent	Cold	Indirect	Muck (100%)	Stagnant	Riparian: Cattails In-water: Cattails	– Fluctuating water levels and dense vegetation provide permanent barriers. – Avoid highway improvements that requirement realignment of this feature.	None
Unknown lake within 30 m	Oct 15, 2020	n/a	Warm	Direct (assumed)	Not assessed (no PTE)	n/a	Not assessed (no access)	– Avoid highway improvements that requirement infilling of this feature.	None
Smithfield Creek Tributary (C9)	Oct 15, 2020	Intermittent	Cold	Indirect	Clay (30%) Sand (30%) Silt (20%) Cobble (20%)	Stagnant	Riparian: Grasses Cattails In-water: Cattails	– Steep gradient downstream of crossing likely creates a permanent barrier. – It is not known at this time if this culvert is within the study limits or if design considerations have been discussed in the previously approved EA under GWP 256-98-00. This site is included for a Spring visit to confirm seasonal fish use. If this culvert is impacted by the recommended plan for this EA, then design considerations will be provided at an appropriate time.	None
Mayhew Creek Tributary 1 (C10)	Oct 15, 2020	Intermittent	Cold	Indirect	Gravel (60%) Clay (20%) Sand (20%)	Runs	Riparian: Cattails Horsetails In-water: Cattails	– Mapping and field data indicates this feature has its headwater within or very close to the highway ROW. Given the lack of suitable fish habitat within the upstream reaches, the lack of flow, as well as the barriers to fish movement in the downstream reaches, design for fish passage is not warranted. Design Considerations: – If the culverts require replacement, the design should consider appropriately sized culverts for hydraulic capacity, maintaining flow and allochthonous inputs to fish habitat further downstream, appropriate embedment to ensure smooth transitions to prevent erosion, undermining of the culverts and the transport of sediment downstream.	None

Waterbody ID	Date	Flow	Thermal Regime	Fish Habitat*	Substrate Type	Channel Morphology	Vegetation	Constraints & Opportunities	Significant Fish Habitat
Mayhew Creek Tributary 2 (C11)	Oct 15, 2020	Intermittent	Cold	Indirect	Sand (40%) Boulder (25%) Cobble (25%) Gravel (5%) Clay (5%)	Runs	Riparian: Cattails Common Reed Grasses In-water: Common Reed	– Mapping and field data indicates this feature has its headwater within or very close to the highway ROW. Given the lack of suitable fish habitat within the upstream reaches, the lack of flow, as well as the barriers to fish movement in the downstream reaches, design for fish passage is not warranted. Design Considerations: – If the culverts require replacement, the design should consider appropriately sized culverts for hydraulic capacity, maintaining flow and allochthonous inputs to fish habitat further downstream, appropriate embedment to ensure smooth transitions to prevent erosion, undermining of the culverts and the transport of sediment downstream.	None
Mayhew Creek Tributary 3 (C12)	Oct 15, 2020	Intermittent	Cold	Indirect	Sand (50%) Clay (50%)	Dry	Riparian: Cattails Common Reed Grasses In-water: Common Reed	– Mapping and field data indicates this feature has its headwater within or very close to the highway ROW. Given the lack of suitable fish habitat within the upstream reaches, the lack of flow, as well as the barriers to fish movement in the downstream reaches, design for fish passage is not warranted. Design Considerations: – If the culvert requires replacement, the design should consider appropriately sized culverts for hydraulic capacity, maintaining flow and allochthonous inputs to fish habitat further downstream, appropriate embedment to ensure smooth transitions to prevent erosion, undermining of the culverts and the transport of sediment downstream.	None

Table 3: MTO Table Template D2B: Existing Fish Community Summary Table

Waterbody ID	Date	Fish Species Present	Year Class(es)	Species at Risk Present	In-water Works Timing Window
Colborne Creek Tributary (C1)	Oct 14, 2020	None	Not Recorded	None (Bridle Shiner (SC) present downstream)	July 1st to September 30th of any given year.
Little Lake Tributary 1 (C2)	Oct 14, 2020	Blacknose Dace Blacknose Shiner Bluegill Bluntnose Minnow Brook Stickleback Brook Trout Brown Trout Central Mudminnow Common Shiner Creek Chub Fallfish Fathead Minnow Finescale Dace Johnny Darter x Tesselated Darter Largemouth Bass Longnose Dace Mottled Sculpin Northern Pearl Dace Northern Redbelly Dace Pumpkinseed Spottail Shiner White Sucker Source: MNRF	Not Recorded	None	July 1st to September 30th of any given year.
Little Lake Tributary 2 (C3 / 21-471)	Oct 14, 2020	Blacknose Dace Blacknose Shiner Bluegill Bluntnose Minnow Brook Stickleback Brook Trout* Brown Trout Central Mudminnow Common Shiner	Juvenile Brook Trout Adult Creek Chub	None	July 1st to September 30th of any given year.

Waterbody ID	Date	Fish Species Present	Year Class(es)	Species at Risk Present	In-water Works Timing Window
		Creek Chub* Fallfish Fathead Minnow Finescale Dace Johnny Darter x Tesselated Darter Largemouth Bass Longnose Dace Mottled Sculpin Northern Pearl Dace Northern Redbelly Dace Pumpkinseed Spottail Shiner White Sucker Source: MNRF *Collected by WSP			
Little Lake Tributary 3	Oct 14, 2020	None	Not Recorded	None	July 1st to September 30th of any given year.
Biddy Creek Crossing 1 (C4 / 21-472)	Oct 14, 2020	Blacknose Dace* Blacknose Shiner Bluegill Brook Stickleback* Brook Trout* Brown Trout Central Mudminnow Common Shiner Creek Chub Fallfish Fathead Minnow Finescale Dace Johnny Darter x Tesselated Darter Largemouth Bass Longnose Dace Mottled Sculpin* Northern Pearl Dace* Northern Redbelly Dace* Pumpkinseed	Adult Blacknose Dace Adult Brook Stickleback Juvenile Brook Trout Adult Mottled Sculpin Adult Northern Pearl Dace Adult Northern Redbelly Dace Juvenile White Sucker	None	July 1st to September 30th of any given year.

Waterbody ID	Date	Fish Species Present	Year Class(es)	Species at Risk Present	In-water Works Timing Window
		Spottail Shiner White Sucker* Source: MNRF *Collected by WSP			
Biddy Creek Crossing 2 (C5 / 21-473)	Oct 14, 2020	Blacknose Dace* Blacknose Shiner Bluegill Brook Stickleback* Brook Trout* Brown Trout Central Mudminnow Common Shiner Creek Chub Fallfish Fathead Minnow Finescale Dace Johnny Darter x Tesselated Darter Largemouth Bass Longnose Dace Mottled Sculpin* Northern Pearl Dace* Northern Redbelly Dace* Pumpkinseed Spottail Shiner White Sucker* Source: MNRF *Collected by WSP	Adult Blacknose Dace Adult Brook Stickleback Juvenile Brook Trout Adult Mottled Sculpin Adult Northern Pearl Dace Adult Northern Redbelly Dace Juvenile White Sucker	None	July 1st to September 30th of any given year.
Biddy Creek Crossing 3 (21-474)	Oct 15, 2020	Blacknose Dace* Blacknose Shiner Bluegill Brook Stickleback* Brook Trout* Brown Trout Central Mudminnow Common Shiner	Adult Blacknose Dace Adult Brook Stickleback Juvenile Brook Trout Adult Mottled Sculpin Adult Northern Pearl Dace	None	July 1st to September 30th of any given year.

Waterbody ID	Date	Fish Species Present	Year Class(es)	Species at Risk Present	In-water Works Timing Window
		Creek Chub Fallfish Fathead Minnow Finescale Dace Johnny Darter x Tesselated Darter Largemouth Bass Longnose Dace Mottled Sculpin* Northern Pearl Dace* Northern Redbelly Dace* Pumpkinseed Spottail Shiner White Sucker* Source: MNRF *Collected by WSP	Adult Northern Redbelly Dace Juvenile White Sucker		
Unknown watercourse (C7)	Oct 15, 2020	Blacknose Dace Blacknose Shiner Bluegill Brook Stickleback* Brook Trout Brown Trout Central Mudminnow Common Shiner Creek Chub Fallfish Fathead Minnow Finescale Dace Johnny Darter x Tesselated Darter Largemouth Bass Longnose Dace Mottled Sculpin Northern Pearl Dace Northern Redbelly Dace Pumpkinseed Spottail Shiner White Sucker	Adult Brook Stickleback	None	July 1st to September 30th of any given year.

Waterbody ID	Date	Fish Species Present	Year Class(es)	Species at Risk Present	In-water Works Timing Window
		Source: MNRF *Collected by WSP Note: Migratory trout unlikely to be present at crossing.			
Unknown watercourse within 30 m	Oct 15, 2020	None	Not Recorded	None	July 1st to September 30th of any given year.
Unknown Lake within 30 m	Oct 15, 2020	Brown Bullhead Brown Trout Carps and Minnows Common Carp Largemouth Bass Muskellunge Pumpkinseed Rock Bass Smallmouth Bass Splake White Sucker Yellow Perch Source: MNRF	Not Recorded	None	July 1st to March 31st of any given year.
Smithfield Creek Tributary (C9)	Oct 15, 2020	None	Not Recorded	None	July 1st to September 30th of any given year.
Mayhew Creek Tributary 1 (C10)	Oct 15, 2020	None	Not Recorded	None	July 1st to September 30th of any given year.
Mayhew Creek Tributary 2 (C11)	Oct 15, 2020	None	Not Recorded	None	July 1st to September 30th of any given year.
Mayhew Creek Tributary 3 (C12)	Oct 15, 2020	None	Not Recorded	None	July 1st to September 30th of any given year.

4.0 GENERAL ASSESSMENT OF PRELIMINARY POTENTIAL IMPACTS OF THE PROJECT

The following sections outline the high level preliminary proposed works at each of the nine watercourses and one waterbody that support fish use directly or indirectly within 30 m of the highway corridor. Smithfield Creek Tributary (C9) and Mayhew Creek Tributary 1, 2, and 3 (C10, C11, and C12) have been assessed under a separate project. The information provided represents the potential proposed works at each location based on the design that was available for review at the time of preparation of this report. However, a formal impact assessment will need to be completed once detailed works are finalized, during detail design, at each of the crossing locations that support fish (directly or indirectly) to determine if review by DFO is required.

4.1 Perliminary Proposed Works

The proposed highway works include a two-phased approach. The interim phase will have highway widening from four to six lanes within the median of the highway. The ultimate phase will have additional lanes added to the outside of the existing road alignment (north and south) for a total of eight lanes (four in each direction).

The interim and ultimate phases will require that the existing culverts either be extended or replaced with longer culverts to accommodate the new lanes in each direction. Culvert replacement over extension will be determined if the hydraulic assessment indicates a deficiency in flow conveyance or capacity, the culvert is in poor condition, there are perched or buried culverts that cannot convey fish passage, or where extensions will increase the velocities through the culvert that surpass the swimming speeds for the target fish in the watercourses. Culvert extension will only be considered for watercourses where fish passage is not an issue, or where the existing culvert is in good shape and has sufficient capacity to convey the expected flows from the additional lanes.

Whether the culvert is being replaced or extended, the result will be new locations for the inlets and outlets. Minor channel modifications will be required to transition the new culvert ends smoothly with the upstream and downstream adjacent channel reaches to avoid creation of barriers/knick points, or exacerbation of erosion through poor flow angles into and out of the culverts. In some instances, scour rock protection may be required at the new culvert ends to support a smooth transition and protect the culverts from future scouring concerns.

Effort will be made during detail design to maintain an open section in the median for each of the watercourses support fish crossed by the highway. This day-lighting will help maintain/enhance fish passage opportunities through the study corridor. Perched culverts will be replaced with culverts embedded within the channel to improve fish passage where appropriate.

Diversion channels may be used to maintain fish passage and access through the highway right-of-way during construction to avoid long term impacts on fish movement and access to habitat that supports a critical life cycle function (i.e., spawning areas).

Each replacement culvert will be designed generally using MTO’s Watercourse Crossing Guideline WC-12 to ensure that flow and fish passage are considered at each crossing location. Where feasible the replacement culverts will have an opening that spans the bankfull width of the channel to avoid impacting flow conveyance. A low flow channel designed with substrates sized to remain in place through reasonably expected flow events will be included for all culvert crossings conveying a watercourse that

supports fish directly. The culverts will also be sized to ensure that expected flows do not surpass the swim speeds for the target fish known to use the watercourses. The detail design team should work directly with an aquatic biologist to ensure that fish passage and habitat needs are included in the replacement culvert designs.

The channel tie-ins and median openings will be designed using natural channel design principles to replace/replicate habitat being impacted by the new culverts to support fish use generally within the highway corridor and to remain stable following construction.

4.2 Potential Impacts

There are a number of watercourse crossings within the study limits that support fish either directly or indirectly through conveyance of nutrient and allochthonous inputs to a receiving watercourse that supports fish downstream. As such, the proposed works for the highway widening through the study limits have the potential to impact fish and fish habitat through alteration of habitat structure and cover. Specifically:

- Longer culverts (either through extensions or replacements) will result in additional enclosure of channel and fish habitat, reducing solar and allochthonous inputs to the channel, potentially impacting fish habitat and use of the habitat for the life cycle functions it supports.
- Culvert extensions and longer culverts have the potential to result in increases in velocity through the corridor that may impact fish use and passage through the crossing unless properly designed.
- Installation of rock scour protection will result in a change in the substrates and habitat supporting fish, transitioning the channel sections into and out of the culvert, and altering potential food sources.
- Temporary diversion channels and by-pass pumping have the potential to temporarily impact fish passage and access to habitat upstream of the highway, as well as increase potential for sediment release to the receiving watercourse/body.
- Due to proximity to the widened lanes, and to avoid tight angles into and out of the highway corridor, some channel section may require realignment. These realigned sections will provide limited fish habitat until they are established, and the benthic organisms recolonize, and also increase the potential for sediment release to the receiving watercourse/body downstream.

There are also a number of construction related works that have the potential to impact fish and fish habitat indirectly (i.e., de-watering of construction footprint, road grading and ditching), however these impacts are expected to be mitigated through implementation of standard construction related mitigation measures.

4.3 Design Consideration Tables

The following Design Consideration Tables identify the project-specific design considerations. Watercourse crossings were grouped based on fish habitat use (indirect and direct fish habitat) and the presence of sensitive species (i.e., Brook Trout).

Table 4: MTO Design Consideration Table (C1 – Indirect fish habitat)

Factors to Consider	Design Considerations Provided by the Fisheries Assessment Specialist	Describe How Each Factor Was Addressed Through Design
In-water Works Timing Window	Confirmed with the MNRF that the waterbodies are considered coldwater. Timing Window where work can occur is July 1st – September 30th (no in-water or near water works permitted between October 1st and June 30th or any given year). Although these culverts do not support fish directly through the highway corridor, the timing window should be adhered to so as to protect the downstream fishery during important life cycle stages.	[only filled in during Detail Design]
Flows and Allochthonous Inputs	Based on current fieldwork, fish passage is not a requirement at these crossing. If the culverts require replacement, the design should consider appropriately sized culverts for hydraulic capacity, maintaining flow and allochthonous inputs to fish habitat further downstream, appropriate embedment to ensure smooth transitions to prevent erosion, undermining of the culverts and the transport of sediment downstream.	
Significant Fish Habitat	None at the culverts. C1 drains to Colborne Creek with permanent flow ~ 1 km downstream which supports migratory trout and Bridle Shiner (Special Concern – no provincial or federal species or habitat protection).	
Constraints and Opportunities	Receiving watercourse is defined as coldwater. Design of the highway drainage should consider measures to avoid altering the thermal regime (e.g., stormwater design should consider suitable thermal mitigation measures to cool the runoff prior to entering the watercourse).	
Other Considerations	Works at these culverts should consider future erosion concerns. Culverts should be sized to avoid creation of scour pools and bank erosion downstream. Scour protection should be considered at the culvert ends to avoid future erosion and scour that may release sediment to the receiving watercourse/body downstream.	

Table 5: MTO Design Consideration Table (C2, C7 – Direct fish habitat, non-migratory fish)

Factors to Consider	Design Considerations Provided by the Fisheries Assessment Specialist	Describe How Each Factor Was Addressed Through Design
In-water Works Timing Window	Confirmed with the MNRF that the waterbodies are considered coldwater. Timing Window where work can occur is July 1st- September 30th (no in-water or near water works permitted between October 1st and June 30th or any given year).	[only filled in during Detail Design]
Fish Passage	Generalist, non-migratory fish species present. Intermittent flow or low flow in the Fall. If the culverts require replacement, the design should consider appropriately sized culverts for hydraulic capacity and meeting the MTO WC-12 Design Standards for Fish Passage through Culverts. Replacement culverts should be sized to ensure that the velocities do not increase to a point that the swim speeds of the target species are surpassed, thereby creating fish passage concerns. Scour protection will be installed where needed to ensure a smooth transition of the culverts with adjacent channel features to avoid creation of knick points or lips that would impact fish passage. Where feasible an open median will be considered between culverts for the east and west bound lanes to provide day-lighting to support fish habitat and migration through the highway corridor.	
Constraints and Opportunities	C2 has water pooling inside the culvert potentially stranding fish. If culvert is replaced, meeting the MTO WC-12 Design Standards for Fish Passage through Culverts will provide opportunities to provide refuge for fish during periods of stagnant/low flow. Groundwater upwellings (watercress, iron staining, watercress) to be protected (C7). Thermal Sensitivity These watercourses are defined as coldwater. Design of the highway drainage should consider measures to avoid altering the thermal regime (e.g., stormwater design should consider suitable thermal mitigation measures to cool the runoff prior to entering the watercourse).	
Other Considerations	Open bottom culverts may be a consideration when replacing culverts on watercourses with ground water seepage within the highway crossing to support the local habitat that has been established with the ground water inputs.	

Table 6: MTO Design Consideration Table C3 (21-471/C), C4 (21-472/C), C5 (21-473/C), C6 (21-474/C – Direct fish habitat with migratory trout)

Factors to Consider	Design Considerations Provided by the Fisheries Assessment Specialist	Describe How Each Factor Was Addressed Through Design
In-water Works Timing Window	Confirmed with the MNRF that the waterbodies are considered coldwater. Timing Window where work can occur is July 1st - September 30th (no in-water or near water works permitted between October 1st and June 30th or any given year).	[to be filled in during Detail Design]
Fish Passage	Migratory fish present: Brook Trout (confirmed in Fall surveys), Brown Trout (MNRF). Design shall avoid disturbing spawning areas; fish passage should maintain access to spawning areas by following MTO's WC-12 Design Standard for fish passage (i.e., design should span bankfull width, with new culverts embedded 300 mm or 10%, minimum, with a low flow channel through the culvert that match the existing channel bed elevations to ensure smooth transition). Natural channel designs should be completed by a fluvial geomorphologist. Build replacement culverts on the same alignment as existing to avoid unnecessary realignments to tie the culverts into the channel unless minor modification would help address erosion and flow concerns. Replacement culverts should be sized to ensure that the velocities do not increase to a point that the swim speeds of the target species are surpassed, thereby creating fish passage concerns. Scour protection will be installed where needed to ensure a smooth transition of the culverts with adjacent channel features to avoid creation of knick points or lips that would impact fish passage. Where feasible an open median will be considered between culverts for the east and west bound lanes to provide day lighting to support fish habitat and migration through the highway corridor.	
Significant Fish Habitat*	High potential spawning habitat for trout up and downstream of C4, C5 and C6. High potential spawning habitat downstream of C3. Spawning habitat includes areas with rocky substrate (i.e., boulders, cobble, gravel), which are located within the ROW of the crossings. Groundwater upwellings are present, as indicated by iron staining, seepage and watercress. Watercourses are cold, clear and well-oxygenated. The final design and contract should ensure it avoids impacts to these important features, and/or replicates similar habitat in areas impacted through construction. Culvert lengths should be minimized as much as possible to ensure the longer enclosed channel sections do not impact fish migration and movement through the	

Factors to Consider	Design Considerations Provided by the Fisheries Assessment Specialist	Describe How Each Factor Was Addressed Through Design
	corridor. Headwalls and/or wingwalls (or beveled culverts) should be considered to avoid significantly longer culverts for these sensitive fisheries.	
Constraints and Opportunities	General coldwater stream objectives apply, including promotion of Brook Trout recovery. Critical environmentally sensitive areas (spawning habitat) to be avoided. Groundwater upwelling areas (iron staining, seepage, watercress) is to be protected (C3, C4, C5, C6). Thermal Sensitivity These watercourses are defined as coldwater. Design of the highway drainage should consider measures to avoid altering the thermal regime (e.g., stormwater design should consider suitable thermal mitigation measures to cool the runoff prior to entering the watercourse).	
Other Considerations	Open bottom culverts may be a consideration when replacing culverts on watercourses with ground water seepage within the highway crossing to support the local habitat that has been established with the ground water inputs.	

5.0 POTENTIAL ENHANCEMENT/OFF-SETTING MEASURES

Through the assessment of existing conditions and potential impacts, a number of potential design opportunities have been identified that could be used as potential enhancement measures or off-setting measures for the highway widening works. Below is an outline of these potential opportunities that will aid in the maintenance or enhancement of fish passage through the longer highway cross-section including:

- Shorter culvert lengths minimize the impact of solar inputs to the channel. Shorter culverts should be designed where feasible using head and/or wingwalls.
- Maintaining a median opening through the corridor either through use of headwalls/wingwalls, culvert beveling or steeper embankment grades. These options will maintain some day-lighting through the longer culverts that will encourage fish passage through the corridor. The median openings should provide some rest area (pools) for fish that are using the culvert for migratory purposes.
- Transitioning the new culvert ends with embedded rock scour protection when possible. The embedded scour protection will provide substrate diversity that will attract benthic macroinvertebrates as a food source but will also protect against future erosion and scouring of the channel that could impact fish passage though creation of perched culverts or barriers.
- Existing perched culverts will be replaced with new culverts that are properly embedded and transitioned smoothly with the adjacent channel features to address existing fish passage issues and ensure new issues do not form.
- Existing eroded banks within the highway corridor will be addressed through redesign of the flow direction, enclosed within the longer culverts, or protected with rock scour protection/bank armouring.
- Diversion channels will be considered for use during culvert replacement works to ensure that fish passage and access to habitat upstream of the crossing is maintained throughout construction. Diversion channels will be designed using natural channel design principles to mimic habitat conditions in the existing channel to minimize impacts on fish habitat and use during construction.
- The angle at which the channel is entering and leaving the highway corridor will be designed to ensure that there are no concerns for erosion or scouring of culvert ends and banks. If required, minor channel modifications will be designed to smoothly transition flows into and out of the highway corridor that avoids impacts to the adjacent bed and banks. If the alignment cannot be addressed, then bank protection measures (embedded rock) will be considered to avoid exacerbating erosion concerns that would impact downstream habitat (i.e., bury spawning areas).
- The new and replacement culverts will all be designed generally using MTO's WC-12 watercrossing standard to avoid impacts to flows and fish passage through the corridor. The culverts will be sized to support the needed hydraulic capacity while also maintaining a velocity suitable for the target fish swim speeds. The culvert capacity will consider the need for low flow channels that will help confine flows to a smaller area to promote fish passage during lower flow events, and the substrates used in the low flow channel design will be sized to stay in place for designed flows. Each replacement culvert will be embedded to address future scour potential, and transition smoothly with adjacent channel sections.

If channel realignments and channel tie-ins are necessary for the crossings, submission of a Request for Review to DFO would be anticipated during the Impact Assessment stage.

6.0 REFERENCES

C. Warren., Aug 20, 2020. Personal Communication with Catherine Warren, District Planner – MNRF – Peterborough District.

M. Charette, Jun 9, 2021. Personal Communication with Monique Charette, Management Biologist – MECP.

Ministry of Natural Resources and Forestry, 2015. Species at Risk in Ontario Website. http://www.ontario.ca/environment-and-energy/species-risk-ontario-list - Accessed April 2023.

Ministry of Transportation. 2020. *Interim Environmental Guide for Fisheries*. Provincial and Environmental Planning Office, MTO.

Ministry of Transportation. 2020. Version 4. MTO/DFO/MNRF Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings (Pilot). Provincial and Environmental Planning Office, MTO.

Natural Heritage Information Centre (NHIC). 2010. Information obtained online at: https://www.biodiversityexplorer.mnr.gov.on.ca/nhicWEB/mainSubmit.do - Accessed April 2023.

Ontario Freshwater Fisheries Life History Database. Information obtained online at: http://www.ontariofishes.ca/ - Accessed April 2023.

Fisheries and Oceans Canada – Aquatic Species at Risk Map. Information obtained online at: http://www.dfo-mpo.gc.ca/species-especes/sara-lep/map-carte/index-eng.html – Accessed April 2023.

Fisheries and Oceans Canada. 2020. Interim code of practice: Temporary cofferdams and diversion channels. https://www.dfo-mpo.gc.ca/pnw-ppe/codes/cofferdams-batardeaux-eng.html . Accessed April 2023.

Fisheries and Oceans Canada. 2022. Codes of Practice. https://www.dfo-mpo.gc.ca/pnw-ppe/practice-practique-eng.html . Accessed April 2023.

Fisheries and Oceans Canada. 2022. Measures to protect fish and fish habitat. https://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures-eng.html. Accessed April 2023.

Ministry of Transportation. 2016. MTO/DFO/MNRF Protocol for Protecting Fish and Fish Habitat on Provincial Transportation Undertakings Version 3 (Pilot), 2016.

Signature Page

WSP Canada Inc.

Leslie Keith, HBSc
Fisheries Ecologist

Kim LeBrun, HBSc
Senior Biologist/ Project Manager

LK/KL/ld

https://wsponline.sharepoint.com/sites/CA-17m-01712-11/Technical/Forms/AllItems.aspx?viewpath=%2Fsites%2FCA%2D17m%2D01712%2D11%2FTechnical%2FForms%2FAllItems%2Easpx&id=%2Fsites%2FCA%2D17m%2D01712%2D11%2FTechnical%2F02%2E%20Technical%2F09%2E%20Ecology%2FReporting%2FFisheries%20Prelim%20Impact%20Assessment%20Report&viewid=15af4067%2D3160%2D49d7%2Dbbac%2D8b9469ce05f9

APPENDIX A

Photo Plates

Site: Highway 401 Colborne to Brighton

Plate 1: Colborne Creek (C1) inlet, facing south (downstream).

Plate 2: Colborne Creek (C1) inlet, facing north (upstream).

Plate 3: Colborne Creek (C1) outlet, facing north (upstream).

Plate 4: Colborne Creek (C1) outlet, facing south (downstream).

Plate 5: Little Lake Tributary 1 (C2), facing south (downstream).

Plate 6: Little Lake Tributary 1 (C2), facing north (upstream).

Plate 7: Little Lake Tributary 1 (C2), facing north (upstream).

Plate 8: Little Lake Tributary 1 (C2), facing south (downstream).

Site: Highway 401 Colborne to Brighton

Plate 1: Little Lake Tributary 2 (C3) inlet, facing north (downstream).

Plate 2: Little Lake Tributary 2 (C3) inlet, facing south (upstream).

Plate 3: Little Lake Tributary 2 (C3) outlet, facing south (upstream).

Plate 4: Little Lake Tributary 2 (C3) outlet, facing north (downstream).

Plate 5: Little Lake Tributary 3, facing south.

Plate 6: Biddy Creek Crossing 1 (C4) inlet, facing north (downstream).

Plate 7: Biddy Creek Crossing 1 (C4) inlet, facing south (upstream).

Plate 8: Biddy Creek Crossing 1 (C4), watercress upstream of culvert.

Site: Highway 401 Colborne to Brighton

Plate 1: Biddy Creek Crossing 1 (C4) outlet, facing south (upstream).

Plate 2: Biddy Creek Crossing 1 (C4) outlet, facing north (downstream).

Plate 3: Biddy Creek Crossing 2 (C5) inlet, facing south (downstream).

Plate 4: Biddy Creek Crossing 2 (C5) inlet, facing north (upstream).

Plate 5: Biddy Creek Crossing 2 (C5) outlet, facing north (upstream).

Plate 6: Biddy Creek Crossing 2 (C5) outlet, facing south (downstream).

Plate 7: Biddy Creek Crossing 3 (C6) inlet, facing north (downstream).

Plate 8: Biddy Creek Crossing 3 (C6) inlet, facing south (upstream).

Site: Highway 401 Colborne to Brighton

Plate 1: Biddy Creek Crossing 3 (C6) outlet, facing south (upstream).

Plate 2: Biddy Creek Crossing 3 (C6) outlet, facing north (downstream).

Plate 3: Unknown watercourse (C7) inlet, facing south (downstream).

Plate 4: Unknown watercourse (C7) inlet, facing north (upstream).

Plate 5: Unknown watercourse (C7) outlet, facing north (upstream).

Plate 6: Unknown watercourse (C7) outlet, facing south (downstream).

Plate 7: Unknown watercourse within 30 m facing east (upstream).

Plate 8: Unknown watercourse within 30 m facing west (downstream).

APPENDIX B

Field Data Collection Forms

GENERAL INFORMATION				
PROJECT #: 17M-01712-11	**PROJECT DESCRIPTION:** Hwy 401 Colborne	**DAY:** 14	**MONTH:** Oct	**YEAR:** 2020
Is STREAM REALIGNMENT required for this section: O Yes O No ✓ Unknown				
COLLECTORS: KM CV	**WEATHER CONDITIONS:** sunny	**TIME STARTED:** Oct 16 / Oct 14 10:00	**TIME FINISHED:** 10:15	
AIR TEMP: Oct 14 11°C / Oct 16 10°C	**WATER TEMP:** —	**CONDUCTIVITY (µS/cm):** —		
PHOTO NUMBERS AND DESCRIPTIONS: ph. 8645 - 8651 , ph. 8882 - 8888				

LOCATION			
NAME OF WATERBODY: Colborne Creek	**DRAINAGE SYSTEM:** Lake Ontario	**CROSSING #:** C1	**STATION #:** —
LOCATION OF CROSSING: Between Colborne and Brighton along the 401			
GPS COORDINATES: 18T 270885 4879942	**MTO CHAINAGE:** Eastern		
TOWNSHIP: Colborne to Brighton	**MNR DISTRICT:** Peterborough		

LAND USE AND POLLUTION	
SURROUNDING LAND USE: woodland	**SOURCES OF POLLUTION:** road runoff

EXISTING STRUCTURE TYPE				
Bridge O	Box Culvert ✓ O	Open Foot Culvert O	CSP O	N/A O
Other O Describe:			132 width x 136 height Size (w x h) m^2 1.5 m x 1.5 m	

SECTION TYPE AND MORPHOLOGY						
SECTION IDENTIFIER: C1	**SECTION LOCATION:** (include on habitat map) along Hwy 401					
TYPE:	Stream / river O	Channelized O	Permanent O	Intermittent ✓ O	Ephemeral O	**ASSOCIATED WETLAND:**
TOTAL SECTION LENGTH (m): 60			**CURRENT VELOCITY (m/s):** dry			

SUB-SECTION(S)	Run O	Pool O	Riffle O	Flats O	Inside culvert O	Other: Dry channel
Percentage of area						100
Mean depth wetted (m)						—
Mean width wetted (m)						—
Mean bankfull width (m)						1.9
Mean bankfull depth(m)						0.3
Substrate						40 sand 10 cobble 40 gravel 10 clay

Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D

Bank Height
left = 1.4m
right = 1.4m

BANK STABILITY				
	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank	✓	O	O	O
Right Upstream Bank	✓	O	O	O

HABITAT								
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris Instream Overhanging		Organic debris	Vascular Macrophytes Instream 20 Overhanging 40	None

SHORE COVER (% stream shaded):	100 – 90 % O	90 – 60% O	60- 30% O	30 – 1% O	None O

VEGETATION TYPE (%):	Submergent	Floating	Emergent 100	None
Predominant Species			grasses, shrubs, forbs	

MIGRATORY OBSTRUCTIONS:	None	Seasonal low flow	Permanent median of highway has a drop of ~ 0.5m
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning	Evidence of Groundwater	Other

POTENTIAL ENHANCEMENT OPPORTUNITIES:

COMMENTS:

goldenrod, grasses, sedges
milkweed → monarchs
dead trees, peeling bark → bats
chickadees
clean culvert bed indicates very little flow throughout the year

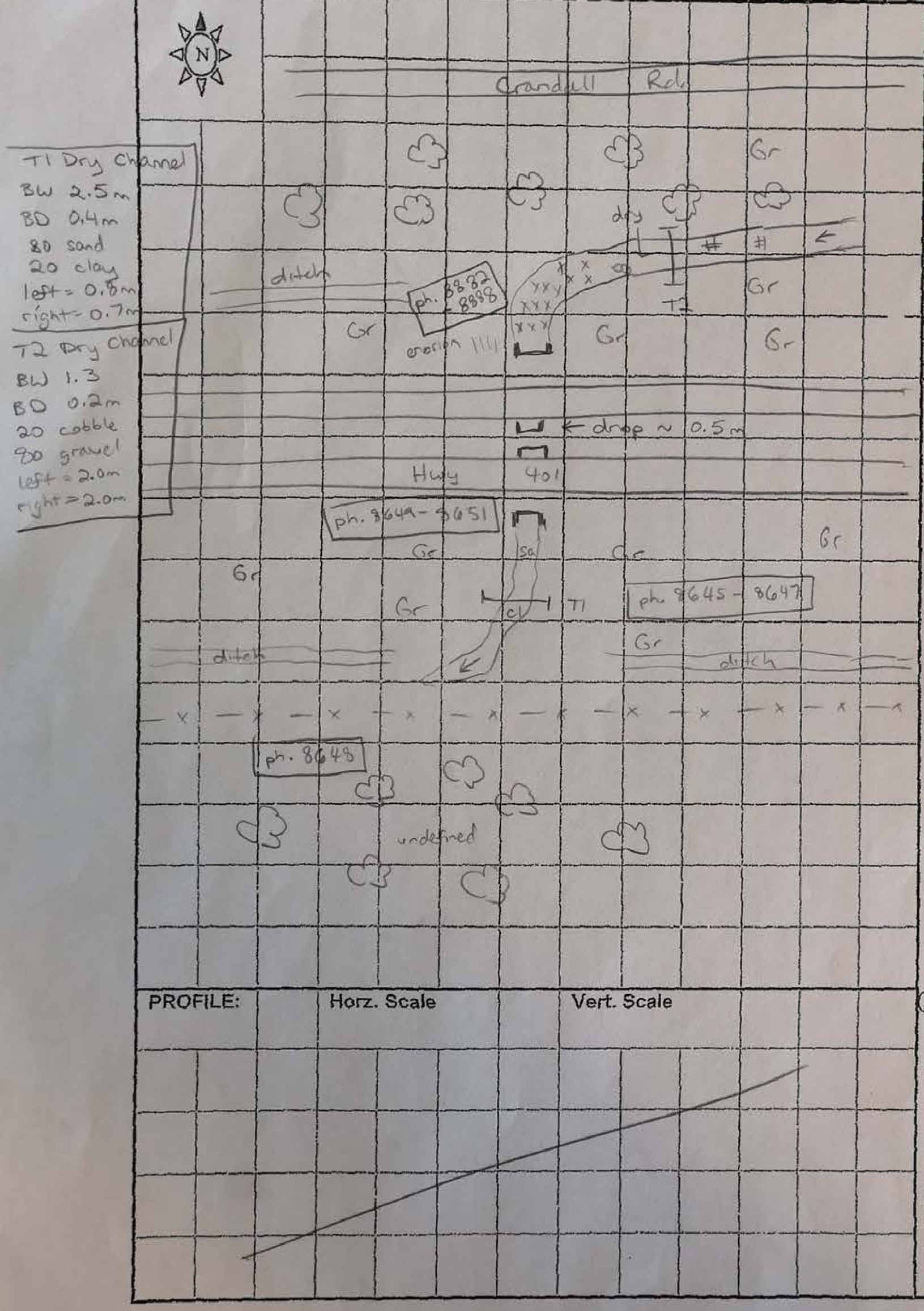
Indirect fish habitat
↳ undefined d/s
↳ barrier at median of 401

salmon and trout noted d/s in creek ~ 4 km d/s

Additional Notes Appended? O No O Yes **number of pages** _____

C1

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
C1	along Hwy 401	60	1 cm / 10 m



PROFILE: Horz. Scale Vert. Scale

PROJECT #: 17M-01712-11

MAPPER: KM CVD

NAME OF WATERBODY: Colborne Creek

CROSSING #: C1

STATION #: —

DATE: DD-MMM-YY 14-OCT-20 / 16-OCT-20

LEGEND

10d depth (cm)
6w width

➡ Riffle
⇨ Run/Glide
⬭ Pool
▒ Island/Bar

▒ Fine Substrate
Gravel Substrate
oOooO Cobble /Boulder
*** Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

Seep/Spring
------ Undercut Bank

— Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
Culvert

GENERAL INFORMATION				
PROJECT #: HM-01712-11	**PROJECT DESCRIPTION:** Hwy 401 Colborne	**DAY:** 14	**MONTH:** Oct	**YEAR:** 2020
Is STREAM REALIGNMENT required for this section: O Yes O No O Unknown				
COLLECTORS: KM CVD	**WEATHER CONDITIONS:** Sunny	**TIME STARTED:** 10:30	**TIME FINISHED:** 11:00	
AIR TEMP: 11°C	**WATER TEMP:** —	**CONDUCTIVITY (µS/cm):** —		
PHOTO NUMBERS AND DESCRIPTIONS: ph. 8652- 8659 , ph. 8877 - 8881				

LOCATION			
NAME OF WATERBODY: Little Lake Tributary	**DRAINAGE SYSTEM:** Lake Ontario	**CROSSING #:** C2	**STATION #:** —
LOCATION OF CROSSING: Between Colborne and Brighton along the 401			
GPS COORDINATES: 18T 272716 4880709		**MTO CHAINAGE:** Eastern	
TOWNSHIP: Colborne to Brighton		**MNR DISTRICT:** Peterborough	

LAND USE AND POLLUTION	
SURROUNDING LAND USE: woodland	**SOURCES OF POLLUTION:** road runoff

EXISTING STRUCTURE TYPE				
Bridge O	Box Culvert O	Open Foot Culvert O	CSP O	N/A O
Other O Describe:			1.95m x 1.03m Size (w x h) m^2	

SECTION TYPE AND MORPHOLOGY						
SECTION IDENTIFIER: C2			**SECTION LOCATION:** (include on habitat map) along Hwy 401			
TYPE:	Stream / river O	Channelized O	Permanent O	Intermittent O	Ephemeral O	**ASSOCIATED WETLAND:**
TOTAL SECTION LENGTH (m): 60			**CURRENT VELOCITY (m/s):** dry			

SUB-SECTION(S)	Run O	Pool O	Riffle O	Flats O	Inside culvert O	Other dry channel
Percentage of area						100
Mean depth wetted (m)						—
Mean width wetted (m)						—
Mean bankfull width (m)						1.2
Mean bankfull depth(m)						0.3
Substrate						55 clay 35 sand 10 gravel

Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D

Bank Height
left= 0.6m
right= 0.6m

BANK STABILITY	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank	0	0	0	0
Right Upstream Bank	0	0	0	0

HABITAT								
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris Instream Overhanging 10		Organic debris	Vascular Macrophytes Instream 10 Overhanging 30	None
			10					

SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None
	0	0	0	0	0

VEGETATION TYPE (%):	Submergent	Floating	Emergent	None
			100	
Predominant Species			grasses, shrubs, forbs	

MIGRATORY OBSTRUCTIONS:	None	Seasonal	Permanent
		low flow	

POTENTIAL CRITICAL HABITAT LIMITING:	Spawning	Evidence of Groundwater	Other

POTENTIAL ENHANCEMENT OPPORTUNITIES:

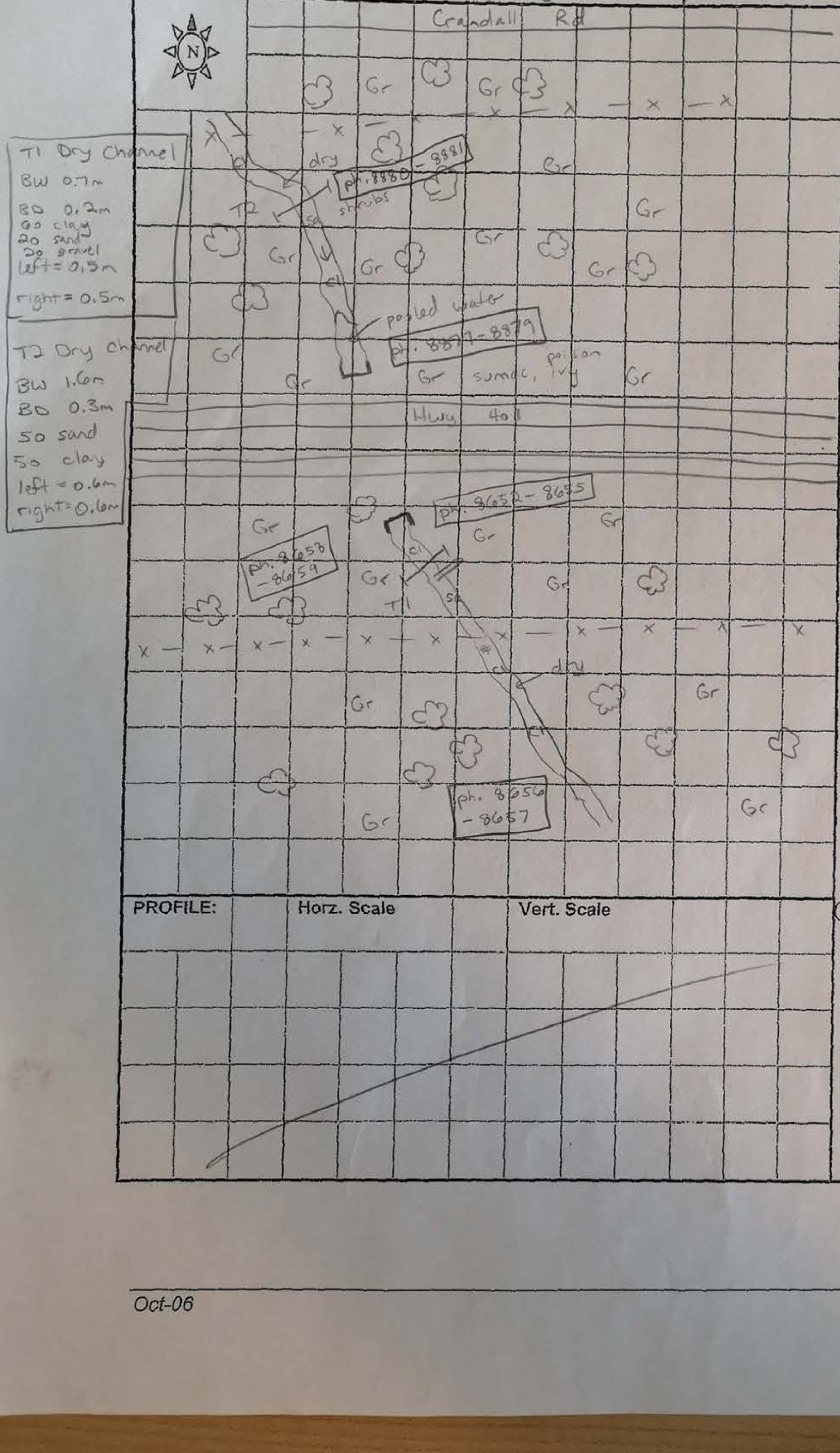
COMMENTS:

Frogs in culvert, potentially spotted fish inside culvert.
Dry channel, but sounds like there is flow in culvert. → Pooled water in culvert on D/S side.
Chickadees and crows, Blue Jay, pigeon.
Drain inside culvert?

Seasonally direct. Flow from pond north of 401.

Additional Notes Appended? O No O Yes **number of pages** _____

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
C2	along Hwy 401 Crandall Rd	60	1 cm / 10 m



PROFILE: Horz. Scale: Vert. Scale

PROJECT #: 17M-01712-11

MAPPER: KM, CVD

NAME OF WATERBODY: Little Lake Tributary 1

CROSSING #: C2

STATION #: —

DATE: DD-MMM-YY: 14-OCT-20

LEGEND

10d depth (cm)
6w width

➡ Riffle
⇨ Run/Glide
⬭ Pool
▒ Island/Bar

▒ Fine Substrate
Gravel Substrate
oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

⊂⊃ Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

⊢▸ Seep/Spring
------- Undercut Bank

▬ Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
⊔ Culvert

GENERAL INFORMATION

PROJECT #:	PROJECT DESCRIPTION:	DAY:	MONTH:	YEAR:
17M-01712-11	Hwy 401 Colborne	14	Oct	2020

Is STREAM REALIGNMENT required for this section:

O Yes O No O Unknown

COLLECTORS:	WEATHER CONDITIONS:	TIME STARTED:	TIME FINISHED:
KM CVD	sunny	11:30	12:00

AIR TEMP:	WATER TEMP:	CONDUCTIVITY (µS/cm):
11°C	13.6°C	392

PHOTO NUMBERS AND DESCRIPTIONS: ph. 8660-8669 , ph. 8870-8876

LOCATION

NAME OF WATERBODY:	DRAINAGE SYSTEM:	CROSSING #:	STATION #:
Little Lake Tributary 2	Lake Ontario	C3	—

LOCATION OF CROSSING: Between Colborne and Brighton along the 401

GPS COORDINATES:	MTO CHAINAGE:
18T 273740 4881632	Eastern
TOWNSHIP: Colborne to Brighton	**MNR DISTRICT:** Peterborough

LAND USE AND POLLUTION

SURROUNDING LAND USE:	SOURCES OF POLLUTION:
woodland, residential	road runoff

EXISTING STRUCTURE TYPE

Bridge O	Box Culvert O ✓	Open Foot Culvert O	CSP O	N/A O

Other O Describe:

4.25m x 1.83m
Size (w x h) m^2

SECTION TYPE AND MORPHOLOGY

SECTION IDENTIFIER:	SECTION LOCATION: (include on habitat map)
C3	along Hwy 401

TYPE:	Stream / river	Channelized	Permanent	Intermittent	Ephemeral	ASSOCIATED WETLAND:
	O	O	O ✓	O	O	

TOTAL SECTION LENGTH (m):	CURRENT VELOCITY (m/s):
60	moderate

SUB-SECTION(S)	Run O ✓	Pool O	Riffle O	Flats O ✓	Inside culvert O	Other
Percentage of area	60			40		
Mean depth wetted (m)	0.1			0.2		
Mean width wetted (m)	3.0			1.3		
Mean bankfull width (m)	7.0			3.0		
Mean bankfull depth(m)	0.2			0.4		
Substrate	60 silt 20 sand 20 clay			40 silt 30 clay 20 sand 10 gravel		

Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D

Bank height
left = 0.9 m
right = 0.7 m

BANK STABILITY				
	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank	O	O	O	O
Right Upstream Bank	O	O	O	O

HABITAT								
IN-STREAM COVER (% surface area):	**Undercut banks**	**Boulders**	**Cobble**	**Woody Debris** **Instream** **Overhanging**	**Organic debris**	**Vascular Macrophytes** **Instream** 30 **Overhanging** 40	**None**
SHORE COVER (% stream shaded):	**100 – 90 %** O	**90 – 60%** O	**60- 30%** O	**30 – 1%** O	**None** O		
VEGETATION TYPE (%):	**Submergent**	**Floating**	**Emergent** 100	**None**			
Predominant Species			cattails, phragmites				
MIGRATORY OBSTRUCTIONS:	**None**	**Seasonal**	**Permanent**				
POTENTIAL CRITICAL HABITAT LIMITING:	**Spawning** juvenile Brook Trout	**Evidence of Groundwater** watercress	**Other**				

POTENTIAL ENHANCEMENT OPPORTUNITIES:

clean sediment out of culvert

COMMENTS:

Raccoons, deer poop, dead snapping turtle, potential raptor habitat (high tree near open water)
pH 8.18
Fish observed in channel.
Wildlife trails to the bank, beaver chewed trees

Direct Fish Habitat
↳ Brook Trout & Creek Chub caught

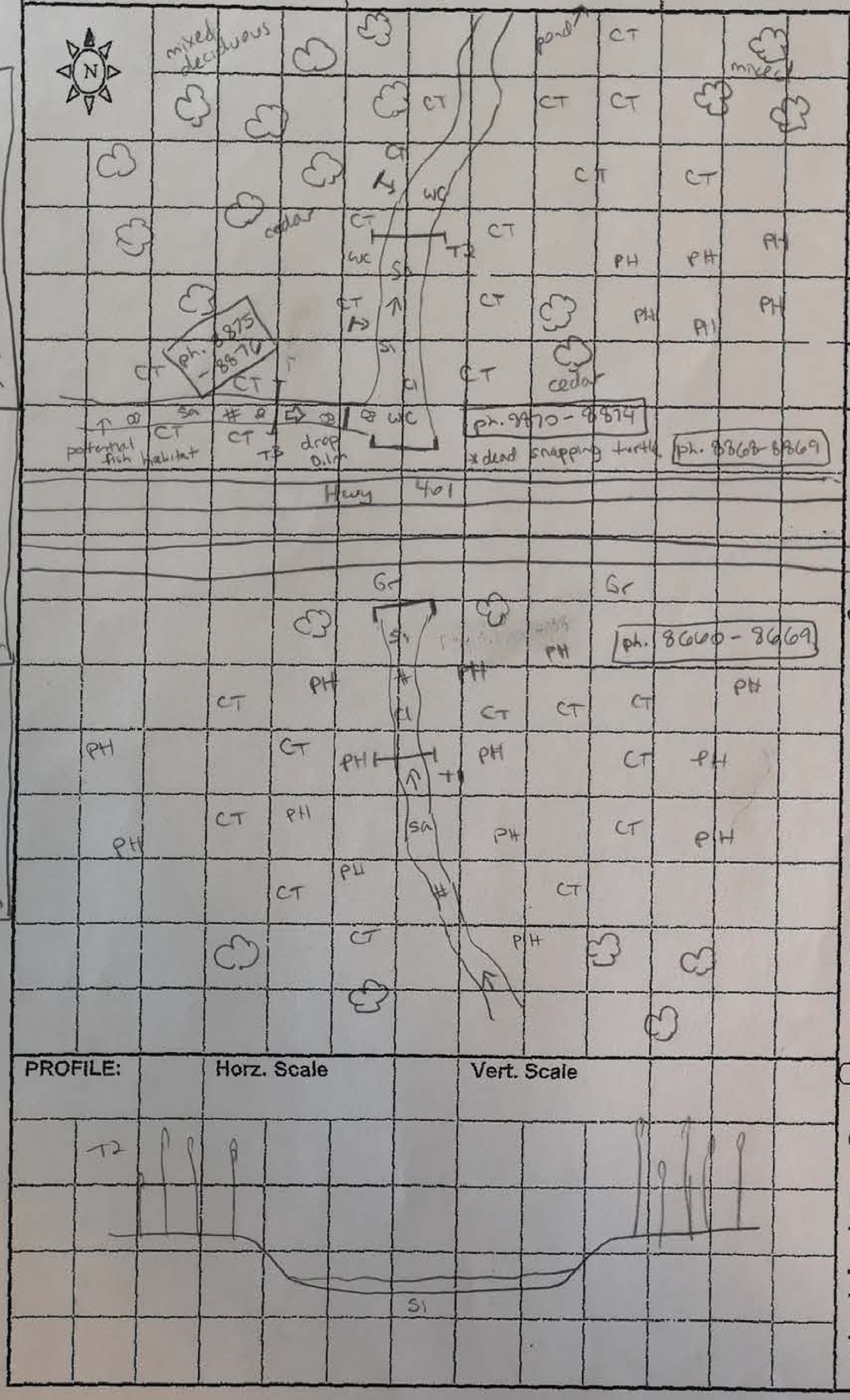
Additional Notes Appended? O No O Yes **number of pages** _____

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
C3	along 401 (ROW)	60	1 cm / 10 m

T1 Flat
WW 1.33m
WD 0.15 m
BW 3.0m
BD 0.4m
40 silt
30 clay
20 sand
10 gravel
left = 1.3 m
right = 1.0 m

T2 Run
WW 3.0m
WD 0.1m
BW 7.0m
BD 0.2m
60 silt
20 sand
20 clay
left = 0.4m
right = 0.4m

T3 Run
WW 1.2m
WD 0.05
BW 1.5m
BD 0.2m
10 sand
40 gravel
50 cobble
left = 0.5m
right = 0.5m



PROFILE: Horz. Scale Vert. Scale

PROJECT #:	17M-01712-11
MAPPER:	KM CVD
NAME OF WATERBODY:	Little Lake Tributary 2
CROSSING #:	C3
STATION #:	—
DATE: DD-MMM-YY	14-OCT-20

LEGEND

10d depth (cm)
6w width

➡ Riffle
⇨ Run/Glide
⬭ Pool
▓ Island/Bar

▒ Fine Substrate
Gravel Substrate

oOooO Cobble /Boulder
* * * Debris

CT Cattail PH phrag
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

Seep/Spring
------ Undercut Bank

▬ Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
Culvert

GENERAL INFORMATION				
PROJECT #: 17M-01712-11	**PROJECT DESCRIPTION:** Hwy 401 Colborne	**DAY:** 14	**MONTH:** Oct	**YEAR:** 2020
Is STREAM REALIGNMENT required for this section: O Yes O No ✓ Unknown				
COLLECTORS: KM CUD	**WEATHER CONDITIONS:** sunny	**TIME STARTED:** 12:30	**TIME FINISHED:** 13:00	
AIR TEMP: 14°C	**WATER TEMP:** —	**CONDUCTIVITY (µS/cm):** —		
PHOTO NUMBERS AND DESCRIPTIONS: ph. 8686 – 8688				

LOCATION			
NAME OF WATERBODY: Unknown	**DRAINAGE SYSTEM:** Lake Ontario	**CROSSING #:** Little Lake Trib	**STATION #:** —
LOCATION OF CROSSING: along 401 ROW			
GPS COORDINATES: 18T 273942 4881693	**MTO CHAINAGE:** Eastern		
TOWNSHIP: Colborne to Brighton	**MNR DISTRICT:** Peterborough		

LAND USE AND POLLUTION	
SURROUNDING LAND USE: woodland, residential	**SOURCES OF POLLUTION:** road runoff

EXISTING STRUCTURE TYPE				
Bridge O	Box Culvert O	Open Foot Culvert O	CSP O	N/A ✓ O
Other O Describe:			Size (w x h) m^2	

SECTION TYPE AND MORPHOLOGY	
SECTION IDENTIFIER: Little Lake Trib (unknown)	**SECTION LOCATION:** (include on habitat map) along 401 ROW

TYPE:	Stream / river	Channelized	Permanent	Intermittent	Ephemeral	ASSOCIATED WETLAND:
	O	O	O	O	✓ O	

TOTAL SECTION LENGTH (m): 50 m	CURRENT VELOCITY (m/s): —

SUB-SECTION(S)	Run O	Pool O	Riffle O	Flats O	Inside culvert O	Other
Percentage of area						
Mean depth wetted (m)						
Mean width wetted (m)						
Mean bankfull width (m)						
Mean bankfull depth(m)						
Substrate						

Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D

BANK STABILITY				
	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank	O	O	O	O
Right Upstream Bank	O	O	O	O

HABITAT								
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris Instream Overhanging	Organic debris	Vascular Macrophytes Instream Overhanging	None

SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None
	O	O	O	O	O

VEGETATION TYPE (%):	Submergent	Floating	Emergent	None
Predominant Species				

MIGRATORY OBSTRUCTIONS:	None	Seasonal	Permanent
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning	Evidence of Groundwater	Other

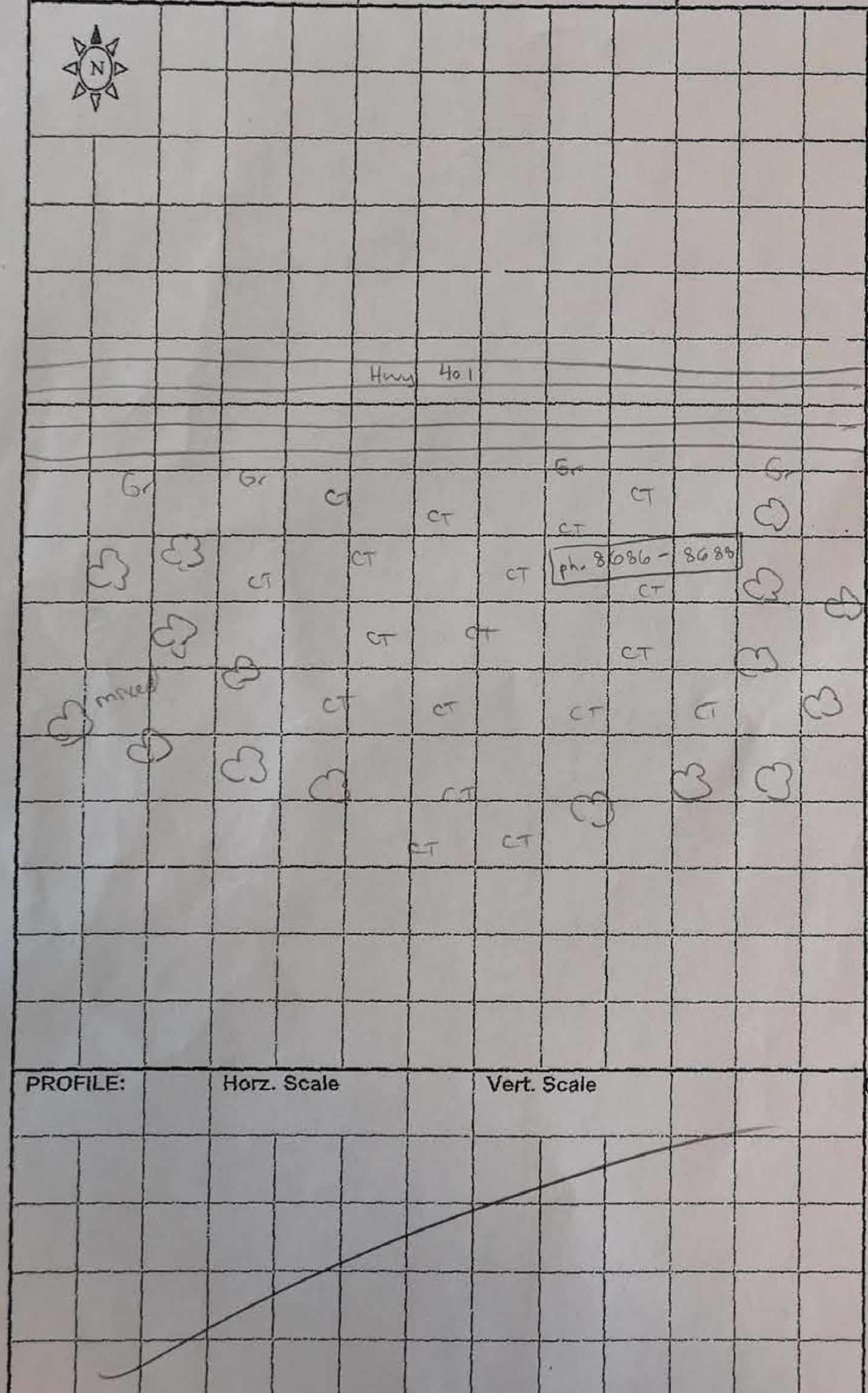
POTENTIAL ENHANCEMENT OPPORTUNITIES:

COMMENTS:

no channel was observed from ROW of 401.

Additional Notes Appended? O No O Yes number of pages _____

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
Little Lake Trib (unknown)	along 401 RoW	50	1 cm / 10 m



PROFILE: Horz. Scale Vert. Scale

PROJECT #: 17M-01712-11

MAPPER: KM CVD

NAME OF WATERBODY: Little Lake Trib (unknown)

CROSSING #: Little Lake Trib

STATION #: —

DATE: DD-MMM-YY 14-OCT-20

LEGEND

10d depth (cm)
6w width

➡ Riffle
⇨ Run/Glide
⬭ Pool
▥ Island/Bar

▒ Fine Substrate
Gravel Substrate
oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

⬭ Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

⊢▸ Seep/Spring
------- Undercut Bank

— Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
└─┘ Culvert

GENERAL INFORMATION

PROJECT #:	PROJECT DESCRIPTION:	DAY:	MONTH:	YEAR:
17M-01712-11	Hwy 401 Colborne	14	Oct	2020

Is STREAM REALIGNMENT required for this section:
O Yes O No O Unknown

COLLECTORS:	WEATHER CONDITIONS:	TIME STARTED:	TIME FINISHED:
KM CVD	Sunny	14:30	15:00

AIR TEMP:	WATER TEMP:	CONDUCTIVITY (µS/cm):
14°C	11.5°C	557

PHOTO NUMBERS AND DESCRIPTIONS: ph. 8689 - 8694, ph. 8860 - 8867

LOCATION

NAME OF WATERBODY:	DRAINAGE SYSTEM:	CROSSING #:	STATION #:
Biddy Creek	Lake Ontario	C4	—

LOCATION OF CROSSING: along 401 RoW

GPS COORDINATES:	MTO CHAINAGE:
18T 273743 4881629	Eastern
TOWNSHIP: Colborne to Brighton	**MNR DISTRICT:** Peterborough

LAND USE AND POLLUTION

SURROUNDING LAND USE:	SOURCES OF POLLUTION:
woodland, agricultural	road and agricultural runoff

EXISTING STRUCTURE TYPE

Bridge O	Box Culvert O	Open Foot Culvert O	CSP O	N/A O

Other O Describe:

4.2m x 2.3m
Size (w x h) m²

SECTION TYPE AND MORPHOLOGY

SECTION IDENTIFIER:	SECTION LOCATION: (include on habitat map)
C4	along 401 RoW

TYPE:	Stream / river	Channelized	Permanent	Intermittent	Ephemeral	ASSOCIATED WETLAND:
	O	O	Ø	O	O	—

TOTAL SECTION LENGTH (m):	CURRENT VELOCITY (m/s):
60	moderate

SUB-SECTION(S)	Run Ø	Pool Ø	Riffle Ø	Flats O	Inside culvert O	Other
Percentage of area	70	10	20			
Mean depth wetted (m)	0.2	0.3	0.1			
Mean width wetted (m)	3.4	2.3	3.5			
Mean bankfull width (m)	3.5	2.4	4.0			
Mean bankfull depth(m)	0.5	0.5	0.5			
Substrate	40 cobble 35 sand 12 gravel 13 boulder	40 sand 40 cobble 10 boulder 10 silt	30 sand 30 gravel 20 cobble 20 boulder			

Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D

Bank height
left = 0.9m
right = 5.0m

BANK STABILITY	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank	0	0	0	0
Right Upstream Bank	0	0	0	0

HABITAT								
IN-STREAM COVER (% surface area):	Undercut banks	Boulders 10	Cobble 20	Woody Debris Instream 10 Overhanging 10	Organic debris	Vascular Macrophytes Instream Overhanging 30	None

SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None
	0	0	0	0	0

VEGETATION TYPE (%):	Submergent	Floating	Emergent	None
Predominant Species	watercress		cattails, shrubs, grasses	

MIGRATORY OBSTRUCTIONS:	None	Seasonal	Permanent

POTENTIAL CRITICAL HABITAT LIMITING:	Spawning Juvenile Brook Trout	Evidence of Groundwater watercress, iron staining	Other

POTENTIAL ENHANCEMENT OPPORTUNITIES:

Protection of spawning grounds

COMMENTS:

Watercress in channel
Beaver chewed tree, chickadees

Direct Fish Habitat

Fish caught: White sucker, Northern Pearl Dace, Mottled Sculpin, Blacknose Dace, Brook Trout, Brook Stickleback, Northern Redbelly Dace

Additional Notes Appended? O No O Yes **number of pages** _____

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
C4	along 401 ROW	60	1 cm / 10 m

PROJECT #: TM-01712-11

MAPPER: KM CVD

NAME OF WATERBODY: Biddy Creek

CROSSING #: C4

STATION #: —

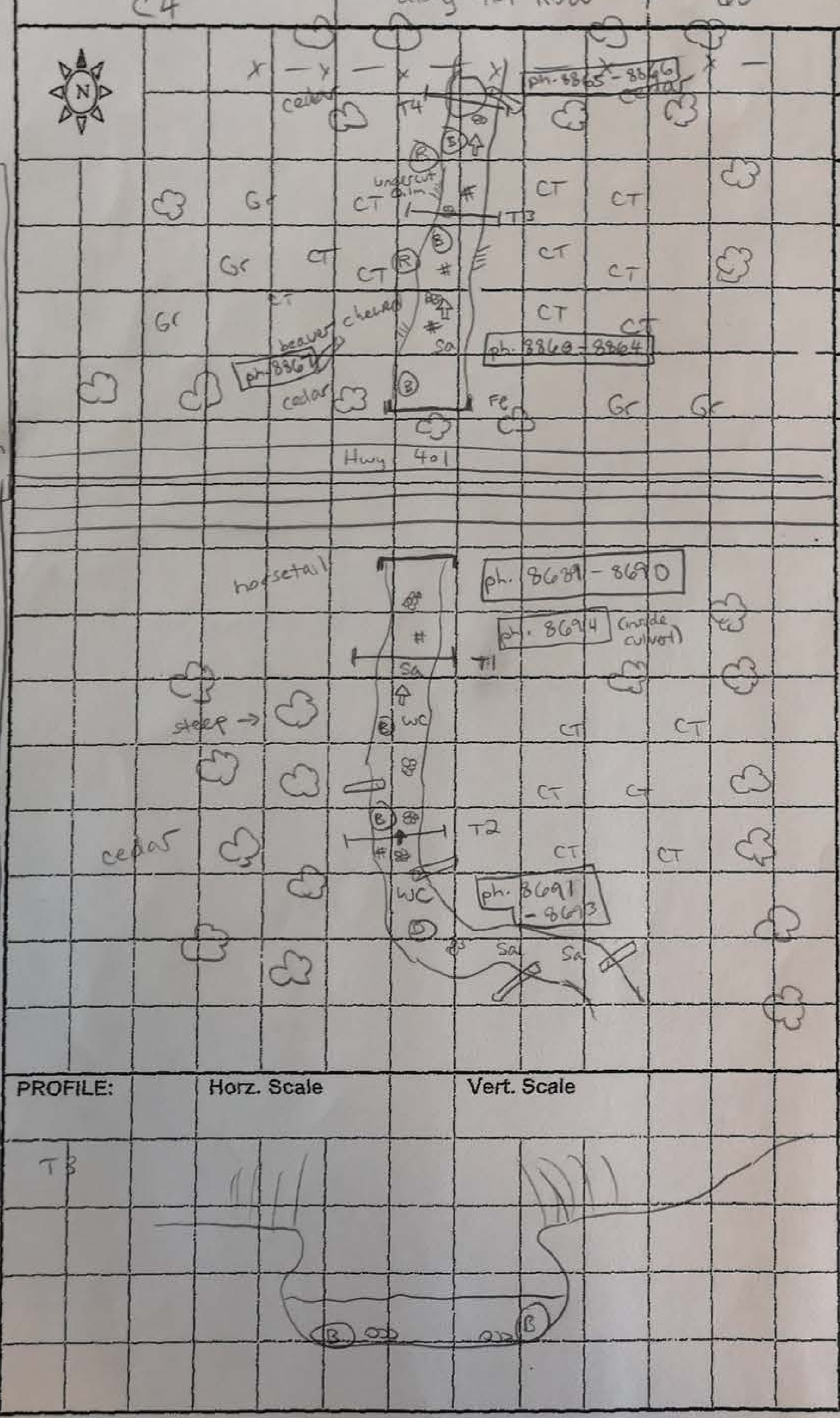
DATE: DD-MMM-YY 14-OCT-20 / 16-OCT-20

T1 Run
LW 3.3m
WD 0.2 m
BW 4.0 m
BD 0.5 m
50 sand
40 cobble
5 gravel
5 boulder
left = 1.0m
right = 8 m

T2 Riffle
WW 3.5m
WD 0.13m
BW 4.0m
BD 0.5m
30 sand
30 gravel
20 cobble
20 boulder
Left: 1.0m
right: 8m

T3 Run
WW 2.5 m
WD 0.23m
BW 2.6m
BD 0.43m
20 boulder
40 cobble
20 gravel
20 sand
left = 0.8m
right = 2.0m

T4 Pool
WW 2.3m
WD 0.3 m
BW 2.4m
BD 0.5
10 silt
40 sand
10 boulder
40 cobble
left = 0.8m
right = 2.0m



LEGEND

10d depth (cm)
6w width

→ Riffle
⇨ Run/Glide
⬭ Pool
▒ Island/Bar

▒ Fine Substrate
Gravel Substrate
oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

Seep/Spring
------ Undercut Bank

— Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
Culvert

GENERAL INFORMATION				
PROJECT #: 17M-01712-11	**PROJECT DESCRIPTION:** Hwy 401 Colborne	**DAY:** 14	**MONTH:** Oct	**YEAR:** 2020
Is STREAM REALIGNMENT required for this section: O Yes O No ✓ Unknown				
COLLECTORS: KM CVP	**WEATHER CONDITIONS:** sunny	**TIME STARTED:** 16:30	**TIME FINISHED:** 17:00	
AIR TEMP: 14°C	**WATER TEMP:** 11.5°C	**CONDUCTIVITY (µS/cm):** 557		
PHOTO NUMBERS AND DESCRIPTIONS: ph. 8737 – 8745, ph. 8850 – 8859				

LOCATION			
NAME OF WATERBODY: Biddy Creek	**DRAINAGE SYSTEM:** Lake Ontario	**CROSSING #:** C5	**STATION #:** —
LOCATION OF CROSSING: along 401 between Colborne and Brighton			
GPS COORDINATES: 18T 273743 4881629		**MTO CHAINAGE:** Eastern	
TOWNSHIP: Colborne to Brighton		**MNR DISTRICT:** Peterborough	

LAND USE AND POLLUTION	
SURROUNDING LAND USE: woodland, agricultural	**SOURCES OF POLLUTION:** road runoff

EXISTING STRUCTURE TYPE				
Bridge O	Box Culvert ✓	Open Foot Culvert O	CSP O	N/A O
Other O Describe:				4.3 m x 1.9 m Size (w x h) m²

SECTION TYPE AND MORPHOLOGY	
SECTION IDENTIFIER: C5	**SECTION LOCATION:** (include on habitat map) along 401

TYPE:	Stream / river	Channelized	Permanent	Intermittent	Ephemeral	ASSOCIATED WETLAND:
	O	O	✓	O	O	—

TOTAL SECTION LENGTH (m): 60	**CURRENT VELOCITY (m/s):** moderate

SUB-SECTION(S)	Run ✓	Pool	Riffle ✓	Flats ✓	Inside culvert	Other
	O	O	O	O	O	
Percentage of area	40		20	40		
Mean depth wetted (m)	0.3		0.1	0.3		
Mean width wetted (m)	1.9		3.2	2.0		
Mean bankfull width (m)	2.3		3.8	4.0		
Mean bankfull depth(m)	0.5		0.4	0.5		
Substrate	40 cobble 30 sand 30 gravel		50 cobble 50 gravel	50 sand 50 gravel		

Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D

Bank height
left= 5.7m
right= 0.5m

BANK STABILITY				
	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank	O	✓	O	O
Right Upstream Bank	✓	O	O	O

HABITAT							
IN-STREAM COVER (% surface area):	**Undercut banks** 5	**Boulders**	**Cobble** 15	**Woody Debris** Instream 10 Overhanging 20	**Organic debris**	**Vascular Macrophytes** Instream Overhanging 10	**None**

SHORE COVER (% stream shaded):	**100 – 90 %** O	**90 – 60%** O	**60- 30%** ✓ O	**30 – 1%** O	**None** O

VEGETATION TYPE (%):	**Submergent**	**Floating**	**Emergent** 100	**None**
Predominant Species			cattails	

MIGRATORY OBSTRUCTIONS:	**None**	**Seasonal**	**Permanent**
POTENTIAL CRITICAL HABITAT LIMITING:	**Spawning** juvenile Brook Trout	**Evidence of Groundwater** iron staining	**Other**

POTENTIAL ENHANCEMENT OPPORTUNITIES:

protect spawning grounds

COMMENTS:

pH 7.95

Direct Fish Habitat

same fish community as C4

Additional Notes Appended? O No O Yes number of pages _____

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
C5	along 401	60	1 cm / 10 m

T1 Flat
WW 2.0m
WD 0.3m
BW 4.0m
BD 0.5m
left = 1.1m
right = 0.7m
50 sand
50 gravel

T2 Run
WW 1.9m
WD 0.3m
BW 2.3m
BD 0.5m
40 cobble
30 sand
30 gravel
left = 8.0m
right = 0.8m

T3 Riffle
WW 3.2m
WD 0.1m
BW 3.8m
BD 0.4m
50 cobble
50 gravel
left = 8.0m
right = 0.8m

PROFILE: Horz. Scale Vert. Scale

PROJECT #: 17M-01712-11

MAPPER: KM CVD

NAME OF WATERBODY: Biddy Creek

CROSSING #: C5

STATION #:

DATE: DD-MMM-YY 14-OCT-20

LEGEND

10d depth (cm)
6w width

➡ Riffle
⇨ Run/Glide
⬭ Pool
▮ Island/Bar

▒ Fine Substrate
Gravel Substrate
oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

⬭ Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

⊢► Seep/Spring
------- Undercut Bank

▬ Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
└┘ Culvert

GENERAL INFORMATION

PROJECT #:	PROJECT DESCRIPTION:	DAY:	MONTH:	YEAR:
17M-01712-11	Hwy 401 Colborne	15	Oct	2020

Is STREAM REALIGNMENT required for this section:
O Yes O No Ø Unknown

COLLECTORS:	WEATHER CONDITIONS:	TIME STARTED:	TIME FINISHED:
KM CVD	cloudy	8:45	9:00

AIR TEMP:	WATER TEMP:	CONDUCTIVITY (µS/cm):
16°C	10.8°C	522

PHOTO NUMBERS AND DESCRIPTIONS: ph. 8747-8752 , ph. 8842-8846

LOCATION

NAME OF WATERBODY:	DRAINAGE SYSTEM:	CROSSING #:	STATION #:
Biddy Creek	Lake Ontario	C6	—

LOCATION OF CROSSING: along 401 ROW between Colborne and Brighton

GPS COORDINATES:	MTO CHAINAGE:
18T 275747 4882351	Eastern
TOWNSHIP: Colborne to Brighton	**MNR DISTRICT:** Peterborough

LAND USE AND POLLUTION

SURROUNDING LAND USE:	SOURCES OF POLLUTION:
wetland, woodland	road runoff

EXISTING STRUCTURE TYPE

Bridge O	Box Culvert Ø	Open Foot Culvert Ø	CSP O	N/A O

Other O Describe:	4.25m x 2.0m Size (w x h) m^2

SECTION TYPE AND MORPHOLOGY

SECTION IDENTIFIER:	SECTION LOCATION: (include on habitat map)
C6	along 401

TYPE:	Stream / river	Channelized	Permanent	Intermittent	Ephemeral	ASSOCIATED WETLAND:
	O	O	Ø	O	O	—

TOTAL SECTION LENGTH (m):	CURRENT VELOCITY (m/s):
60	moderate

SUB-SECTION(S)	Run	Pool	Riffle	Flats	Inside culvert	Other
	O	O	O	Ø	O	
Percentage of area				100		
Mean depth wetted (m)				1.3		
Mean width wetted (m)				4.2		
Mean bankfull width (m)				6.6		
Mean bankfull depth(m)				1.6		
Substrate				40 muck 25 sand 25 gravel 10	cobble	

Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D

Bank height
left = 2.0m
right = 2.0m

BANK STABILITY	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank	0	0	0	0
Right Upstream Bank	0	0	0	0

HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris Instream Overhanging	Organic debris	Vascular Macrophytes Instream 30 Overhanging 40	None

SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None
	0	0	0	0	0

VEGETATION TYPE (%):	Submergent	Floating	Emergent	None
	30	10	60	
Predominant Species	watercress	duck weed	cattails	

MIGRATORY OBSTRUCTIONS:	None	Seasonal	Permanent

POTENTIAL CRITICAL HABITAT LIMITING:	Spawning	Evidence of Groundwater	Other
	juvenile Brook Trout d/s	watercress (high amounts)	

POTENTIAL ENHANCEMENT OPPORTUNITIES:

COMMENTS:

pH 7.55

Marsh bird habitat (i.e. redwing blackbirds), crows

Fish observed (minnows)

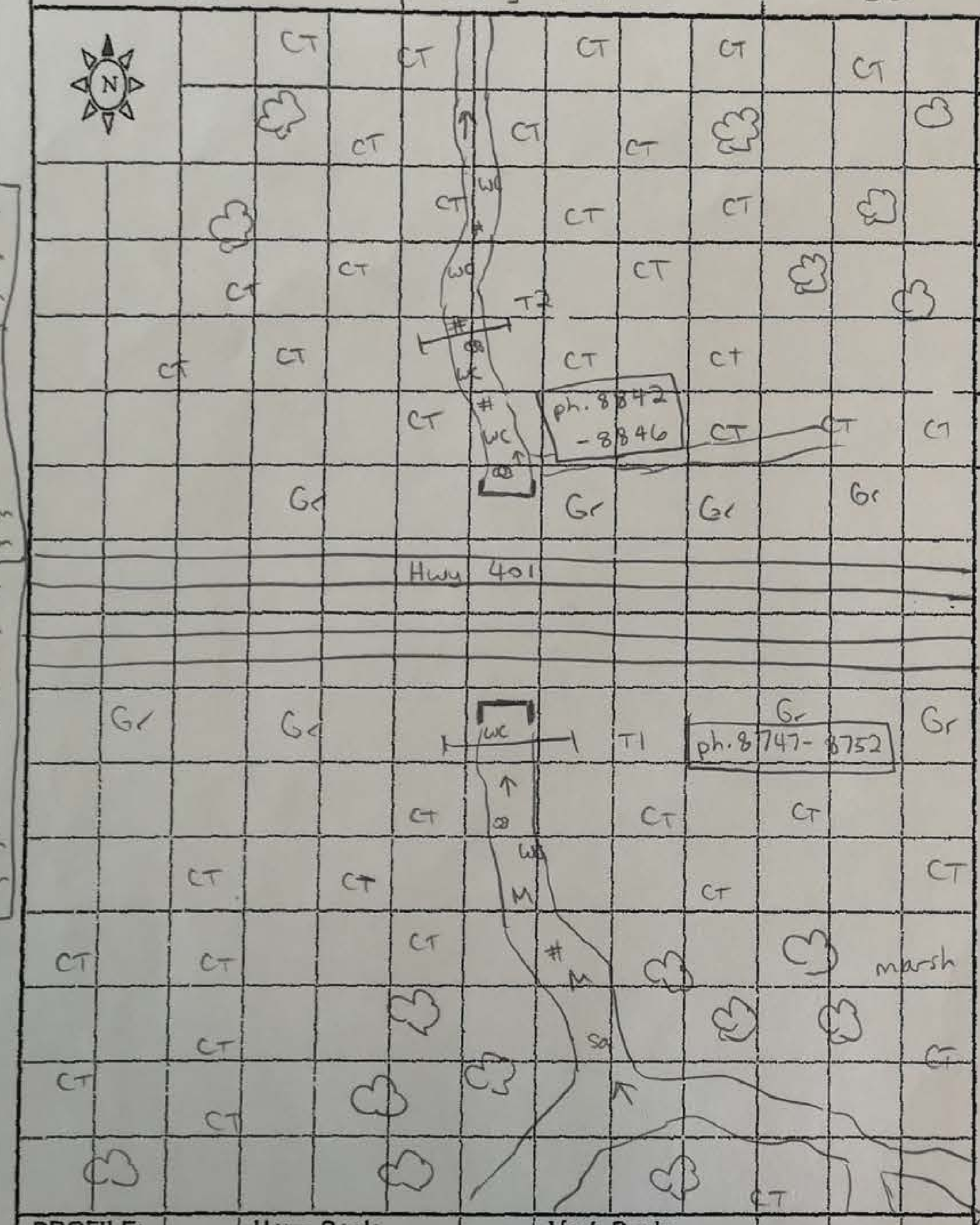
Direct fish habitat

Additional Notes Appended? O No O Yes number of pages _____

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
C6	along 401	60	1 cm / 10m

T1 Flat
WW 5.0m
WD 1.3m
BW 7.0m
BD 1.6m
60 muck
20 sand
10 gravel
10 cobble
Left = 2.0m
right = 2.0m

T2 Flat
WW 3.45m
WD 1.2m
BW 6.1 m
BD 1.5m
30 sand
20 muck
40 gravel
10 cobble
left = 2.0m
right = 2.0m



PROFILE: Horz. Scale Vert. Scale

PROJECT #:	17M-01712-11
MAPPER:	KM CVD
NAME OF WATERBODY:	Biddy Creek
CROSSING #:	C6
STATION #:	—
DATE: DD-MMM-YY	15-OCT-20

LEGEND

10d depth (cm)
6w width

➡ Riffle
⇨ Run/Glide
⬭ Pool
▮ Island/Bar

▒ Fine Substrate
Gravel Substrate
oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

⊂⊃ Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

⊢▸ Seep/Spring
------ Undercut Bank

— Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
⌴ Culvert

GENERAL INFORMATION

PROJECT #:	PROJECT DESCRIPTION:	DAY:	MONTH:	YEAR:
17M-01712-11	Hwy 401 Colborne	15	Oct	2020

Is STREAM REALIGNMENT required for this section:

O Yes O No O✓ Unknown

COLLECTORS:	WEATHER CONDITIONS:	TIME STARTED:	TIME FINISHED:
KM CVD	cloudy	Oct 16 9:15 / 10:10	9:30 / 10:30

AIR TEMP:	WATER TEMP:	CONDUCTIVITY (µS/cm):
Oct 16 8°C	10.8°C	750

PHOTO NUMBERS AND DESCRIPTIONS: ph. 8753 – 8758, ph. 8834 – 8841

LOCATION

NAME OF WATERBODY:	DRAINAGE SYSTEM:	CROSSING #:	STATION #:
Unknown	Biddy Creek?	C7	—

LOCATION OF CROSSING: along 401 between Colborne and Brighton

GPS COORDINATES:	MTO CHAINAGE:
18T 276607 4882430	Eastern
TOWNSHIP: Colborne to Brighton	**MNR DISTRICT:** Peterborough

LAND USE AND POLLUTION

SURROUNDING LAND USE:	SOURCES OF POLLUTION:
woodland	road runoff

EXISTING STRUCTURE TYPE

Bridge O	Box Culvert O	Open Foot Culvert O	CSP O✓	N/A O

Other O Describe:	Size (w x h) m²
	1.35m x 0.98m

SECTION TYPE AND MORPHOLOGY

SECTION IDENTIFIER:	SECTION LOCATION: (include on habitat map)
C7	along 401

TYPE:	Stream / river	Channelized	Permanent	Intermittent	Ephemeral	ASSOCIATED WETLAND:
	O	O	O✓	O	O	—

TOTAL SECTION LENGTH (m):	CURRENT VELOCITY (m/s):
60	moderate

SUB-SECTION(S)	Run O✓	Pool O	Riffle O	Flats O	Inside culvert O	Other
Percentage of area	100					
Mean depth wetted (m)	0.1					
Mean width wetted (m)	1.2					
Mean bankfull width (m)	2.0					
Mean bankfull depth(m)	0.3					
Substrate	50 cobble 20 gravel 15 sand	15 clay				

Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D

Bank height:
left = 0.8m
right = 1.7m

BANK STABILITY				
	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank	O	O	O	O
Right Upstream Bank	O	O	O	O

HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris Instream Overhanging	Organic debris	Vascular Macrophytes Instream 30 Overhanging 30	None
			20				

SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None
	O	O	O	O	O

VEGETATION TYPE (%):	Submergent	Floating	Emergent	None
	40		60	
Predominant Species	watercress		cattails	

MIGRATORY OBSTRUCTIONS:	None	Seasonal	Permanent

POTENTIAL CRITICAL HABITAT LIMITING:	Spawning	Evidence of Groundwater	Other
		watercress, oily sheen, Fe staining	

POTENTIAL ENHANCEMENT OPPORTUNITIES:

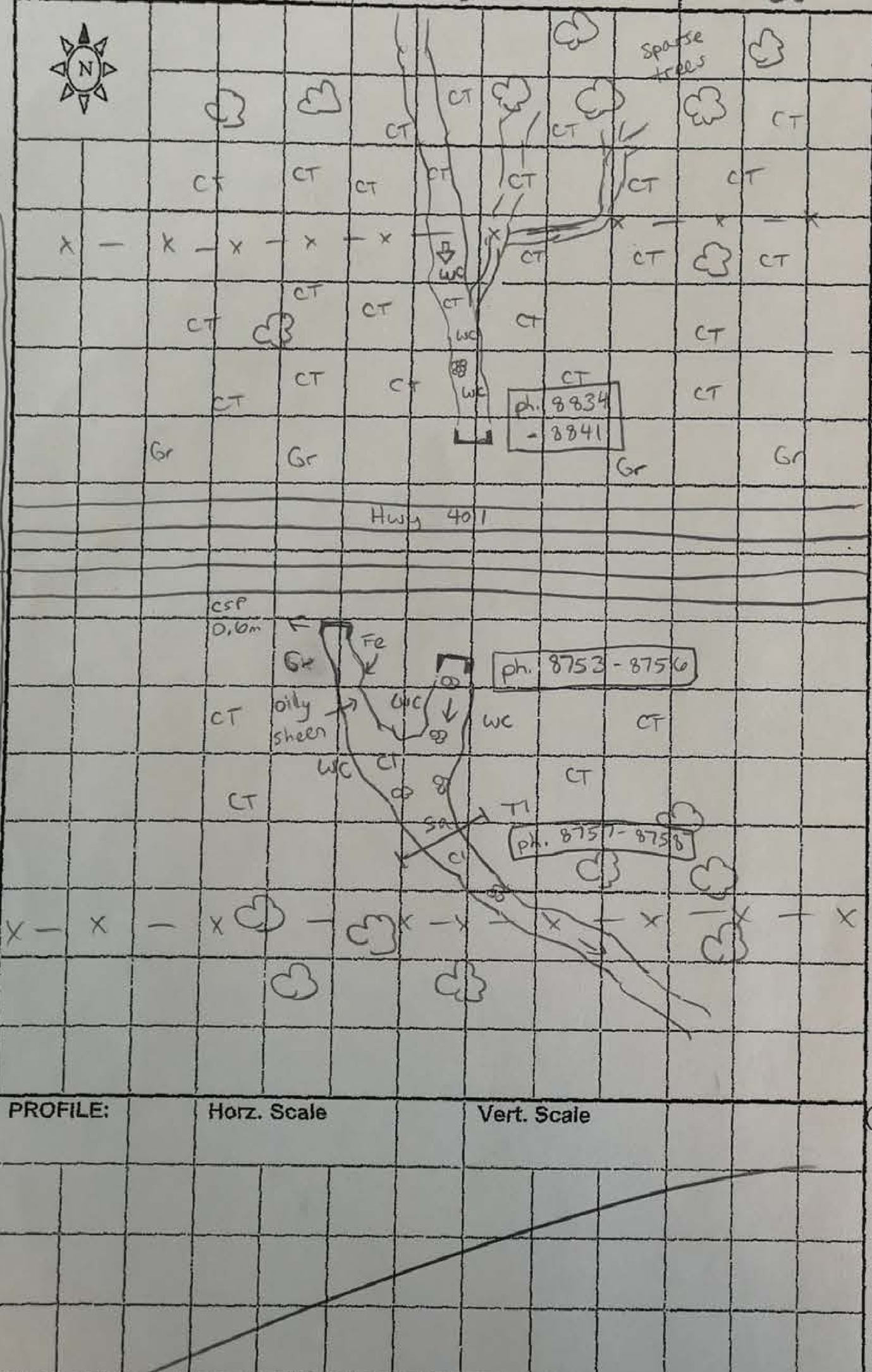
COMMENTS:

pH 8.08
woodpecker holes, chickadees

Direct fish habitat. (Brook Stickleback present)

Additional Notes Appended? O No O Yes number of pages _____

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
C7	along 401	60	1 cm / 10 m



PROJECT #: 17M-01712-11

MAPPER: KM CUD

NAME OF WATERBODY: Unknown

CROSSING #: C7

STATION #: —

DATE: DD-MMM-YY: 15-Oct-20

LEGEND

10d depth (cm)
6w width

➡ Riffle
⇨ Run/Glide
⬭ Pool
▒ Island/Bar

▒ Fine Substrate
Gravel Substrate
oOooO Cobble /Boulder
*** Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

⊂⊃ Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

⊢▸ Seep/Spring
------ Undercut Bank

— Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
└─┘ Culvert

GENERAL INFORMATION				
PROJECT #: 17M-01712-11	**PROJECT DESCRIPTION:** Hwy 401 Colborne	**DAY:** 15	**MONTH:** Oct	**YEAR:** 2020
Is STREAM REALIGNMENT required for this section: O Yes O No O Unknown				
COLLECTORS: KM CVD	**WEATHER CONDITIONS:** cloudy, rain	**TIME STARTED:** 10:10	**TIME FINISHED:** 11:00	
AIR TEMP: 16°C	**WATER TEMP:** 11.1°C	**CONDUCTIVITY (µS/cm):** 2392		
PHOTO NUMBERS AND DESCRIPTIONS: ph. 8762 - 8765				

LOCATION			
NAME OF WATERBODY: Unknown WC within 30 m	**DRAINAGE SYSTEM:** Lake Ontario	**CROSSING #:** Unknown WC	**STATION #:** —
LOCATION OF CROSSING: along 401 ROW between Colborne and Brighton			
GPS COORDINATES: 18T 277229 4882724		**MTO CHAINAGE:** Eastern	
TOWNSHIP: Colborne to Brighton		**MNR DISTRICT:** Peterborough	

LAND USE AND POLLUTION	
SURROUNDING LAND USE: agricultural, woodland	**SOURCES OF POLLUTION:** road and agricultural runoff

EXISTING STRUCTURE TYPE				
Bridge O	Box Culvert O	Open Foot Culvert O	CSP O	N/A O
Other O Describe:			Size (w x h) m^2 —	

SECTION TYPE AND MORPHOLOGY						
SECTION IDENTIFIER: unknown WC		**SECTION LOCATION:** (include on habitat map) along 401 ROW				
TYPE:	Stream / river O	Channelized O	Permanent O	Intermittent O	Ephemeral O	**ASSOCIATED WETLAND:**
TOTAL SECTION LENGTH (m): 100			**CURRENT VELOCITY (m/s):** stagnant			

SUB-SECTION(S)	Run O	Pool O	Riffle O	Flats O	Inside culvert O	Other stagnant
Percentage of area						100
Mean depth wetted (m)						0.1
Mean width wetted (m)						0.8
Mean bankfull width (m)						1.0
Mean bankfull depth(m)						0.2
Substrate						100 muck

Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D

Bank height
left = 1.0m
right = 1.0m

BANK STABILITY				
	Stable	Slightly Unstable	Moderately Unstable	Unstable
Left Upstream Bank	O	O	O	O
Right Upstream Bank	O	O	O	O

HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris Instream Overhanging	Organic debris	Vascular Macrophytes Instream 40 Overhanging 40	None

SHORE COVER (% stream shaded):	100 – 90 %	90 – 60%	60- 30%	30 – 1%	None
	O	O	O	O	O

VEGETATION TYPE (%):	Submergent	Floating	Emergent	None
		10	90	
Predominant Species		duck weed	cattails	

MIGRATORY OBSTRUCTIONS:	None	Seasonal	Permanent
		low flow	dense veg

POTENTIAL CRITICAL HABITAT LIMITING:	Spawning	Evidence of Groundwater	Other

POTENTIAL ENHANCEMENT OPPORTUNITIES:

COMMENTS:

pH 7.37
Stagnant water
Potential deer beds

Looks like ditch flow.
Potentially originates from Little Lake or ends there.

Indirect fish habitat

Additional Notes Appended? O No O Yes **number of pages** _____

SECTION IDENTIFIER:	SECTION LOCATION:	SECTION LENGTH (m):	SCALE (cm / m):
unknown WC	runs along 401	100	1 cm / 10 m

T1 Stagnant
WW 0.84 m
WD 0.14 m
100 muck

Hwy 401

CT CT CT CT CT CT CT CT CT CT CT CT CT

ph. 8762 – 8763

PROFILE: Horz. Scale Vert. Scale

PROJECT #: 17M-01712-11

MAPPER: KM CUD

NAME OF WATERBODY: unknown

CROSSING #: Unknown WC within 30 m

STATION #: —

DATE: DD-MMM-YY
15-OCT-20

LEGEND

10d depth (cm)
6w width

➡ Riffle
⇨ Run/Glide
⬭ Pool
▒ Island/Bar

▒ Fine Substrate
Gravel Substrate

oOooO Cobble /Boulder
* * * Debris

CT Cattail
SV/FV Submerg/Float Veg

EV Emergent Vegetation
W Watercress

Fe Iron Staining
/////// Eroded Bank

XXX Riprap / Other Stabilization

⊂⊃ Instream Log/Tree
^^^ Dam/Weir/Obstruction

® Riparian Tree

⊢▶ Seep/Spring
------ Undercut Bank

— Barrier to Fish Movement
-S- Seasonal Barrier

-x--x- Fence line
⌴ Culvert

APPENDIX C

Correspondence

Enoae, Jenny

From: Warren, Catherine (MNRF) <Catherine.Warren@ontario.ca>
Sent: August 20, 2020 10:36 AM
To: Enoae, Jenny
Cc: Ritchie, Shannon; Mohr, Pat; Mitchell, Kim; Vazz, Christine; Formsma, Julie (MNRF)
Subject: RE: Highway 401 Planning Study from Colborne to Brighton - Preliminary Design and Class Environmental Assessment Study MNRF File No: 20-CRAM-NOR-EAE-3124
Attachments: MNRF Information Request_Request to Confirm WSP 20200806_CHcomments.docx; ANSI_P-ES- BrightonBluff-CS-I_from_PAPIR.pdf; Approved Boundary Map.2012.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Hello Jenny,

The MNRF Peterborough District has received your e-mail dated August 10, 2020 regarding the Class EA for rehabilitation and replacement of six structures in preparation for the widening Highway 401 Colborne to Brighton. We provide the following general information and technical advice for your consideration.

General: MNRF Data and Information

The MNRF's natural heritage and natural resources GIS data layers can be obtained through the Ministry's Land Information Ontario (LIO) website. You may also view natural heritage information online (e.g., Provincially Significant Wetlands, ANSIs, woodlands, etc.) using the Natural Heritage Make a Map tool.

We recommend that you use the above-noted sources of information during the review of your project proposal.

The MNRF may provide additional information and technical advice if additional details of the proposed works are circulated to our office.

Wetlands

The subject area is adjacent to unevaluated wetlands as well as a wetland, Biddy Creek (which is evaluated as "other significance"), located where the 401 crosses Brighton Cramahe Boundary Road). The MNRF recommends that the unevaluated wetlands be treated as Provincially Significant Wetland or evaluated by an Ontario Wetland Evaluation System (OWES) certified evaluator.

Any new evaluations or proposed changes made to an evaluated wetland boundary must be submitted to our office for approval as per the Ontario Wetland Evaluation System (OWES).

If a new OWES evaluation will be undertaken, please contact our office early in the process for advice on scoping the evaluation/field studies.

We recommend contacting your local Conservation Authority for more information on approvals that they may require.

As the study area contains unevaluated wetlands and a wetland evaluated as "other significance" please note that all wetlands (regardless of significance) within the Growth Plan area (except settlement areas) are both key hydrologic features and key natural heritage features and should be assessed for any negative impacts from the proposed works. Unevaluated wetlands generally require field verification to confirm boundaries since they are based on remotely-sensed data. MNRF recommends that any potential wetlands in the study area be mapped and confirmed in the field.

The Infrastructure policies of the Growth Plan state that an environmental assessment should demonstrate "that any impacts on key natural heritage features in the Natural Heritage System for the Growth Plan, key hydrologic features and key hydrologic areas have been avoided, or if avoidance is not possible, minimized and to the extent feasible mitigated." (S. 3.2.5). Please see the Growth Plan definitions for a list of key natural heritage features and key hydrologic features. Please note that not all key natural heritage features or key hydrologic features have been mapped in advance and field verifications may be required to map some of these features.

MNRF recommends that new footprint or disturbance (including temporary disturbance e.g. laydown areas) be avoided within or adjacent to wetlands. Work should avoid negative impacts to these features by following best practices for construction e.g. avoiding sedimentation into wetlands. The use of equipment cleaning protocols is strongly recommended to prevent the introduction or spread of invasive species (e.g. European common reed, *Phragmites australis*) into natural heritage features. An example protocol can be found here: http://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf

General turtle critical periods include;
Active season: April 15th – October 15th
Hibernation: October 15th – April 15th
Mating: April, September and October but may occur at any time of year, including during hibernation
Nesting: May 15th – June 30th; lasts about 3 weeks each year
Hatching: August 15th – September 30st
Dispersal/migration: April 15th – May 15th; September 1st – September 30th

If works are planned between May 15 and September 30 and work locations are adjacent to wetlands, ponds, or lakes, they should have turtle exclusion fencing erected prior to May 15 and maintained until June 30 to prevent turtles from nesting in the work area. BMP for fencing can be found at https://files.ontario.ca/bmp_herp_2016_final_final_resized.pdf

Areas of Natural and Scientific Interest (ANSIs)
The Brighton Bluff Earth Science ANSI is in the subject area, east of County Road 26 to near the Brighton-Quinte West boundary. Information about this ANSI is attached to this email.

Fish and Fish Habitat
Please see attached fisheries table for information on the watercourse thermal regime and fish species.

The MNRF recommends minimum 30 m naturally vegetated buffers to protect fish habitat.

Please contact Fisheries and Oceans Canada and the local Conservation Authority for any other approvals that may be required.

Species at Risk

The Ministry of Environment, Conservation and Parks (MECP) has now assumed responsibility for the Endangered Species Act (ESA), including species at risk (SAR) in Ontario. Please contact SAROntario@ontario.ca to reach the MECP for advice about species at risk and the ESA.

Breeding Bird Season:
Workers must be vigilant and check work areas for the presence of breeding birds and nests containing eggs and/or young. If breeding birds and/or nests are encountered, works should not continue in the location of the nest until after August 1 (or as soon as it has been determined that that the young have left the nest). Please note that the breeding bird season in the subject area extends from April 15 to July 31.

For further information of bird timing windows, see: https://www.ontario.ca/page/remove-bird-nests-or-eggs.

Fish and Wildlife Conservation Act
Please note that you may require a Licence to Collect Fish for Scientific Purposes or Wildlife Scientific Collector's Authorization from our office if you will be doing any fish or wildlife sampling, collection, salvage, or relocation. For more information, please contact Julie Formsma, Fish and Wildlife Technical Specialist, at 705-755-3296.

MNRF has received your FCL for this project and are working on processing it.

Other Approvals
It is the responsibility of the proponent to acquire all other information and necessary approvals from any other municipal, Conservation Authority, provincial, or federal authority under other legislation.

If you have any questions regarding the above comments, don't hesitate to contact me. Please reference file number: 20-CRAM-NOR-EAE-3124 for any future correspondence.

Sincerely,
Catherine

From: Enoae, Jenny <Jenny.Enoae@wsp.com>
Sent: August 10, 2020 3:46 PM
To: Warren, Catherine (MNRF) <Catherine.Warren@ontario.ca>
Cc: Ritchie, Shannon <shannon.ritchie@wsp.com>; Mohr, Pat <Pat.Mohr@wsp.com>; Mitchell, Kim <Kim.Mitchell@wsp.com>; Vazz, Christine <Christine.Vazz@wsp.com>
Subject: RE: Highway 401 Planning Study from Colborne to Brighton - Preliminary Design and Class Environmental Assessment Study

Hello Catherine,

Please find attached WSP's request for natural heritage information with regards to the MTO Highway 401 Colborne to Brighton EA/PD project in which you recently received a Project Commencement Notification for.

In addition to the request for information, we are also seeking a FCL for the watercourses identified – forms are attached.

If you have any questions, please feel free to contact me at any time.

Regards,

Jenny Enoae, M.Sc.
Project Ecologist
Ecology and Environmental Impact Assessment (EIA)

T+ 1 289-982-4848
M+ 1 416-885-0721

100 Commerce Valley Drive West
Thornhill, Ontario
L3T 0A1 Canada
wsp.com

From: Warren, Catherine (MNRF) [mailto:Catherine.Warren@ontario.ca]
Sent: August-05-20 11:13 AM
To: Highway 401 Colborne to Brighton Project Team <project-team@highway401colbornebrighton.ca>
Subject: RE: Highway 401 Planning Study from Colborne to Brighton - Preliminary Design and Class Environmental Assessment Study

Hello,

Thank you very much for sending this notice to MNRF. If it would be helpful MNRF can provide information about natural heritage features (e.g., wetlands and ANSIs) for this area. It would be useful for us to have a more detailed may of the study area to confirm that we are looking at the correct features. We can also look into the thermal regimes of waterways that may be affected by this project. To do this it would be necessary for us to have a list of the coordinates of the water crossings in the study area. Are you looking for that sort of information at this time?

All the best,
Catherine

From: Highway 401 Colborne to Brighton Project Team <project-team@highway401colbornebrighton.ca>
Sent: July 27, 2020 5:12 PM
Cc: Waseem, Muhammad (MTO) <Muhammad.Waseem@ontario.ca>; Pipe, Erin (MTO) <Erin.Pipe@ontario.ca>; Gotts, Brent <Brent.Gotts@wsp.com>; Nairn, Sandy <Sandy.Nairn@wsp.com>
Subject: Highway 401 Planning Study from Colborne to Brighton - Preliminary Design and Class Environmental Assessment Study

Hi,

Please see the attached Notice of Study Commencement letter regarding the above mentioned project.

Thank you,

The Highway 401 Colborne to Brighton Project Team

-LAEmHhHzdJzBITWfa4Hgs7pbKI

From: Warren, Jeff
Sent: December 5, 2021 11:31 AM
To: Warren, Jeff
Subject: FW: MECP Data Request

From: Species at Risk (MECP) <SAROntario@ontario.ca>
Sent: Wednesday, June 09, 2021 8:34 PM
To: Van Daele, Carly <Carly.VanDaele@wsp.com>
Cc: Warren, Jeff <Jeff.Warren@wsp.com>
Subject: RE: MECP Data Request

Good evening Ms. Van Daele,

I'm sorry I was unable to respond sooner. A review of our best available information includes the same species you have listed. We also have the following additional species observations to add to your list.

- Butternut (Endangered)
- Monarch (Special Concern)

This list should not be considered complete. Site surveys may be required to confirm the presence of species at risk and/or their habitat and to also determine if there will be potential impacts associated with the project.

Please let me know if you have any questions.

Monique Charette
Management Biologist
Ministry of the Environment, Conservation and Parks
Permissions and Compliance Section
Species At Risk Branch
(613) 583-3162
Monique.charette@ontario.ca

From: Van Daele, Carly <Carly.VanDaele@wsp.com>
Sent: November 17, 2020 9:38 AM
To: Species at Risk (MECP) <SAROntario@ontario.ca>
Cc: Warren, Jeff <Jeff.Warren@wsp.com>
Subject: RE: MECP Data Request

To whom it may concern,

WSP Canada Inc. (WSP) has been retained by Ministry of Transportation Ontario (MTO) to complete Planning, Preliminary Design and Class Environmental Assessment Study (Class EA) on Highway 401 between Colborne and Brighton. The location of the study area is shown on the attached map.

As such, we are formally contacting you to request any available natural heritage information pertinent to the study area. We have also contacted Lower Trent Conservation.

We are currently aware of the following natural heritage information for the study area:

- A review of Natural Heritage Information Centre (NHIC) revealed records for:
    - Blanding's Turtle (*Emydoidea blandingii*) – END
    - Eastern Wood-pewee (*Contopus virens*) – SC
    - Snapping Turtle (*Chelydra serpentina*) – SC
    - Wood Thrush (*Hylocichla mustelina*) – SC

- The following watercourses and waterbodies are within the study area vicinity:
    - Colborne Creek Tributary
    - Little Lake Tributary 1 and 2
    - Unknown Watercourse (44° 3'39.39"N, 77°47'21.03"W)
    - Biddy Creek Crossing 1, 2 and 3
    - Proctor's Creek
    - Proctor's Creek Tributary
    - Smithfield Creek Tributary
    - Mayhew Creek Tributary 1 and 2
    - Little Lake

- A review of the Ontario Breeding Bird Atlas (OBBA) for square #18TTP78 and 18TTP67 revealed additional records for the following SAR and provincially rare species within the study area vicinity:
    - Bank Swallow
    - Barn Swallow
    - Black Tern
    - Bobolink
    - Canada Warbler
    - Cerulean Warbler
    - Chimney Swift
    - Common Nighthawk
    - Eastern Meadowlark
    - Eastern Whip-poor-will
    - Evening Grosbeak
    - Golden-winged Warbler
    - Grasshopper Sparrow
    - King Rail
    - Least Bittern
    - Loggerhead Shrike
    - Northern Bobwhite
    - Olive-sided Flycatcher

    - Red-headed Woodpecker
    - Red-shouldered Hawk
    - Short-eared Owl
    - Yellow-breasted Chat

- A review of the Ontario Reptile and Amphibian Atlas (ORAA) for square #18TP67, 18TP88 revealed additional records for the following SAR and provincially rare species within the study area vicinity:
    - Milksnake
    - Northern Map Turtle

Additional information we are seeking includes any of the following information that is not publicly available through the above sources:

- Species at Risk (SAR):
    - List of SAR to be considered for the study area
    - Locations, observation dates and any other relevant information about SAR – if possible, please provide the UTMs/accuracy codes
    - Locally rare species lists or records and/or rare vegetation communities known from the study area

If further information is required, please feel free to contact the undersigned. Thank you for your assistance, it is greatly appreciated.

Thank you,
Carly

Carly Van Daele, B.E.S.
T +1 519-904-1778

From: Leah Stephens <leah.stephens@ltc.on.ca>
Sent: November 25, 2020 3:01 PM
To: Van Daele, Carly
Cc: eff.Warren@wsp.com
Subject: Re: Data Request (LTC e-mail reply 1 of 4)
Attachments: PL-20-150 (map 1 of 3).pdf

Good afternoon Carly,

Thank you for reaching out to LTC to obtain natural heritage information for the study area. I have created three maps of the area in question, progressing from west to east along the Highway 401 corridor, showing the natural heritage, wetland, and water features we have mapping available for. In the study area the following features are showing up on our mapping:

- a Ministry of Natural Resources and Forestry (MNRF) evaluated non-provincially significant wetland (i.e., the Cankerville Swamp);
- the Brighton Bluff provincially significant earth science area of natural and scientific interest (ANSI);
- Mayhew Creek significant natural area;
- watercourses (Biddy Creek, Proctors Creek, and other unnamed tributaries);
- Little Lake; and,
- MNRF unevaluated wetlands.

My three maps will have to be sent via separate e-mails due to their size. I have also scanned the 1996 report information and mapping for the Mayhew Creek significant natural area for your use. This will follow after the maps make it through.

Information regarding the Cankerville Swamp and the Brighton Bluff ANSI should be obtained directly through MNRF as they are responsible for the designation of these features.

Please let me know if you have any questions about the information/materials provided.

Leah Stephens
Environmental Planner / Regulations Officer
Lower Trent Conservation
613.394.3915 x220
leah.stephens@ltc.on.ca

** COVID-19 Notice: In order to protect the health of our working environments, our office is closed to the public until further notice. However, we remain available to provide our services. We will advise when our office reopens.

From: Information <information@ltc.on.ca>
Sent: 11 November 2020 14:28

To: Janet Noyes <janet.noyes@ltc.on.ca>; Leah Stephens <leah.stephens@ltc.on.ca>
Subject: Fw: Data Request

Please see below/attached.

Lower Trent Conservation
714 Murray Street, RR 1, Trenton, ON K8V 5P4
Telephone: 613-394-4829 Fax: 613-394-5226
information@ltc.on.ca
www.ltc.on.ca

**COVID-19 Notice: We are now able to accommodate in-person meetings at our office by appointment only. We also remain available to serve you virtually or by phone. To ensure everyone's continued safety, we are not open for unscheduled meetings at this time. Please call 613-394-4829 if your message is urgent.

Buying or building near wetlands or waterways? Check out these online services – ***Property Inquiry Service*** and ***Map Viewer*** will help you get information about environmental features & required permits.

From: Van Daele, Carly <Carly.VanDaele@wsp.com>
Sent: November 11, 2020 2:09 PM
To: Information <information@ltc.on.ca>
Cc: Warren, Jeff <Jeff.Warren@wsp.com>
Subject: Data Request

Good afternoon,
Please review the attached document regarding upcoming Highway 401 works. If you have any comments or questions please let me know.
Thanks,

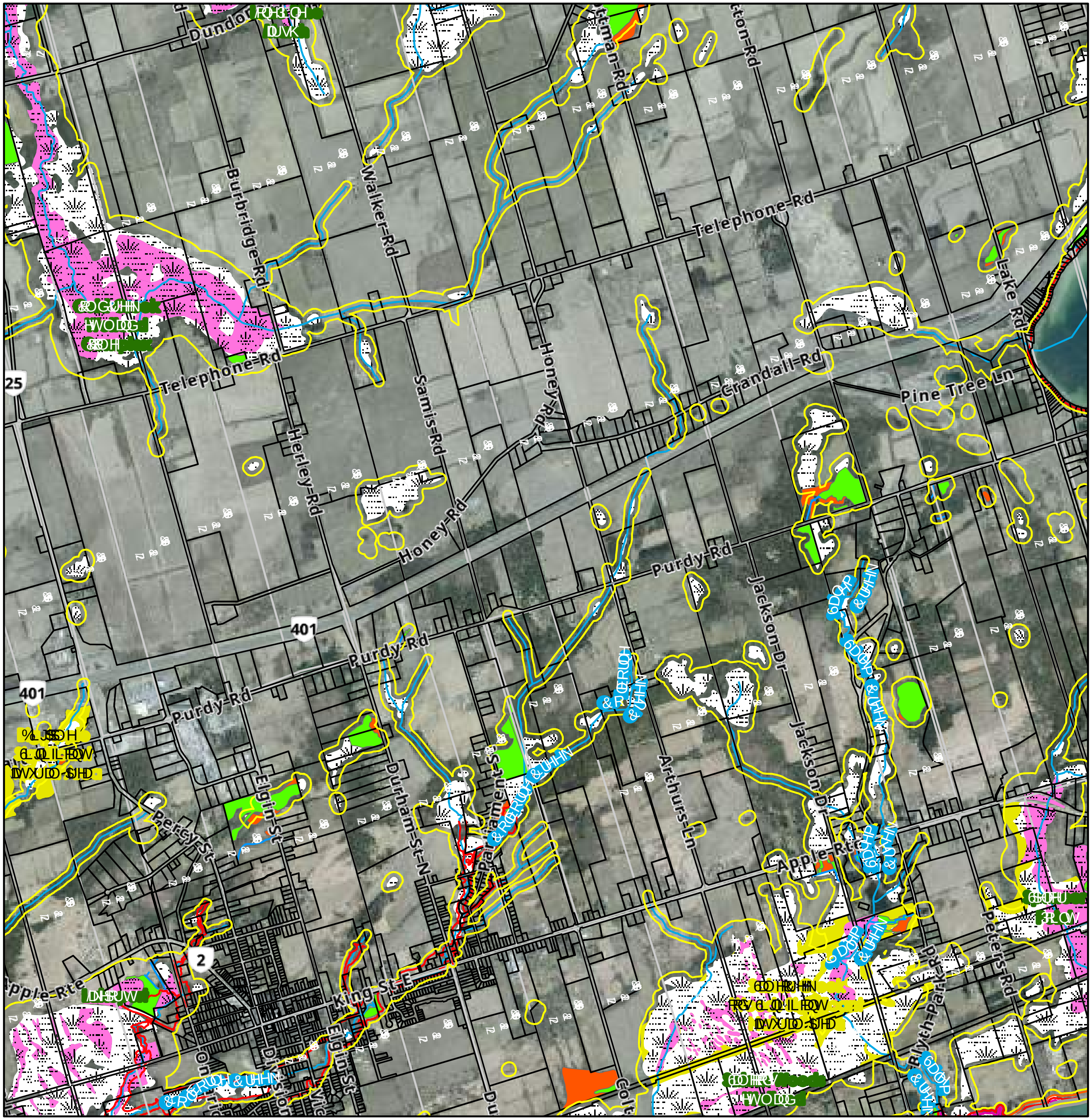
Carly Van Daele, B.E.S.
Terrestrial Ecologist – ISA Certified Arborist
Ecology & Environment Impact Assessment (EIA)

T+ 1 519-904-1778
M+ 1 519-358-2837

582 Lancaster Street West
Kitchener, Ontario
N2K 1M3 Canada

wsp.com

-LAEmHhHzdJzBlTWfa4Hgs7pbKI



3

/HJHQG

25HJ 6FUHHQLQJ$UHD

3URSHUWLHV

:DWHU

6WUHDP

9LUWXDO)ORZ&RQQHFWRU

:HWODQGV 0,15

8QHYDOXDWHG:HWODQG

(YDOXDWHG:HWODQG36:

(YDOXDWHG:HWODQG QRQ36:

)LHOG9HULILHG:HWODQG

+HV3UHVHQW

1RW3UHVHQW

)ORRG(URVLRQ/LQHV

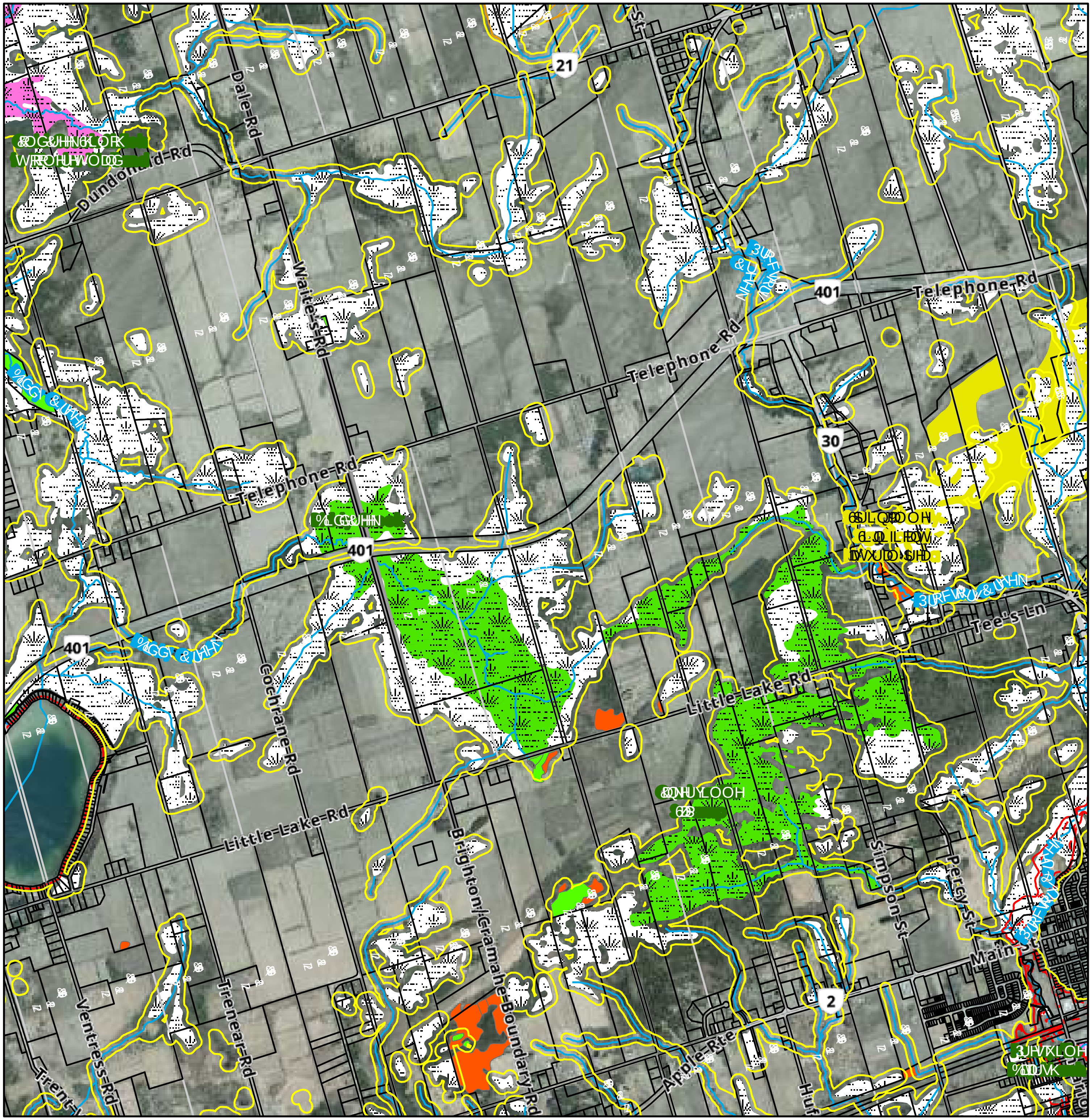
)ORRG/LQHV

0HDQGHU(URVLRQ/LQH

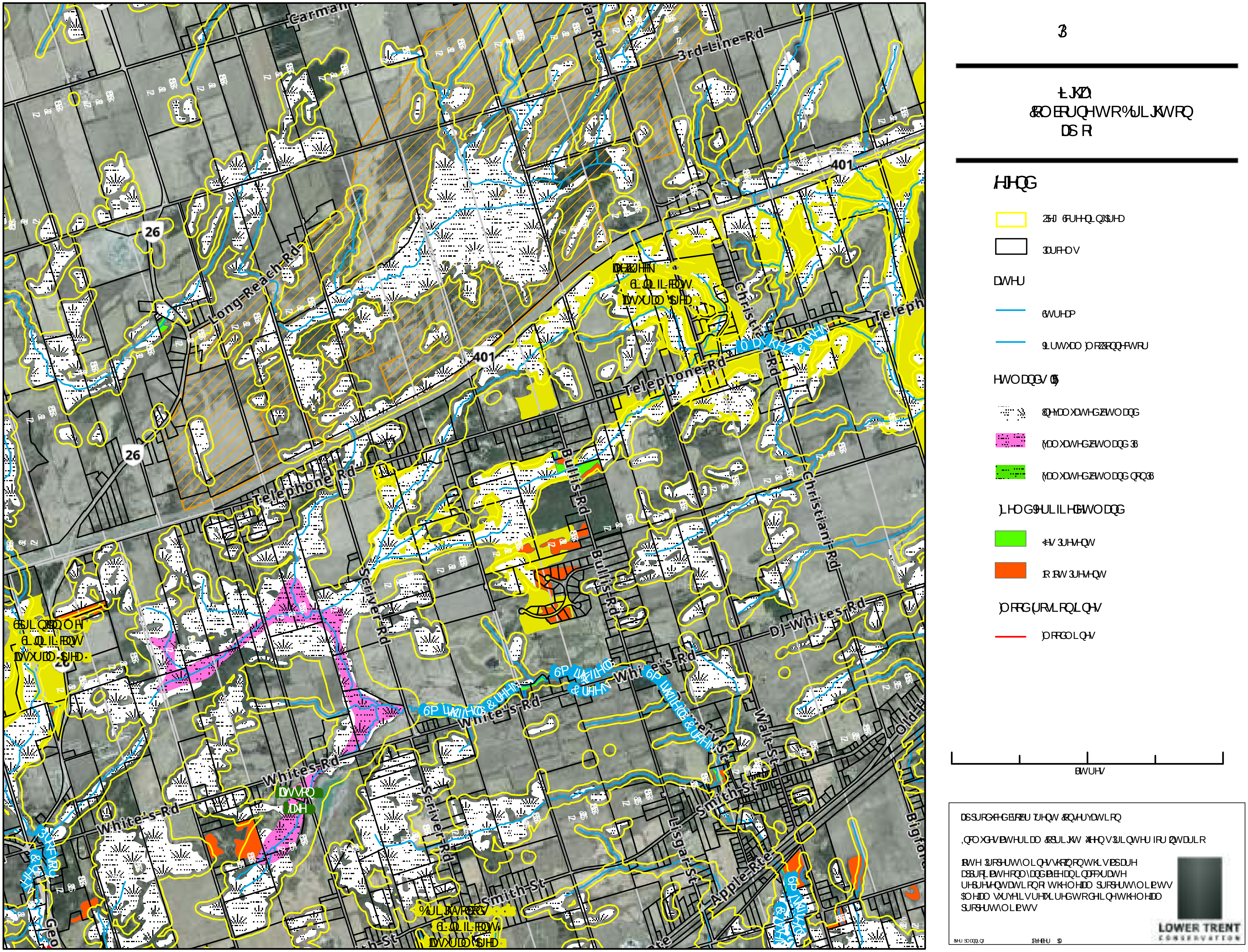
0HDQGHU%HOW6WDWLF+HDG

0HWUHV

LOWER TRENT CONSERVATION

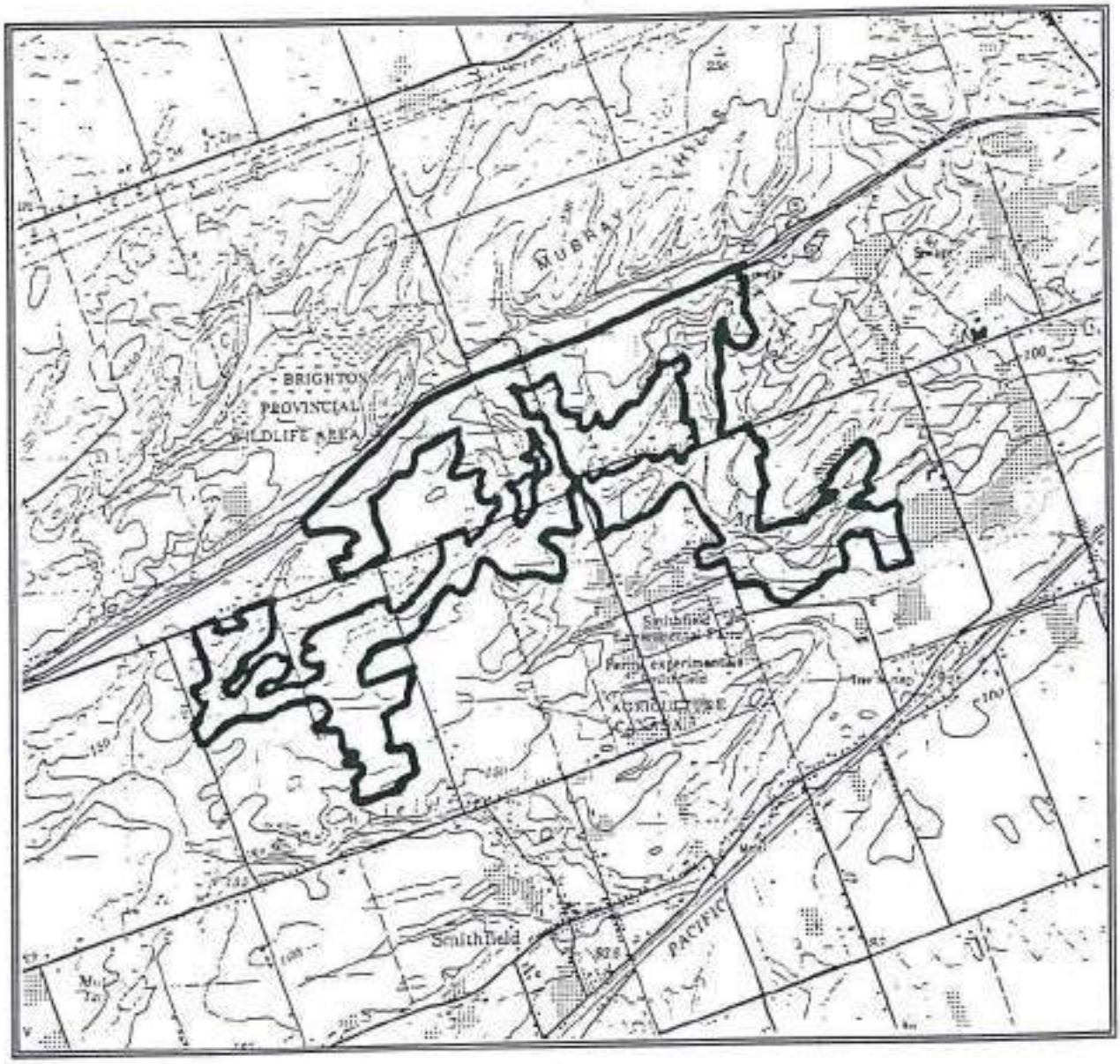


LOWER TRENT
CONSERVATION


Carman
3rd-Line-Rd
401
26
Long-Reach-Rd
Telephone-Rd
Teleph
Christiani-Rd
Bullis-Rd
Scriver-Rd
DJ-Whites-Rd
White's-Rd
Whites-Rd
Walt-St
Smith-St
Lisgar-St
Apple-Rte
Old-H
Bigford
Geo
LOWER TRENT
CONSERVATION

34. MAYHEW CREEK HEADWATER

Scale: 1:50,000
2 cm = 1 km



Location References

NTS MAP SHEET: Trenton 31C/4
UTM: 18 TD 850858
OBM MAP: 10 18 2800 4880, 48850; 2850 48800, 48850.
1993 AIR PHOTOS: ASC 93039; 7-165-171; 8-103-108
LOTS & CONCESSIONS: Murray Twp. Lots 16-28, Conc. 1; Lots 17-26, Conc. 2.

34. Mayhew Creek Headwater

COUNTY: Northumberland
TOWNSHIP: Murray
SIZE: 432.2 ha
SUB-WATERSHEDS: Mayhew
LANDSCAPE UNIT: 3 - Lake Iroquois Shoreline (Reid & Grand, 1994)
OMNR: Southern Region, Tweed District
OWNERSHIP: Approximately 31 private landowners and one parcel owned by the township of Murray.

GENERAL SUMMARY

Mayhew Creek Headwater study area is located approximately 3 km west of Trenton, just south of Highway 401. This shorecliff, boulder pavement and sand plain left by Lake Iroquois supports a high diversity of habitats and plant species, many of which are provincially and regionally rare. Two plant species found there, Nut Grass (*Cyperus schweinitzii*) and Sedge (*Carex laevivaginata*), have not been previously documented in Eastern Ontario. Provincially rare communities include black oak woodland, black oak-white oak-white pine woodland, spicebush ravine and old growth hemlock ravine. The black oak and oak-pine woodland communities are some of the best known examples in eastern Ontario. The 10.7 ha hemlock forest is estimated to be about 120-150 years old with about 3% of the trees reaching about 250 years and may be one of the oldest, extensive examples in southern Ontario. Generally the area supports relatively high quality upland forest and is highly representative of the Lake Iroquois sand plain landform. Mayhew Creek contains 3 plant species considered rare in Ontario based on Oldham (1996), 11 plants that are rare in Eastern Ontario and 7 plants that are rare in the Lake Ontario Lowlands physiographic region (status based on Cuddy, 1991). Red-shouldered Hawk, a provincially significant bird species, was recorded as a possible breeder in 1995. The site is important hydrologically as a major recharge area and strong coldwater spring source for Mayhew Creek. It is adjacent to the Murray Hills Significant Natural Area , and Brighton Provincial Wildlife Area and earth science ANSI. Buffering capability is quite low due to its highly irregular shape and nearby housing developments. Mayhew Creek Headwater is considered a Significant Natural Area because it meets 8 of the 10 natural areas selection criteria. The site warrants consideration by OMNR as a regionally significant life science ANSI or sections could possibly be incorporated with Murray Hills Significant Natural Area as a provincially significant life science ANSI.

A. Physical Features

Bedrock: Paleozoic, Middle Ordovician, Trenton, Black River limestone.

Landform Types: Lake Iroquois shorecliff, sand plain with boulder pavement and esker (all major representation) (Chapman and Putnam, 1984).

Topography: Relatively gentlely sloping southward except for several deeply cut creek and ravine systems. Elevations range from 100m at the southeast end to 170 m at the top of a centrally located drumlin.

Surficial Geology: Deep glaciolacustrine, wave planned shoreline deposits of sand at the northwest end near the 401 and glaciolacustrine shallow water deposits on the south and east side. A small esker is located at the southwest end (Leyland and Mihychuk 1984).

Soil Type: Brighton, Bondhead and Dundonald sandy loams, Pontypool sand (major representation), muck, Granby and Colborne sandy loam (minor) (Hoffman and Acton, 1974).

Soil pH: Bondhead is mildly to moderately alkaline and Pontypool is neutral to strongly acidic providing a diverse range of pH.

Moisture Regimes: Dry - wet.

Microclimate: Colder than normal, normal and warmer than normal.

Evaluation of Landform Representation and Rarity: This is an excellent example of drumlinized sand plain and Lake Iroquois shoreline and is probably only surpassed within the lower Trent region by Murray Hills Significant Natural Area. None of the soil types are rare.

B. Hydrological Function

Mayhew Creek Headwater is the source of intermediate-tributaries of Mayhew Creek and may contribute up to half of the water that eventually flows into the City of Trenton. It contains several major springs and one major seepage area. The site is underlain by deep deposits of sand and gravelly till which constitutes an important regional groundwater recharge zone. The area does not contribute significantly to water detention since it only has a small amount of wetland.

Evaluation of Hydrological Function:
Mayhew Creek Headwater constitutes an important regional groundwater recharge zone and contains several major springs and seeps which feed Mayhew Creek.

C. Vegetation Community Representation and Diversity (see Map 34 on file at the LTRCA, scale 1:10,000):

Community condition rankings are provided as follows: poor, fair, good and excellent. Definitions of the condition rankings and other terminology and an explanation of the vegetation classifications are given in the section on field methodology.

A. WETLAND VEGETATION

WETLAND ON SAND PLAIN

RIVERINE AQUATIC

1. OPEN SHALLOW WATER
   a. sparsely to none vegetated
   b. *Potamogeton natans - P. pusillus - Typha latifolia*

MARSH

2. EMERGENT MARSH
   a. *Typha latifolia*
   b. *Phalaris arundinacea - Leersia oryzoides - Typha latifolia*

SWAMP

3. SHRUB SWAMP: *Salix bebbiana - S. discolor - Cornus stolonifera - Sambucus canadensis - Viburnum lentago* (30% shrub cover) - white cedar - balsam poplar - trembling aspen - American elm - white birch (20% tree cover) (fair)

4. DECIDUOUS FOREST SWAMP
   a. white ash[3] - trembling aspen[2] - sugar maple[1] - red maple[1] - white birch[1] - balsam poplar[1] - (white pine - basswood - yellow birch -black ash - butternut)[1] (fair)
   b. white birch[3] - American elm[3] - red ash[1] - white pine[1] - basswood[1] - (trembling aspen - balsam poplar)[1] - (white cedar - hemlock)[1] (poor-fair)
   c. white cedar[2] - American elm[2] - red ash[2] - trembling aspen[1] - balsam poplar[1] - white ash[1] - (white birch - sugar maple - black ash - basswood)[1] (fair)

5. MIXED FOREST SWAMP
   a. hemlock[3] - yellow birch[2] - sugar maple[2] - white cedar[1] - beech[1] - (white ash - basswood - red oak - white birch - red maple - striped maple - black ash)[1] (good-excellent)
   b. hemlock[2] - yellow birch[1] - sugar maple[2] - white cedar[1] - white birch[1] - white ash[1] - large-toothed aspen[1] - (red maple - white pine - basswood - red oak)[1] (fair-good)
   c. yellow birch[3] - white cedar[2] - hemlock[2] - red maple[2] - red ash[1] - (white birch - beech - white pine) (good)
   d. white cedar[3] - hemlock[2] - yellow birch[2] - sugar maple[2] - (white birch - black ash - balsam poplar - basswood - American elm)[1] (fair)
   e. white cedar[3] - hemlock[2] - yellow birch[2] - white birch[1] - red maple[1] - (white pine - basswood - white ash - American elm - sugar maple)[1] (fair-good)
   f. white cedar[3] - hemlock[3] - yellow birch[1] - white birch[1] - trembling aspen[1] - (black ash - red maple)[1] (good)
   g. white cedar[2] - red ash[2] - hemlock[1] - basswood[1] - American elm[1] - balsam poplar[1] - sugar maple[1] - white birch[1] - (red maple - white pine - trembling aspen) (fair)
   h. white cedar[2] - white birch[2] - red maple[1] - trembling aspen[1] - hemlock[1] - American elm[1] - yellow birch[1] - (black ash - red ash)[1] (fair)
   i. white cedar[4] - trembling aspen[2] - balsam poplar[2] - white birch[2] (fair)
   j. white cedar[3] - trembling aspen[2] - American elm[1] - white birch[1] - white pine[1] - (Norway spruce - white ash - balsam poplar)[1] (poor)

6. CONIFEROUS FOREST SWAMP
   a. white cedar[9] - (white pine - white birch - trembling aspen - American elm)[1] (fair)
   b. white cedar[7] - white pine[2] - (hemlock - white birch - yellow birch - American elm)[1] (fair)
   c. white cedar[7] - hemlock[1] - yellow birch[1] - (white birch - white pine - basswood - American elm)[1] (good)

B. UPLAND VEGETATION

UPLAND ON SAND PLAIN

OPEN UPLAND

7. THICKET
   a. *Juniperus communis - Rhus typhina - Juniperus virginiana* (35% shrub cover) - (white pine[2] - trembling aspen[2] - apple[2] - black oak[2] - (red oak - white oak)[1] - (bitternut hickory - American elm - white ash)[1] (30% tree cover) (poor)
   b. *Rhus typhina - Rubus allegheniensis - Prunus virginiana* (25% shrub cover, 20% tree cover) - *Carex foenea - Rhus radicans - Poa compressa* (fair)
   c. *Rhus typhina - Juniperus communis - Ceanothus americanus* (30% shrub cover) - *Poa compressa - Danthonia spicata* (fair)

WOODLAND (OPEN FOREST)

8. DRY MESIC TO DRY WOODLAND
   a. white pine[5] - (white ash - white oak - apple - large-toothed aspen)[2] - white cedar[1] - red oak[1] - black oak[1] (fair-good)
   b. black oak[10] (40% tree cover, 30% lichen cover, 30% herb cover - *Poa compressa - Carex pensylvanica*) (fair)
   c. black oak[4] - white pine[1] - red pine[1] - white oak[1] - (red oak - hemlock - sugar maple - white ash)[1] (excellent)
   d. red cedar[4] - white ash[3] - (sugar maple - trembling aspen - white pine - white oak)[1] (poor)

FORESTED UPLAND

9. MESIC TO WET MESIC, DECIDUOUS FOREST
   a. sugar maple[4] - bitternut hickory[2] - basswood[2] - beech[1] - (red oak - white ash)[1] (fair)
   b. sugar maple[3] - bitternut hickory[2] - white ash[2] - red oak[1] - large-toothed aspen[1] - (white birch - basswood - ironwood - black cherry - butternut)[1] (fair-good)
   c. sugar maple[3] - white ash[1] - ironwood[1] - red oak[1] - white birch[1] - trembling aspen[1] - beech[1] - (bitternut hickory - basswood - black cherry)[1] (fair)
   d. sugar maple[3] - red oak[2] - large-toothed aspen[1] - white pine[1] - white birch[1] - white ash[1] - (red maple - bitternut hickory - hemlock - trembling aspen - white oak - basswood - beech)[1] (fair-good)
   e. sugar maple[3] - beech[2] - white birch[1] - red maple[1] - white ash[1] - yellow birch[1] - (basswood - american elm - red oak)[1] (good)
   f. white ash[5] - bitternut hickory[3]- sugar maple[1] - (basswood - American elm)[1] (fair)
   g. white ash[4] - basswood[2] - sugar maple[2] - trembling aspen[1] - (white birch - balsam poplar - American elm - white cedar)[1] (poor)
   h. white ash[3] - white pine[2] - white birch[2] - sugar maple[2] - (black cherry - trembling aspen - basswood)[1] (fair)
   i. white ash[3] - bitternut hickory[2] - sugar maple[1] - white birch[1] - balsam poplar[1] - (American elm - basswood - trembling aspen - white cedar - Manitoba maple)[1] (poor-fair)
   j. white ash[2] - trembling aspen[2] - white birch[2] - red cedar[1] - ironwood[1] - white pine[1] - (American elm - white pine - bitternut hickory - sugar maple - black oak)[1] (poor-fair)
   k. trembling aspen[4] - white birch[2] - cottonwood[1] - red maple[1] - sugar maple[1] - (white pine - American elm - basswood)[1] (fair)
   l. trembling aspen[3] - white birch[3] - white pine[1] - white cedar[1] - American elm[1] - (black cherry - white ash)[1] (fair)
   m. trembling aspen[3] - balsam poplar[2] - white ash[2] - white birch[2] - (American elm - black cherry - ironwood)[1] (poor-fair)
   n. trembling aspen[2] - sugar maple[2] - red oak[2] - bitternut hickory[1] - white cedar[1] - butternut[1] - (American elm - white pine - white birch - cottonwood)[1] (poor-fair)
   o. red maple[3] - sugar maple[2] - white ash[2] - black maple[1] - red oak[1] - (black cherry - white birch) (fair)

10. MESIC TO DRY MESIC DECIDUOUS FOREST
    red oak[2] - large-toothed aspen[2] - white pine[1] - white birch[1] - white oak[1] - red maple[1] - sugar maple[1] -

(ironwood - white ash - black oak - beech)[1] (fair)

11. MESIC TO WET MESIC MIXED FOREST
    a. hemlock[4] - sugar maple[3] - beech[1] - white pine[1] - (ironwood - white ash - black cherry - basswood)[1] (good)
    b. hemlock[4] - sugar maple[4] - beech[1] - (white birch - trembling aspen - white pine - white cedar - white ash)[1] (fair)
    c. hemlock[2] - sugar maple[2] - white cedar[1] - red maple[1] - large-toothed aspen[1] - red oak[1] - white pine[1] - (white birch - yellow birch - beech - black ash - white ash)[1] (fair-good)

12. MESIC TO DRY MESIC MIXED FOREST: white pine[5] - trembling aspen[2] - red maple[1] - white birch[1] - (white oak - red oak)[1] (fair)

13. MESIC TO WET MESIC CONIFEROUS FOREST hemlock[5] - white cedar[2] - yellow birch[1] - white pine[1] - (sugar maple - basswood - red oak - beech)[1] (excellent) ph. white cedar[8] - white pine[1] - (trembling aspen - white ash - American elm - white birch)[1] (fair)

UPLAND ON DRUMLIN
FORESTED UPLAND

14. MESIC DECIDUOUS FOREST
    a. sugar maple[6] - basswood[2] - beech[1] - (white ash - white birch - trembling aspen - white pine - white cedar)[1] (fair-poor)
    b. sugar maple[3] - bitternut hickory[2] - white ash[2] - white cedar[1] - ironwood[1] - (red oak - hemlock - white birch - basswood - beech)[1] (fair)

15. MESIC MIXED FOREST: hemlock[4] - sugar maple[4] - white ash[1] - (white birch - ironwood - bitternut hickory - beech)[1] (good)

16. MESIC CONIFEROUS FOREST
    a. hemlock[5] - white cedar[4] - (white birch - white pine - ironwood - white ash)[1] (good)
    b. white pine[4] - white cedar[4] - trembling aspen[1] - (white birch - white ash - apple - pear)[1] (poor)

UPLAND ON KAME MORAINE
FORESTED UPLAND

17. MESIC DECIDUOUS FOREST
    a. sugar maple[3] - red oak[2] - beech[2] - white ash[1] - white oak[1] - (hemlock - white pine)[1] (good)
    b. large-toothed aspen[3] - sugar maple[2] - red oak[2] - white ash[1] - beech[1] - (white birch - ironwood - butternut)[1] (fair)

18. DRY MESIC MIXED FOREST
    a. red oak[3] - white oak[3] - sugar maple[1] - large-toothed aspen[1] - white pine[1] - hemlock[1] - (beech - ironwood) (excellent)
    b. large-toothed aspen[3] - red oak[2] - white oak[2] - white pine[2] - Scots pine (naturally seeded)[1] (poor-fair)

C. ANTHROPOGENIC VEGETATION

19. OLD FIELD
    a. *Poa pratensis - Poa compressa - Vitis riparia* - white pine - trembling aspen - red cedar - white birch - white ash - black oak (10% tree cover) (poor)
    b. *Poa pratensis - Vicia cracca - Euphorbia cyparissias* - white cedar - American elm - (white spruce - black locust, planted) (10% tree cover) (poor)

20. SAND BARREN (FORMER SAND PIT)
    Poa compressa - Danthonia spicata - Sporobolus vaginiflorus - Juniperus communis - J. virginiana - Salix spp. (10% shrub cover) (poor-fair)

21. CONIFER PLANTATION
    a. white pine[10] (intermediate-mature)
    b. red pine[10] (young)
    b. scots pine (young-intermediate)

22. PAVED TWO LANE ROAD

Evaluation of Vegetation Community Representation and Diversity:
The site contains 18 natural vegetation subclasses and 59 natural vegetation community associations which is above average for the region. Representation is considered to be very good.

D. Vegetation Community Rarity

Provincially Rare Communities
1. Community 8b. Dry black oak woodland is

considered extremely rare in Ontario (probably S1 although not ranked by Bakowsky 1995). The black oak woodland at Mayhew Creek contains nearly 100% black oak and is about 40-50 years old. This is the highest percentage of black oak in a community recorded in the lower Trent region. The site is quite unusual with *Poa compressa*, lichens and *Polytrichum* mosses dominating the ground cover. Tree cover is about 40-50% (slightly higher than savanna). The average dbh is about 17 cm and maximum dbh is 50 cm. The site was probably clear cut or burnt about 50 years ago when an adjacent sand and gravel pit was in operation. The community occurs on land owned by the Township of Murray. There is localized impact on the fine sand from trail bike use. This community actually extends south of the road, however that area has been excluded because of recent housing development.

2. Community 8c. Black oak-white oak-white pine-red pine savanna is considered extremely rare in Ontario (S1 rank) (Bakowsky 1995). This is the best example of this type of community seen by the authors in eastern Ontario. Black oak-pine savanna occurs in southwestern Ontario primarily at Pinery and Turkey Point, however it may differ in herbaceous and shrub dominants. The savanna is about 60 years old with about 30-40% tree cover. *Juniperus communis* and *Amelanchier* species dominating the shrub layer. *Carex pensylvanica* and *Pteridium aquilinum* are the main herbaceous ground cover. There is evidence of past tree cutting (about 60 years ago). Recent housing development occurs at the south end of this community.

3. Community 5a. This hemlock-yellow birch-beech-sugar maple swamp and slope forest is about 75 years old. This community occurs in a steep ravine system cut through acidic sand deposits. Major springs arise from the slopes. Striped Maple, Witch Hazel and Spicebush are common shrubs. Spicebush thicket is considered rare to uncommon (S3 rank) in Ontario (Bakowsky 1995). Spicebush (*Lindera benzoin*) is a Carolinian species reaching the northeastern limit of its distribution at Belleville. Eleven populations are currently known in the lower Trent region. Murray Hills supports the largest of these, with the second largest occurring at Mayhew. Selective cutting occurred about 50 years ago. Recent housing development occurs at the south end of this community.

4. Community 15a. This 10.7 ha old growth hemlock swamp and slope forest follows a ravine along a coldwater stream (Mayhew Creek). Hemlock swamp is considered to be rare or uncommon in Ontario (S3 rank) (Bakowsky 1995), however this example is even more significant because of its age and relatively large size. Hemlock trees range in dbh from 40 to 100 cm and white pines occur that are up to 90 cm dbh. About 3% of the trees are 80-100cm dbh. Based on ring counts of hemlocks that have been cut in the area, the forest is about 120-150 years old with some trees reaching about 250 years. A large, mature white pine plantation flanks its eastern and southern boundaries. In 1994 a trail was cut through part of this community along the property line.

Rare or Uncommon Communities in the Lower Trent Region

5. Community 11a-c. Hemlock-sugar maple-beech mixed forest in fair-good condition.

6. Community 18a. A mature, dry mesic, red oak-white oak forest with about 75% tree cover occurs on a small esker near the southwest corner of Mayhew Creek Headwater. Its age is estimated at 90-100 years with the average dbh about 37 cm and maximum dbh 55 cm.

Evaluation of Vegetation Community Rarity:

Four communities within Mayhew Creek are considered provincially rare based on Bakowsky (1995) and personal observations and several others are considered rare or uncommon within the lower Trent region.

E. Condition/Quality of Habitats and Communities

The study area was nearly doubled in size (from 240 ha proposed by Reid and Grand 1994 to about 440 ha). Originally it was confined to the woods flanking Highway 401. It has been extended south one concession nearly to Whites Road and westward to connect to the Matson Lake Wetland in order to include high quality remnant woodlots.

Although little is known about the historical land-use of the site, most of the area was probably cut about 50 years ago. An extensive old growth forest exists in the southeast section along Mayhew Creek where some hemlock and white pine reach 100 cm dbh. Some of the area was cleared about 40-50 years ago for apple orchards and other agricultural uses, but these have been abandoned. A sand and gravel pit owned by Murray Township is no longer in use. Recent disturbances in the vicinity include fairly extensive

housing development and ATV trails.

Each community was assessed utilizing the criteria outlined in chapter 1, section "A" on condition/quality of habitats and communities. The condition of each community is indicated in the vegetation classification for the site as poor, fair, good or excellent. Condition percentages for the site are as follows: poor 14%, fair 50%, good 25%,and excellent 11%

Evaluation of Condition/Quality of Habitats and Communities:
Mayhew Creek meets the criteria since 36% of the site is in good to excellent condition and only 14% is in poor condition.

F. Species Diversity

Total Number of Vascular Plant Taxa: 448
Native Vascular Plant Taxa: 356
Breeding Bird Species: 67
Total Number of Bird Species: 90
Mammal Species: 6
Reptile and Amphibian Species: 0 + 3 = 3

Evaluation of Species Diversity:
This site supports a relatively high number of native vascular plant taxa in relation to site size (well above the regression line in Figure 2). Breeding bird diversity is average (on the regression line in Figure 3).

G. Significant Species

Abundance ratings are given for significant plant species after the common name. Species without an abundance rating below their name were rated as rare in the study area. Definitions of abundance are provided in the section on field methodology. Collections deposited at Agriculture Canada herbarium in Ottawa (DAO) are indicated with an asterisk.

Significant bird species which were not noted as probable or confirmed breeders are included below for use in future studies, but are not considered to have fulfilled the criteria. Refer to Appendix C for breeding status codes.

Provincially Rare Plants

*Carex formosa**	Sedge	S3
*Cyperus schweinitzii**	Nut Grass	S3
-first record for Eastern Ontario.		
*Lactuca hirsuta**	Hairy Lettuce	S3?

Eastern Ontario Rare Plants

Potamogeton pusillus var. *pusillus*	Small Pondweed	
Cinna arundinacea	Stout Wood Grass	
Sporobolus cryptandrus	Sand Dropseed	F
*Carex laevivaginata**	Sedge	U
-new record for Eastern Ontario		
*Carex prasina**	Sedge	
Quercus velutina	Black Oak	C
*Desmodium paniculatum**	Tick-trefoil	U
Lespedeza capitata	Bush Clover	
*Angelica atropurpurea**	Angelica	U
Asclepias exaltata	Poke Milkweed	
Hieracium scabrum	Rough Hawkweed	

Lake Ontario Lowlands Rare Plants

*Oryzopsis pungens**	Mountain-rice	
*Salix eriocephala**	Heart-leaved Willow	
*Ribes hirtellum**	Canada Gooseberry	
Monotropa hypopithys	Pinesap	
*Agalinis tenuifolia**	Narrow-leaved Agalinis	
*Melampyrum lineare**	Cow-wheat	U
Veronica americana	American Brooklime	U

Carolinian affiliates and notable species

Lindera benzoin	Spicebush	
- abundant in bottomland in w. portion of area		
Hamamelis virginiana	Witch Hazel	
- rare in central portion		

Provincially Significant Breeding Birds
Listed as provincially significant in OMNR (1993).

Buteo lineatus	Red-shouldered Hawk	PO (SH)

Listed as vulnerable by COSEWIC, and given an S3B rank by Sutherland (1994a).

Lake Ontario Region Rare Breeding Birds
Status according to Norris (1991).

Dendroica fusca	Blackburnian Warbler	PO (SM)

The species is also considered rare in the LTR.

Evaluation of Significant Species:
Mayhew Creek contains 3 plant species considered rare in Ontario based on Oldham (1996) , 11 plants that are rare in Eastern Ontario and 7 plants that are rare in the

Lake Ontario Lowlands physiographic region (status based on Cuddy, 1991). Two of the plant taxa were previously undocumented as occurring in Eastern Ontario. Red-shouldered Hawk, a provincially significant bird species, was recorded as a possible breeder in 1995.

H. Habitat for Seasonal Concentrations of Wildlife

The site may be important for migratory non-game bird species since very little upland forest remains near to Lake Ontario, however this is not documented.

Evaluation of Habitat for Seasonal Concentrations of Wildlife:
No documented significance.

I. Area Size, Shape and Buffering Capability

Maybew Creek is relatively large (432.2 ha) , however its edges are extremely irregular. The area has a poor buffer capability since it is flanked by Highway 401, bisected by a 2 lane paved road and separated by several gravel roads. Residential development is increasing in the area.

Evaluation of Area Size, Shape and Buffering Capability:
Although the area is fairly large, the irregular shape and poor buffering capability reduce its significance.

J. Linkage and Clustering

Mayhew Creek is immediately south of the Brighton Provincial Wildlife Area which is a provincially significant earth science ANSI and a large publicly-owned parcel of land. It is about 0.5 km southwest of the Murray Hills Significant Natural Area.

Evaluation of Linkage and Clustering:
Mayhew Creek contributes to a fairly large node of natural area just to the west of Trenton which includes the Murray Hills Significant Natural Area and Brighton Provincial Wildlife Area.

SITE EVALUATION SUMMARY

- Landform Representation & Rarity
- Hydrological Function
- Community Representation & Diversity
- Vegetation Community Rarity
- Quality of Habitats & Communities
- Species Diversity
- Significant Species
- o Seasonal Wildlife Concentrations
- o Size & Shape
- Linkage & Clustering

RECOMMENDATIONS

1. Maybew Creek be acknowledged as meeting 8 of the 10 evaluation criteria for natural areas presented in this report and therefore be designated as a Significant Natural Area.
2. The Mayhew Creek Headwater warrants consideration by OMNR as a regionally significant life science ANSI or sections could possibly be incorporated with Murray Hills - Significant Natural Area and Brighton Provincial Wildlife Area earth science ANSI as a provincially significant life science ANSI.
3. OMNR, Tweed District, should be asked to investigate community 15a as a potentially important example of old growth hemlock forest.
4. Management of ATV use in the area is suggested primarily to avoid impacts on rare plant species and rare communities.
5. The LTRCA should contact landowners of the provincially significant communities and inform them of the very significant natural features found on their properties.
6. Reforestation, especially with non-native pines, should be discouraged in open sandy areas.

AP 34: MAYHEW CREEK SIGNIFICANT NATURAL AREA

VEGETATION COMMUNITIES

A. WETLAND VEGETATION

WETLAND ON SAND PLAIN
RIVERINE AQUATIC
1. OPEN SHALLOW WATER
   a. sparsely to non-vegetated
   b. *Potamogeton natans - P. pusillus - Typha latifolia*

MARSH
2. EMERGENT MARSH
   a. *Typha latifolia*
   b. *Phalaris arundinacea - Leersia oryzoides - Typha latifolia*

SWAMP
3. SHRUB SWAMP; *Salix bebbiana - S. discolor - Cornus stolonifera - Sambucus canadensis - Viburnum lentago* (30% shrub cover) - white cedar - balsam poplar - trembling aspen - American elm - white birch (20% tree cover)

4. DECIDUOUS FOREST SWAMP
   a. white ash[3] - trembling aspen[2] - sugar maple[2] - red maple[1] - white birch[1] - balsam poplar[1] - (white pine - basswood - yellow birch -black ash - butternut)[1] (fair)
   b. white birch[3] - American elm[2] - red ash[1] - white pine[1] - basswood[1] - (trembling aspen - balsam poplar)[1] - (white cedar - hemlock)[1] (poor-fair)
   c. white cedar[2] - American elm[2] - red ash[2] - trembling aspen[2] - balsam poplar[1] - white ash[1] - (white birch - sugar maple - black ash - basswood)[1] (fair)

5. MIXED FOREST SWAMP
   a. hemlock[3] - yellow birch[2] - sugar maple[2] - white cedar[1] - beech[1] - (white ash - basswood - red oak - white birch - red maple - striped maple - black ash)[1] (good-excellent)
   b. hemlock[2] - yellow birch[2] - sugar maple[2] - white cedar[1] - white birch[1] - white ash[1] - largetooth aspen[1] - (red maple - white pine - basswood - red oak)[1] (fair-good)
   c. yellow birch[3] - white cedar[2] - hemlock[2] - red maple[2] - red ash[1] - (white birch - beech - white pine) (good)
   d. white cedar[3] - hemlock[2] - yellow birch[2] - sugar maple[2] - (white birch - black ash - balsam poplar - basswood - American elm)[1] (fair)
   e. white cedar[3] - hemlock[2] - yellow birch[2] - white birch[1] - red maple[1] - (white pine - basswood - white ash - American elm - sugar maple)[1] (fair-good)
   f. white cedar[3] - hemlock[3] - yellow birch[1] - white birch[1] - trembling aspen[1] - (black ash - red maple)[1] (good)
   g. white cedar[2] - red ash[2] - hemlock[1] - basswood[1] - American elm[1] - balsam poplar[1] - sugar maple[1] - white birch[1]- (red maple - white pine - trembling aspen) (fair)
   h. white cedar[2] - white birch[2] - red maple[1] - trembling aspen[1] - hemlock[1] - American elm[1] - yellow birch[1] - (black ash - red ash)[1] (fair)
   i. white cedar[4] - trembling aspen[2] - balsam poplar[2] - white birch[2] (fair)
   j. white cedar[3] - trembling aspen[2] - American elm[1] - white birch[1] - white pine[1] - (Norway spruce - white ash - balsam poplar)[1] (poor)

6. CONIFEROUS FOREST SWAMP
   a. white cedar[8] - (white pine - white birch - trembling aspen - American elm)[1] (fair)
   b. white cedar[7] - white pine[2] - (hemlock - white birch - yellow birch - American elm)[1] (fair)
   c. white cedar[7] - hemlock[1] - yellow birch[1] - (white birch - white pine - basswood - American elm)[1] (good)

B. UPLAND VEGETATION

UPLAND ON SAND PLAIN
OPEN UPLAND
7. THICKET
   a. *Juniperus communis - Rhus typhina - Juniperus virginiana* (35% shrub cover) - (white pine[2] - trembling aspen[2] - apple[2] - black oak[2] - (red oak - white oak)[1] - (bitternut hickory - American elm - white ash)[1] (30% tree cover) (poor)
   b. *Rhus typhina - Rubus allegheniensis - Prunus virginiana* (25% shrub cover, 20% tree cover) - *Carex foenea - Rhus radicans - Poa compressa* (fair)
   c. *Rhus typhina - Juniperus communis - Ceanothus americanus* (30% shrub cover) - *Poa compressa - Danthonia spicata* (fair)

WOODLAND (OPEN FOREST)
8. DRY TO DRY MESIC, MIXED WOODLAND
   a. white pine[5] - (white ash - white oak - apple - largetooth aspen)[2] - white cedar[1] - red oak[1] - black oak[1] (fair-good)
   b. black oak[10] (40% tree cover, 30% lichen cover, 30% herb cover - *Poa compressa - Carex pensylvanica*) (fair)
   c. black oak[4] - white pine[3] - red pine[1] - white oak[1] - (red oak - hemlock - sugar maple - white ash)[1] (excellent)
   d. red cedar[6] - white ash[3] - (sugar maple - trembling aspen - white pine - white oak)[1] (poor)

FORESTED UPLAND
9. MESIC TO WET MESIC, DECIDUOUS FOREST
   a. sugar maple[4] - bitternut hickory[2] - basswood[2] - beech[1] - (red oak - white ash)[1] (fair)
   b. sugar maple[3] - bitternut hickory[2] - white ash[2] - red oak[1] - largetooth aspen[1] - (white birch - basswood - ironwood - black cherry - butternut)[1] (fair-good)
   c. sugar maple[3] - white ash[1] - ironwood[1] - red oak[1] - white birch[1] - trembling aspen[1] - beech[1] - (bitternut hickory - basswood - black cherry)[1] (fair)
   d. sugar maple[3] - red oak[2] - largetooth aspen[1] - white pine[1] - white birch[1] - white ash[1] - (red maple - bitternut hickory - hemlock - trembling aspen - white oak - basswood - beech)[1] (fair-good)
   e. sugar maple[3] - beech[2] - white birch[1] - red maple[1] - white ash[1] - yellow birch[1] - (basswood - american elm - red oak)[1] (good)
   f. white ash[5] - bitternut hickory[3]- sugar maple[1] - (basswood - American elm)[1] (fair)
   g. white ash[4] - basswood[2] - sugar maple[2] - trembling aspen[1] - (white birch - balsam poplar - American elm - white cedar)[1] (poor)
   h. white ash[3] - white pine[2] - white birch[2] - sugar maple[2] - (black cherry - trembling aspen - basswood)[1] (fair)
   i. white ash[3] - bitternut hickory[2] - sugar maple[1] - white birch[1] - balsam poplar[1] - (American elm - basswood - trembling aspen - white cedar - Manitoba maple)[1] (poor-fair)
   j. white ash[2] - trembling aspen[2] - white birch[2] - red cedar[1] - ironwood[1] - white pine[1] - (American elm - white pine - bitternut hickory - sugar maple - black oak)[1] (poor-fair)

c. sugar maple[2] - white ash[1] - ironwood[1] - red oak[1] - white birch[1] - trembling aspen[1] - beech[1] - (bitternut hickory - basswood - black cherry)[1] (fair)
d. sugar maple[3] - red oak[2] - largetooth aspen[1] - white pine[1] - white birch[1] - white ash[1] - (red maple - bitternut hickory - hemlock - trembling aspen - white oak - basswood - beech)[1] (fair-good)
e. sugar maple[3] - beech[2] - white birch[1] - red maple[1] - white ash[1] - yellow birch[1] - (basswood - american elm - red oak)[1] (good)
f. white ash[3] - bitternut hickory[3] - sugar maple[1] - (basswood - American elm)[1] (fair)
g. white ash[4] - basswood[2] - sugar maple[2] - trembling aspen[1] - (white birch - balsam poplar - American elm - white cedar)[1] (poor)
h. white ash[3] - white pine[2] - white birch[2] - sugar maple[2] - (black cherry - trembling aspen - basswood)[1] (fair)
i. white ash[3] - bitternut hickory[2] - sugar maple[1] - white birch[1] - balsam poplar[1] - (American elm - basswood - trembling aspen - white cedar - Manitoba maple)[1] (poor-fair)
j. white ash[2] - trembling aspen[2] - white birch[2] - red cedar[1] - ironwood[1] - white pine[1] - (American elm - white pine - bitternut hickory - sugar maple - black oak)[1] (poor-fair)
k. trembling aspen[4] - white birch[2] - cottonwood[1] - red maple[1] - sugar maple[1] - (white pine - American elm - basswood)[1] (fair)
l. trembling aspen[3] - white birch[3] - white pine[1] - white cedar[1] - American elm[1] - (black cherry - white ash)[1] (fair)
m. trembling aspen[3] - balsam poplar[2] - white ash[2] - white birch[2] - (American elm - black cherry - ironwood)[1] (poor-fair)
n. trembling aspen[2] - sugar maple[2] - red oak[2] - bitternut hickory[1] - white cedar[1] - butternut[1] - (American elm - white pine - white birch - cottonwood)[1] (poor-fair)
o. red maple[3] - sugar maple[2] - white ash[2] - black maple[1] - red oak[1] - (black cherry - white birch) (fair)

10. MESIC TO DRY MESIC DECIDUOUS FOREST: red oak[2] - largetooth aspen[2] - white pine[1] - white birch[1] - white oak[1] - red maple[1] - sugar maple[1] - (ironwood - white ash - black oak - beech)[1] (fair)

11. MESIC MIXED FOREST
a. hemlock[4] - sugar maple[3] - beech[1] - white pine[1] - (ironwood - white ash - black cherry - basswood)[1] (good)
b. hemlock[4] - sugar maple[4] - beech[1] - (white birch - trembling aspen - white pine - white cedar - white ash)[1] (fair)
c. hemlock[2] - sugar maple[2] - white cedar[1] - red maple[1] - largetooth aspen[1] - red oak[1] - white pine[1] - (white birch - yellow birch - beech - black ash - white ash)[1] (fair-good)

12. MESIC TO DRY MESIC MIXED FOREST: white pine[3] - trembling aspen[2] - red maple[1] - white birch[1] - (white oak - red oak)[1] (fair)

13. MESIC TO WET MESIC CONIFEROUS FOREST
a. hemlock[3] - white cedar[2] - yellow birch[1] - white pine[1] - (sugar maple - basswood - red oak - beech)[1] (excellent)
b. white cedar[4] - white pine[4] - (trembling aspen - white ash - American elm - white birch)[1] (fair)

UPLAND ON DRUMLIN
FORESTED UPLAND

14. MESIC DECIDUOUS FOREST
a. sugar maple[5] - basswood[2] - beech[1] - (white ash - white birch - trembling aspen - white pine - white cedar)[1] (fair-poor)
b. sugar maple[3] - bitternut hickory[2] - white ash[2] - white cedar[1] - ironwood[1] - (red oak - hemlock - white birch - basswood - beech)[1] (fair)

15. MESIC MIXED FOREST: hemlock[4] - sugar maple[4] - white ash[1] - (white birch - ironwood - bitternut hickory - beech)[1] (good)

16. MESIC CONIFEROUS FOREST
a. hemlock[5] - white cedar[4] - (white birch - white pine - ironwood - white ash)[1] (good)
b. white pine[4] - white cedar[4] - trembling aspen[1] - (white birch - white ash - apple - pear)[1] (poor)

UPLAND ON KAME MORAINE
FORESTED UPLAND

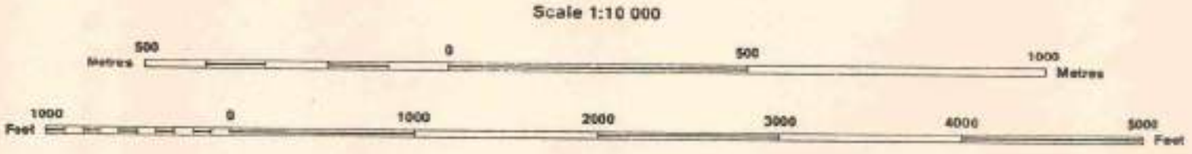
17. MESIC DECIDUOUS FOREST
a. sugar maple[3] - red oak[2] - beech[2] - white ash[1] - white oak[1] - (hemlock - white pine)[1] (good)
b. largetooth aspen[3] - sugar maple[2] - red oak[2] - white ash[1] - beech[1] - (white birch - ironwood - butternut)[1] (fair)

18. DRY MESIC MIXED FOREST
a. red oak[3] - white oak[3] - sugar maple[1] - largetooth aspen[1] - white pine[1] - hemlock[1] - (beech - ironwood) (excellent)
b. largetooth aspen[3] - red oak[2] - white oak[2] - white pine[2] - Scots pine (naturally seeded)[1] (poor-fair)

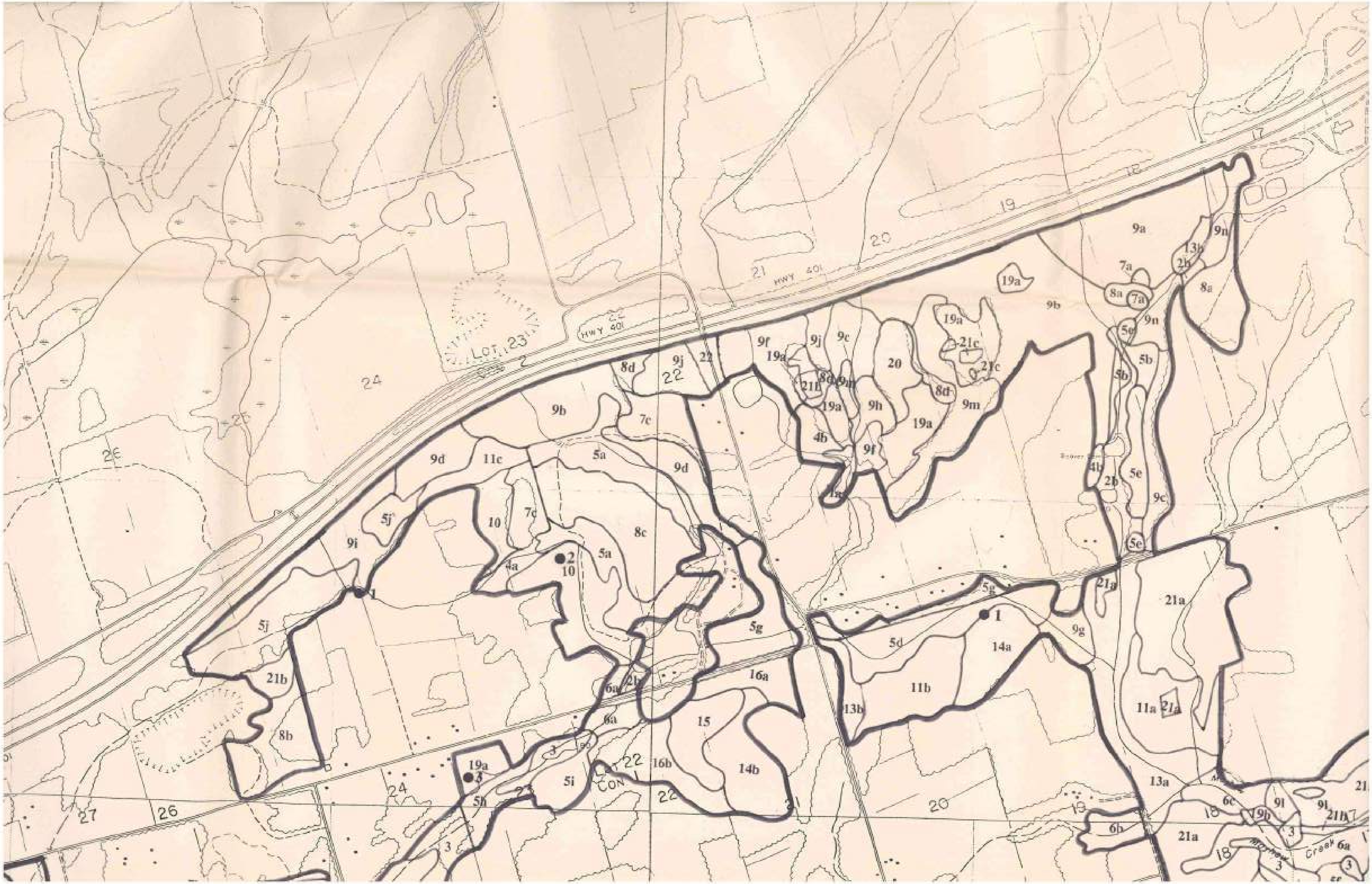
C. ANTHROPOGENIC VEGETATION

19. OLD FIELD
a. *Poa pratensis* - *Poa compressa* - *Vitis riparia* - white pine - trembling aspen - red cedar - white birch - white ash - black oak (tree cover 10%) (poor)
b. *Poa pratensis* - *Vicia cracca* - *Euphorbia cyparissias* - white cedar - American elm - (white spruce - black locust, planted) (10% tree cover) (poor)
20. SAND BARREN (FORMER SAND PIT): *Poa compressa* - *Danthonia spicata* - *Sporobolus vaginiflorus* - *Juniperus communis* - *J. virginiana* - *Salix* spp. (10% shrub cover) (poor-fair, semi-natural)
21. CONIFER PLANTATION
a. white pine[10] (intermediate-mature)
b. red pine[10] (young)
c. scots pine (young-intermediate)
22. PAVED TWO LANE ROAD

Scale 1:10 000



Vivian R. Brownell & C. Sean Blaney 1996


HWY 401
LOT 23
CON
Creek
9a
9n
13b
2b
7a
8a
19a
9b
5e
21c
9f
9j
9c
20
8d
9m
5b
22
21b
19a
9h
4b
7c
5a
9d
11c
5j
10
8c
2
4a
1
5g
9g
14a
5d
11b
13b
21a
11a
16a
6a
15
16b
14b
19a
3
5i
5h
13a
6c
9l
6b
18
24
25
26
27

wsp.com