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Environmental Sciences Ltd.

Town of Erin

Urban Centre Wastewater Servicing Class EA

Natural Environment Report

Prepared for: Ainley Group
Job #: J160005

December 18, 2017

DRAFT FOR DISCUSSION

1-5 Chancery Lane, Bracebridge ON P1L 2E3 | 705-645-0021
202-501 Krug Street, Kitchener ON N2B 1L3 | 519-576-1711

December 18, 2017 HESL Job #: J160005

Mr. Joe Mullan
550 Welham Road
Barrie, ON
L4N 8Z7

Dear Mr. Mullan:

Re: Town of Erin Urban Centre Wastewater Servicing Class Environmental Assessment – Natural Environment Report - Draft

We are pleased to submit the draft Natural Environment Report in support of the Town of Erin Urban Centre Wastewater Servicing Class Environmental Assessment (UCWS Class EA). We have collected and summarized baseline data on aquatic characteristics (fisheries, benthic invertebrates, and aquatic habitat) and terrestrial communities (vegetation communities, vascular plants, amphibians, breeding birds) and species at risk. The report includes contributions from Palmer Environmental Consulting Group on terrestrial assessment components.

The effects of the alternative design concepts on the natural environment (fisheries and aquatic resources, amphibians, birds, and vegetation communities) have been assessed and recommendations for mitigation to minimize negative effects have been provided.

We thank you for the opportunity to work on this project. If you have any questions please do not hesitate to contact me.

Sincerely,
Per. Hutchinson Environmental Sciences Ltd.

Brent Parsons, M.Sc.
brent.parsons@environmentalsciences.ca

Signatures

Report Prepared by:

Brent Parsons, M.Sc.
Senior Aquatic Ecologist

Andrea Smith, Ph.D.
Senior Ecologist

Dirk Janas, B.Sc. (Palmer Environmental Consulting Group)
Senior Ecologist

Natalie Dunn, (Palmer Environmental Consulting Group)
Ecologist

Report Reviewed by:

Neil Hutchinson, Ph.D
President, HESL

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Abbreviation	Meaning
ACS	Assimilative Capacity Study
BMP	Best Management Practice
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
COSSARO	Committee on the Status of Species at Risk in Ontario
CVC	Credit Valley Conservation
EA	Environmental Assessment
ECA	Environmental Compliance Approval
ELC	Ecological Land Classification
EPT	Ephemeroptera, Plecoptera and Trichoptera
ESA	Environmentally Significant Area
HBI	Hilsenhoff Biotic Index
IBI	Index of Biological Integrity
MNR	Ministry of Natural Resources
MNRF	Ministry of Natural Resources and Forestry
NAI	Natural Areas Inventory
NHIC	Natural Heritage Information Centre
OBBN	Ontario Benthic Biomonitoring Network
PNA	Priority Natural Area
PSW	Provincially Significant Wetland
PWQO	Provincial Water Quality Objectives
SAR	Species at Risk
SPS	Sewage Pumping Station
SSMP	Servicing and Settlement Master Plan
SWH	Significant Wildlife Habitat
UCWS	Urban Centre Wastewater Servicing
WWTP	Wastewater Treatment Plant

1. Introduction

1.1 Background

The Town of Erin is currently completing a Class Environmental Assessment (Class EA) for a municipal wastewater treatment and collection system for Hillsburgh and the Village of Erin (Figure 1). The Urban Centre Wastewater Servicing Class EA (UCWS Class EA) is informed by the conclusions of the Servicing and Settlement Master Plan (SSMP; BM Ross 2014), which completed part of Phase 1 and part of Phase 2 of the UCWS Class EA process. The SSMP identified a general area (along Wellington County Road 52) for the location of a wastewater treatment plant (WWTP) with an outfall to the West Credit River in the vicinity of the 10th Line or Winston Churchill Boulevard. Credit Valley Conservation (CVC) completed an extensive Existing Conditions Report (CVC et al. 2011) as part of the SSMP, which summarized the existing hydrogeology, hydrology, geomorphology, aquatic ecology (fish and benthos), terrestrial ecology (vegetation), water quality and hydraulics in the SSMP study area (approximately 5th Line to Winston Churchill Blvd, and 5th Sideroad to Highpoint Sideroad).

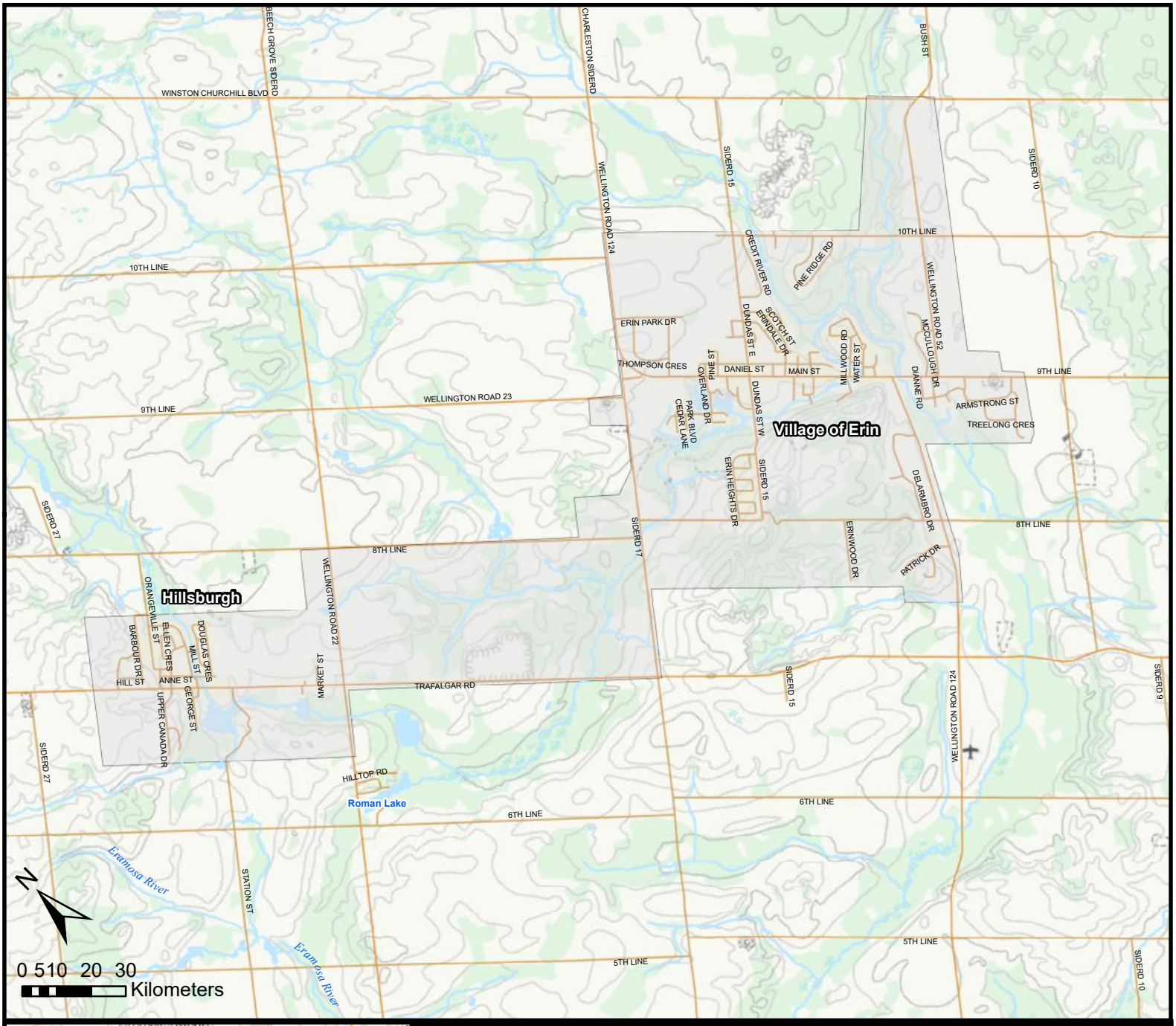
The preliminary Assimilative Capacity Study (ACS; BM Ross 2014) was based on water quality data contained within the CVC report, as it provided an excellent baseline of the natural environment in the study area. The 2014 BM Ross ACS was updated in March 2017 as part of Phase 1 and 2 of the current UCWS Class EA process (HESL 2017). It confirmed that the West Credit River downstream of 10th Line was a preferred discharge location and provided recommended effluent limits for discharge. The Town is now engaged in completing Phase 3 and Phase 4 of the EA, identifying and evaluating collection system alternatives, plant locations, and outfall locations.

The purpose of this natural environment report is to assess the effects of the alternative design concepts for the proposed wastewater collection system, WWTP location, and outfall location on the natural environment (fisheries and aquatic resources, amphibians, birds, and vegetation communities) within the study area (Figure 1) and provide recommendations for mitigation to ensure that the project can be completed with no significant adverse effects to the natural environment.

1.2 Description of Different Project Alternatives

The infrastructure for the municipal wastewater servicing will consist of a system of main sewers, sewage pumping stations (SPS), forcemains and gravity sewers conveying sewage to a WWTP, which will discharge treated effluent through an outfall to the West Credit River (Figures 2-4). The preliminary ACS identified the West Credit River between 10th Line and Winston Churchill Boulevard as the best location for the WWTP outfall (Ainley Group 2017). Three potential outfall sites have been proposed in this general area: two at 10th Line and one at Winston Churchill Boulevard (Figure 2). Three potential WWTP locations were identified at Wellington Rd. 52 and 10th Line:

- Site 1 on the north side of Wellington Rd. 52;
- Site 2A on the southwest side of Wellington Rd. 52; and
- Site 2B on the southeast side of Wellington Rd. 52 (Figure 2).



Legend

- Roads
- Rivers
- Lakes
- Survey Area

Project Lead: Brent Parsons
Prepared by: Kris Hadley
Data Source: HESL,Ontario Land, ESRI
Coordinate System: NAD 1983 UTM Zone 17N

Figure 1:
Study Area

Project: Town of Erin UCWS Class EA – Natural Environment

Project #: J160005

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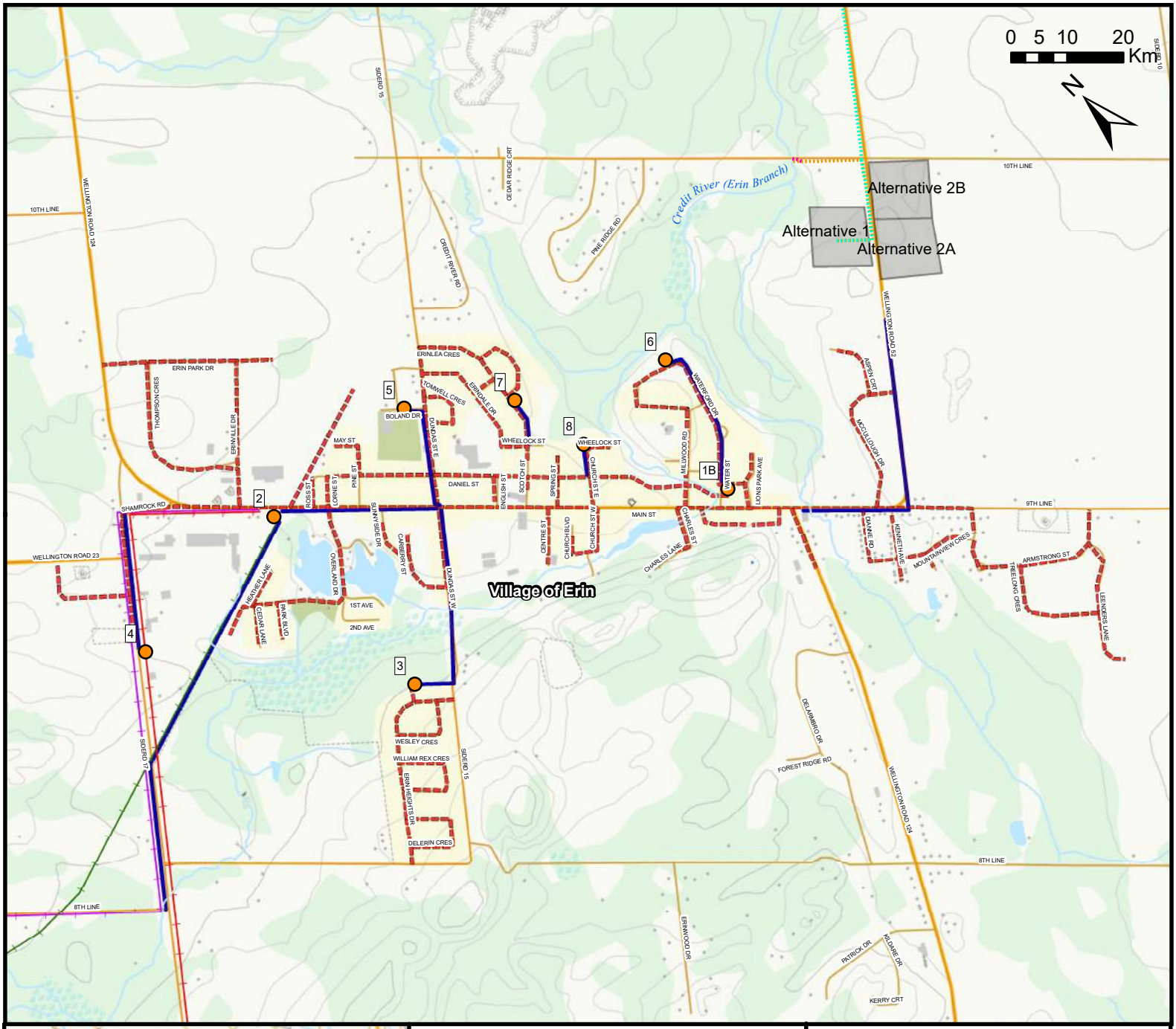

Legend

- Roads
- Rivers
- Lakes
- Forcemain
- Sewer
- Potential Pump Stations
- Potential WWTP Sites
- Forcemain Route Alternative 1
- Forcemain Route Alternative 2
- Forcemain Route Alternative 3
- Outfall Alternative1A
- Outfall Alternative 1B
- Outfall Alternative 2

Figure 2:
Proposed Infrastructure for Erin Servicing – Erin Village

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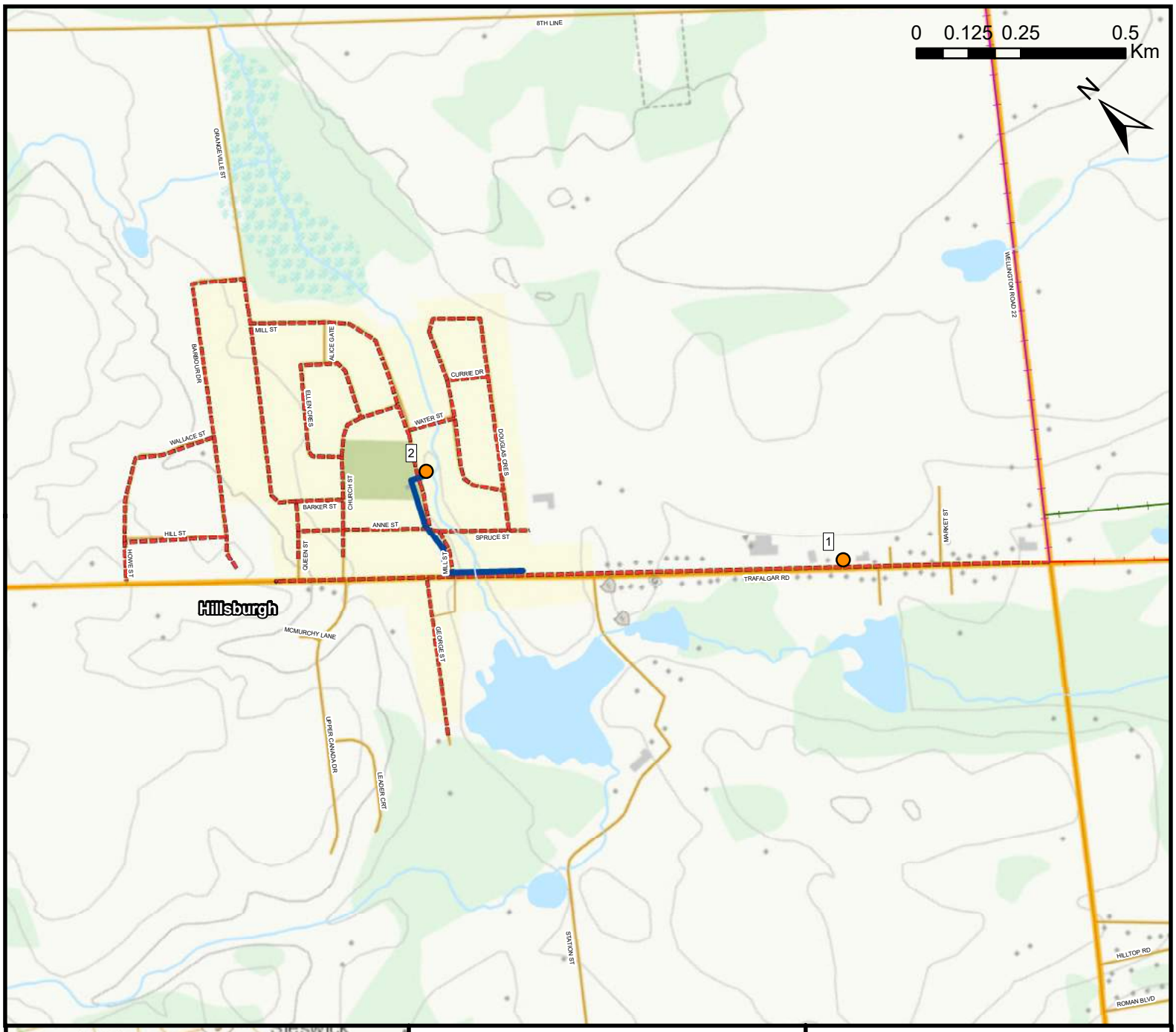

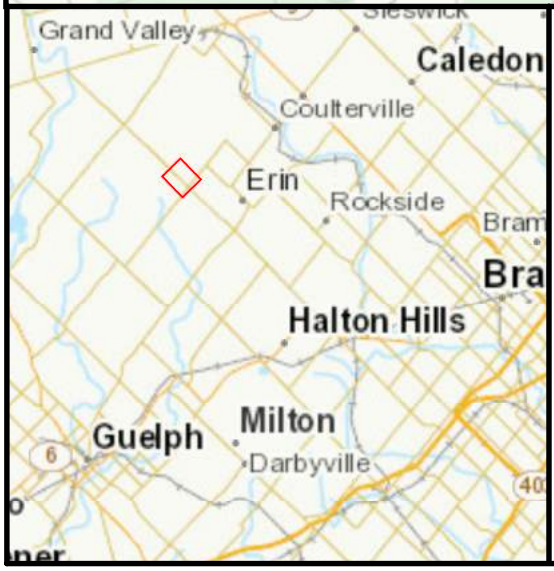

Legend

- Roads
- Rivers
- Lakes
- Forcemain
- Sewer
- Potential Pump Stations
- Forcemain Route Alternative 1
- Forcemain Route Alternative 2
- Forcemain Route Alternative 3

Figure 3:
Proposed Infrastructure for Erin Servicing – Hillsburgh

Project: Town of Erin UCWS Class EA – Natural Environment

Project #: J160005

Project Lead: Brent Parsons
Prepared by: Kris Hadley
Data Source: HESL,Ontario Land, ESRI
Coordinate System: NAD 1983 UTM Zone 17N

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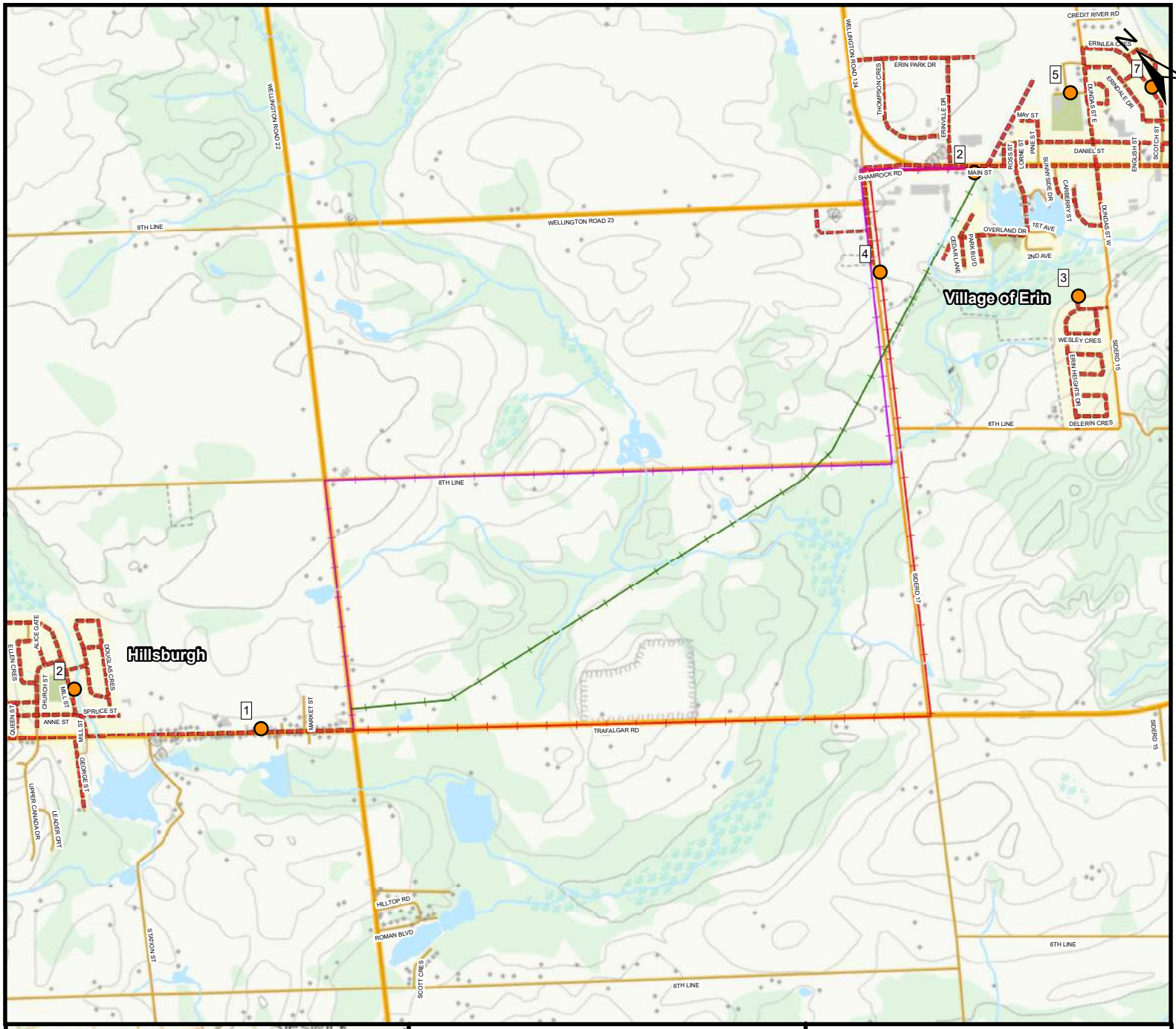

Figure 4:
Proposed Infrastructure for Erin Servicing – Hillsburgh to Village of Erin Forcemain

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Data Source: HESL,Ontario Land, ESRI
Coordinate System: NAD 1983 UTM Zone 17N

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2. Methodology

2.1 Background Review

We conducted a background review of information relating to the biological and physical setting of the subject area. The following information sources were reviewed:

- Erin Servicing and Settlement Master Plan. Phase 1 – Environmental Component – Existing Conditions (CVC et al. 2011);
- A Cooperative Management Planning Initiative for the Credit River Fishery (Ontario Ministry of Natural Resources (MNR) and CVC 2002);
- Credit River Watershed and Region of Peel Natural Areas Inventory – Volume 1 and 2 (CVC 2011);
- Ontario Ministry of Natural Resources and Forestry (MNRF) Natural Heritage Information Centre (NHIC) records of species at risk and natural areas (MNRF 2014a, MNRF 2017a,b);
- MNR/MNRF Natural Heritage Reference Manual and Significant Wildlife Habitat resource material (e.g., MNR 2000; MNRF 2015)
- Ontario Breeding Bird Atlas records for the area (Bird Studies Canada et al. 2006).
- Monitoring results from CVC's Integrated Watershed Monitoring Program (IWMP),
- Other sources of information, such as aerial photography and topographic maps, were also consulted prior to commencing field investigations.

2.2 Field Investigations

2.2.1 Aquatic Ecology

Information was collected on fisheries, benthic invertebrates and aquatic habitat for the West Credit River between 10th Line and Winston Churchill Boulevard to:

a) Determine and document the quality of aquatic habitat to inform effluent outfall site selection.

b) Inform selection of mitigation measures based on site-specific sensitivities.

c) Establish a baseline data set with which to compare future conditions and assess the presence or absence of impacts associated with treated effluent.

Data on water quality and flow conditions in the West Credit River are provided in the ACS report (HESL 2017).

2.2.1.1 Fisheries

CVC provided information on the resident fish assemblages in the study reach from surveys that they had completed (CVC et al. 2011). The findings from the CVC study were combined with the aquatic habitat assessment and observations made during field surveys to characterize fish assemblages as part of the

impact assessment. An assessment of spawning habitat and Brook Trout (*Salvelinus fontinalis*) spawning activity was made in November 2016 (Section 2.2.1.3).

The spawning assessment was completed with Jon Clayton, Aquatic Biologist, CVC on November 1, 2016 in accordance with CVC protocol (CVC 2015). Brook Trout are known to spawn in the Credit River between late-September and mid-December (MNR and CVC 2002) and active spawning was noted during the assessment. The spawning assessment was completed from approximately 500 m downstream of Winston Churchill Boulevard to 10th Line. Redds were marked via GPS, counted and categorized as Category 1 (definite redd, confirmed, fish may be seen on redd), Category 2 (probable but not 100% sure), or Category 3 (possible; Figure 5).

2.2.1.2 Benthic Invertebrates

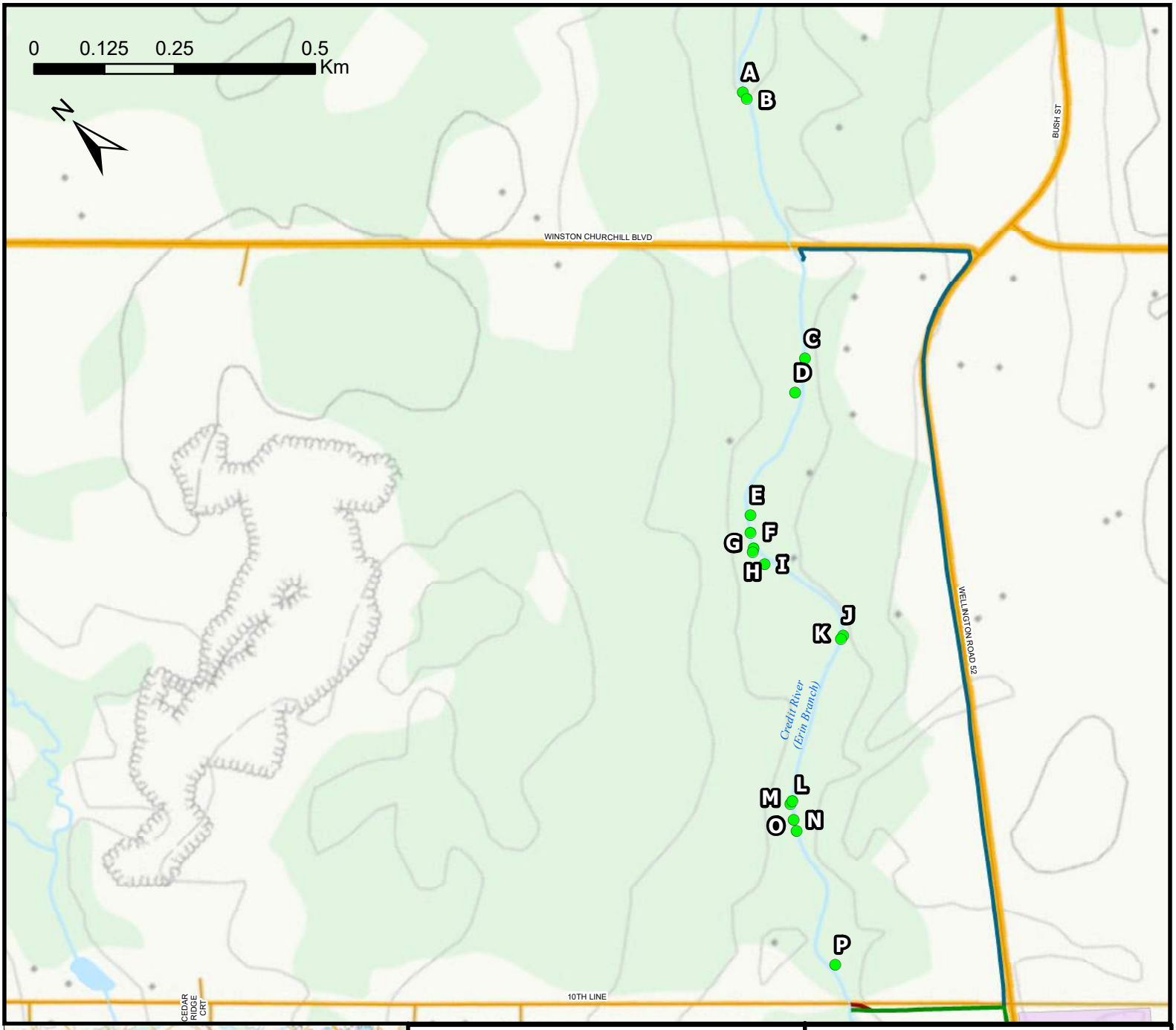
Benthic invertebrates were collected following the Ontario Benthic Biomonitoring Network (OBBN) protocol (Jones et al. 2007) and in the summer (August 15, 2017) to align with current CVC sampling methodology and to allow for future like-to-like comparison of data in accordance with requests by CVC staff. Triplicate samples were collected near the potential effluent outfall locations at 10th Line and Winston Churchill Boulevard through a 2-minute travelling kick-and-sweep sampling effort with a 500 µm D-net (Figure 6). Samples were preserved in the field with 99% isopropyl alcohol and sent to Richard Bland Associates, to identify the first 100 animals from the samples to the lowest practical taxonomic level.

A variety of biological metrics were calculated for each replicate from the taxonomic data. Metrics were selected to match those used in the background review (CVC et al. 2011) and included: taxa abundance, taxa richness, EPT (*Ephemeroptera, Plecoptera* and *Trichoptera*) taxa richness, % EPT, % *Chironomidae*, Shannon Diversity, and the Hilsenhoff Biotic Index (HBI). The biological metrics provide an indication of stream health and a robust description of the benthic community.

Habitat is a key driver of benthic assemblages and should be controlled during sampling and assessed during interpretation to separate natural variability due to habitat from changes related to identified stressors. All samples were therefore collected from riffle or shallow run habitat, which is ubiquitous in the study reach. Benthic habitat was described according to morphology, substrate and food sources (e.g., aquatic vegetation and woody debris).

2.2.1.3 Aquatic Habitat

Aquatic habitat was described at the benthic invertebrate sampling locations and characterized in the general vicinity of the potential effluent outfall locations on August 15, 2017. Habitat features such as substrates, morphological features, macrophytes, woody debris, riparian vegetation and water depth were described and photographed.



Legend

- Roads
- Rivers
- Lakes
- Outfall Alternative 1A
- Outfall Alternative 1B
- Outfall Alternative 2
- Brook Trout Spawning Redds

Figure 5:
Spawning Redds

Project: Town of Erin UCWS Class EA – Natural Environment

Project #: J160005

Project Lead: Brent Parsons
Prepared by: Kris Hadley
Data Source: HESL,Ontario Land, ESRI
Coordinate System: NAD 1983 UTM Zone 17N

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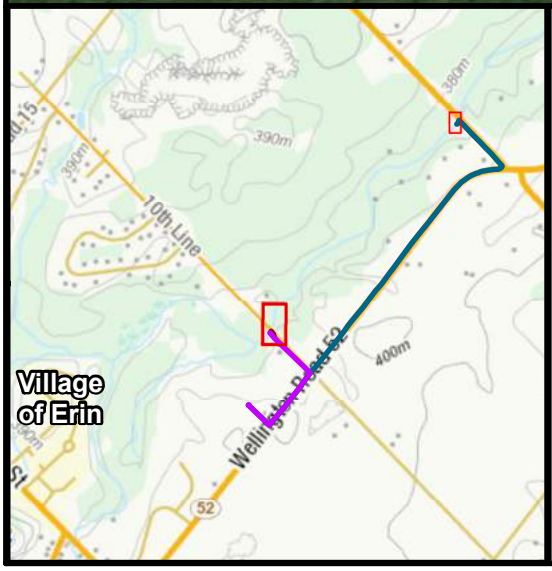

Legend

- Roads
- Rivers
- Lakes
- Outfall Alternative 1A
- Outfall Alternative 1B
- Outfall Alternative 2
- Benthic Sampling Sites

0 0.05 0.1 0.2 km

Figure 6:
Benthic Invertebrate Sampling Sites

Project: Town of Erin UCWS Class EA – Natural Environment

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Project Lead: Brent Parsons
Prepared by: Kris Hadley
Data Source: HESL,Ontario Land, ESRI
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere

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2.2.2 Terrestrial Ecology

2.2.2.1 Vegetation Communities

Vegetation communities were identified at the following study sites (Figure 7) and within the adjacent lands (120 m radius):

- Eight Sewage Pumping Stations (SPS) in Erin Village;
- Two locations proposed for SPS in Hillsburgh (the old Hillsburgh SPS #1 and Hillsburgh SPS #2);
- Three potential locations for the WWTP; and
- Along Route Alternative 1 for the Hillsburgh to Village of Erin Connection Forcemain.

One of the proposed SPS locations (the new Hillsburgh SPS #1) was not surveyed since the location was proposed after the field season.

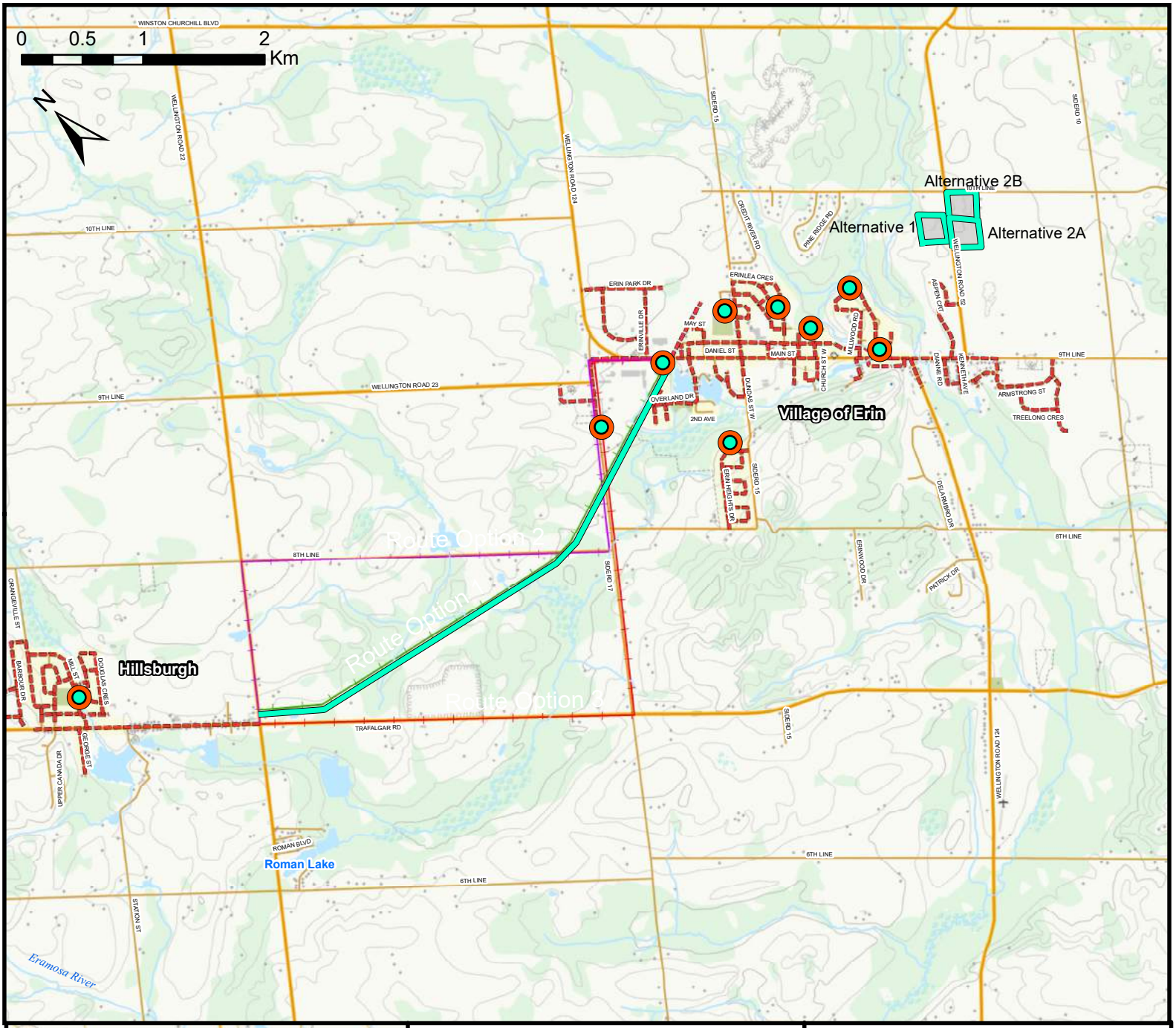
Vegetation communities were mapped and described following the Ecological Land Classification (ELC) System for Southern Ontario (Lee et al. 1998). Vegetation community boundaries were delineated on field maps through the interpretation of recent aerial photographs and refined in the field. Information collected during ELC surveys included dominant species cover, community structure, as well as level of disturbance, presence of indicator species, and other notable features.

Spring and early summer site visits were initially conducted on May 16 and June 29, 2017 with weather conditions ranging from no wind to light breeze, no precipitation, and temperatures around 12ºC and 19ºC, respectively. Late summer site visits were conducted on August 15 and September 6, 2017 with weather conditions ranging from no wind to light breeze, no precipitation, and temperatures were around 19ºC and 13 ºC, respectively.

2.2.2.2 Vascular Plants

A summer season botanical survey was completed by traversing the sites and recording species observed in each vegetation community. The botanical surveys were completed in conjunction with the ELC field investigations (Figure 7). Due to the limited site level access, most surveys were completed from the edge of vegetation communities. Many of the locations surveyed are within Natural Areas Inventory (NAI) sites and the core inventory data was used to provide supplemental vascular plant information.

Peel Region and CVC watershed rarity status was based on the *Plants of the Credit River Watershed* (CVC 2002). Regional and Ecodistrict 6E-7 plant status was based on *The Vascular Plant Flora of the Greater Toronto Area* (Varga et al. 2000). Provincial plant status was based on the *Provincially Rare Flora of Ontario* (Oldham and Brinker 2009) and NHIC information (MNRF 2017a).



Legend

- Roads
- Rivers
- Lakes
- Potential Pump Stations
- Potential WWTP Sites
- Forcemain Route Alternative 1
- Forcemain Route Alternative 2
- Forcemain Route Alternative 3
- Vegetation Survey Locations
- Vegetation Survey Transect
- Sewer

Figure 7:
Vegetation Community Survey

Project: Town of Erin UCWS Class EA – Natural Environment

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Project Lead: Brent Parsons
Prepared by: Kris Hadley
Data Source: HESL,Ontario Land, ESRI
Coordinate System: NAD 1983 UTM Zone 17N

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2.2.2.3 Breeding Amphibians

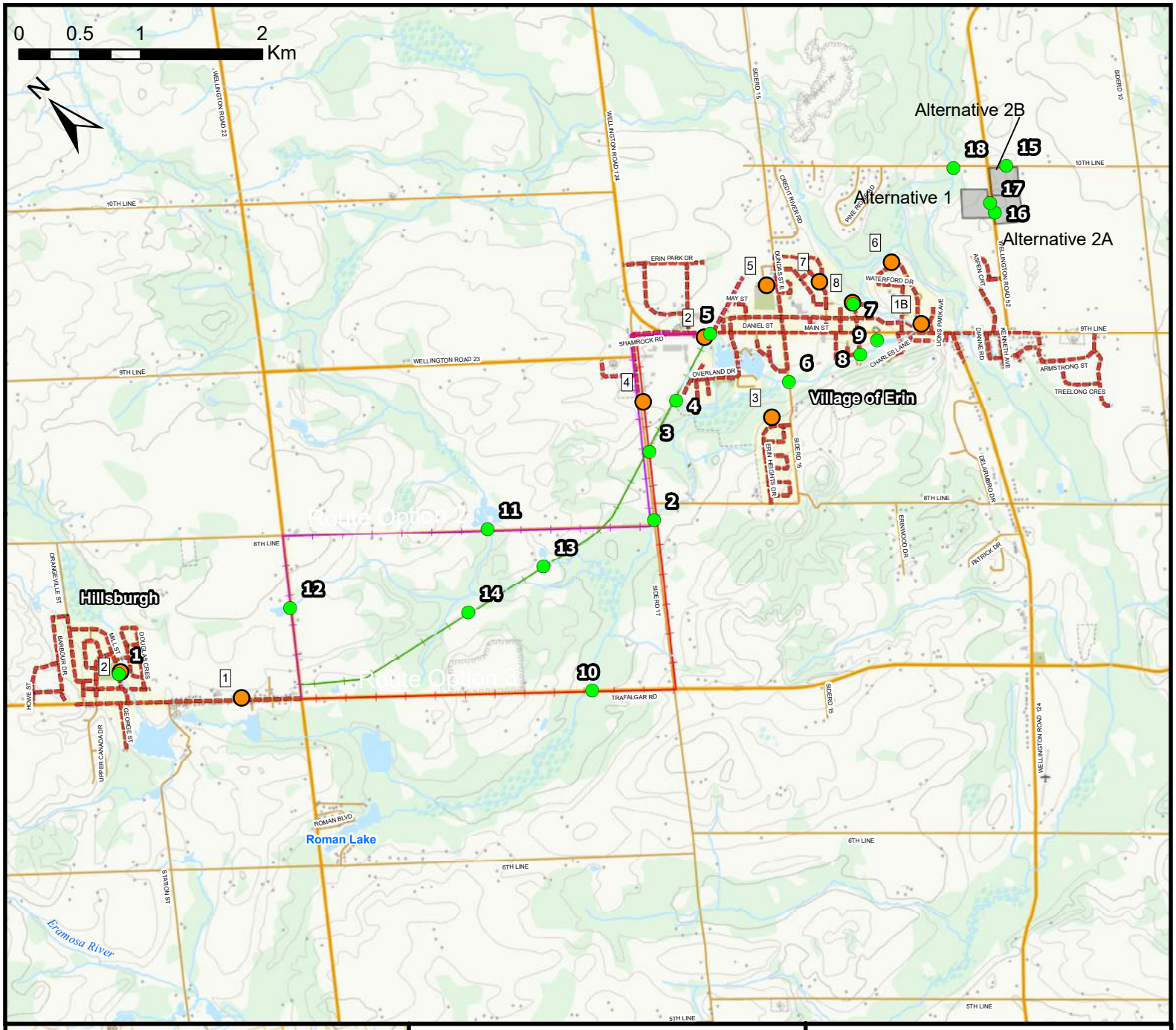
Amphibian surveys were completed following the Marsh Monitoring Program protocol (Bird Studies Canada et al. 2009). A background review of aerial imagery and a preliminary site investigation were completed to determine suitable sampling locations near appropriate breeding habitat (i.e., wetlands or vernal ponds) within the study area with particular focus on areas within or adjacent to the footprint of project infrastructure. Eighteen sampling locations were selected (Figure 8, Table 1). One of the proposed SPS locations (the new Hillsburgh SPS #1) was not surveyed since the location was proposed after the field season.

We conducted three-minute surveys at each location, recording the species and number of amphibians detected, as well as their approximate locations. Surveys were completed on April 26, May 30 and May 31, and June 27 (Table 1) between 21:30 and 24:00 h. Weather conditions during surveys ranged from a few clouds to partly cloudy, with no wind to light air, no precipitation to light drizzle, and temperatures from 9ºC to 17ºC.

Table 1. Location of Breeding Amphibian Survey Stations.

Station	Location	Survey Dates	Site Description
N/A	Hillsburgh SPS #1	Not surveyed	Not surveyed
1	Hillsburgh SPS #2	April 26, May 30, and June 27, 2017	Urban Park beside Fresh-moist Lowland Deciduous Forest
2	8th Line and 17 Sideroad (Route Alternative 2)	April 26, May 30, and June 27, 2017	Dry-fresh Poplar Mixed Forest
3	Entrance to Cataract Trail off 17 Sideroad	April 26, May 30, and June 27, 2017	White Cedar-Conifer Organic Coniferous Swamp
4	Cataract Trail at wetland	April 26, May 30, and June 27, 2017	Cattail Mineral Shallow Marsh
5	Cataract Trail and Main St. (Erin Village SPS #2)	April 26, May 30, and June 27, 2017	Dry-moist Old Field Meadow
6	Dundas St. W wetland	April 26, May 30, and June 27, 2017	West Credit River and Floodplain
7	East Church St. (SPS #8)	April 26, May 30, and June 27, 2017	Mineral Cultural Woodland
8	Church Boulevard (Riverside Park)	April 26, May 30, and June 27, 2017	West Credit River and Floodplain
9	Church Boulevard E	April 26, May 30, and June 27, 2017	West Credit River and Floodplain

Station	Location	Survey Dates	Site Description
10	Trafalgar Rd. N (along Forcemain Alternative 3)	April 26, May 30, and June 27, 2017	Watercourse, Manicured Edge of Road and Deciduous Forest
11	8th Line (along Forcemain Alternative 2)	April 26, May 30, and June 27, 2017	Watercourse and Adjacent Artificial Pond
12	22nd Sideroad	May 31, and June 27, 2017	Watercourse and Floodplain with Adjacent Pond
13	Hillsburgh Cataract Trail East (along Forcemain Alternative 1)	May 31, and June 27, 2017	Dry-fresh White Cedar Coniferous Forest
14	Hillsburgh Cataract Trail West (along Forcemain Alternative 1)	May 30, and June 27, 2017	White Cedar – Conifer Mineral Coniferous Swamp
15	WWTP Site 2B	April 26, May 30, and June 27, 2017	Dry-moist Old Field Meadow
16	WWTP Site 2A	April 26, May 30, and June 27, 2017	Dry-moist Old Field Meadow
17	WWTP Site 1	April 26, May 30, and June 27, 2017	Dry-moist Old Field Meadow, adjacent to White Cedar-Conifer Organic Coniferous Swamp
18	Credit River at 10th Line	April 26 and May 30, 2017	White Cedar-Conifer Organic Coniferous Swamp



Legend

- Roads
- Sewer
- Rivers
- Lakes
- Potential Pump Stations
- Potential WWTP Sites
- Forcemain Route Alternative 1
- Forcemain Route Alternative 2
- Forcemain Route Alternative 3
- Amphibian Survey Site

Project Lead: Brent Parsons
Prepared by: Kris Hadley
Data Source: HESL,Ontario Land, ESRI
Coordinate System: NAD 1983 UTM Zone 17N

Figure 8:
Breeding Amphibian Surveys

Project: Town of Erin UCWS Class EA – Natural Environment

Project #: J160005

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2.2.2.4 Breeding Birds

Breeding bird surveys were conducted to document bird communities throughout the Town of Erin, in areas that could be directly impacted by infrastructure for the urban centre wastewater servicing system (Figure 9; Gregory et al. 2004):

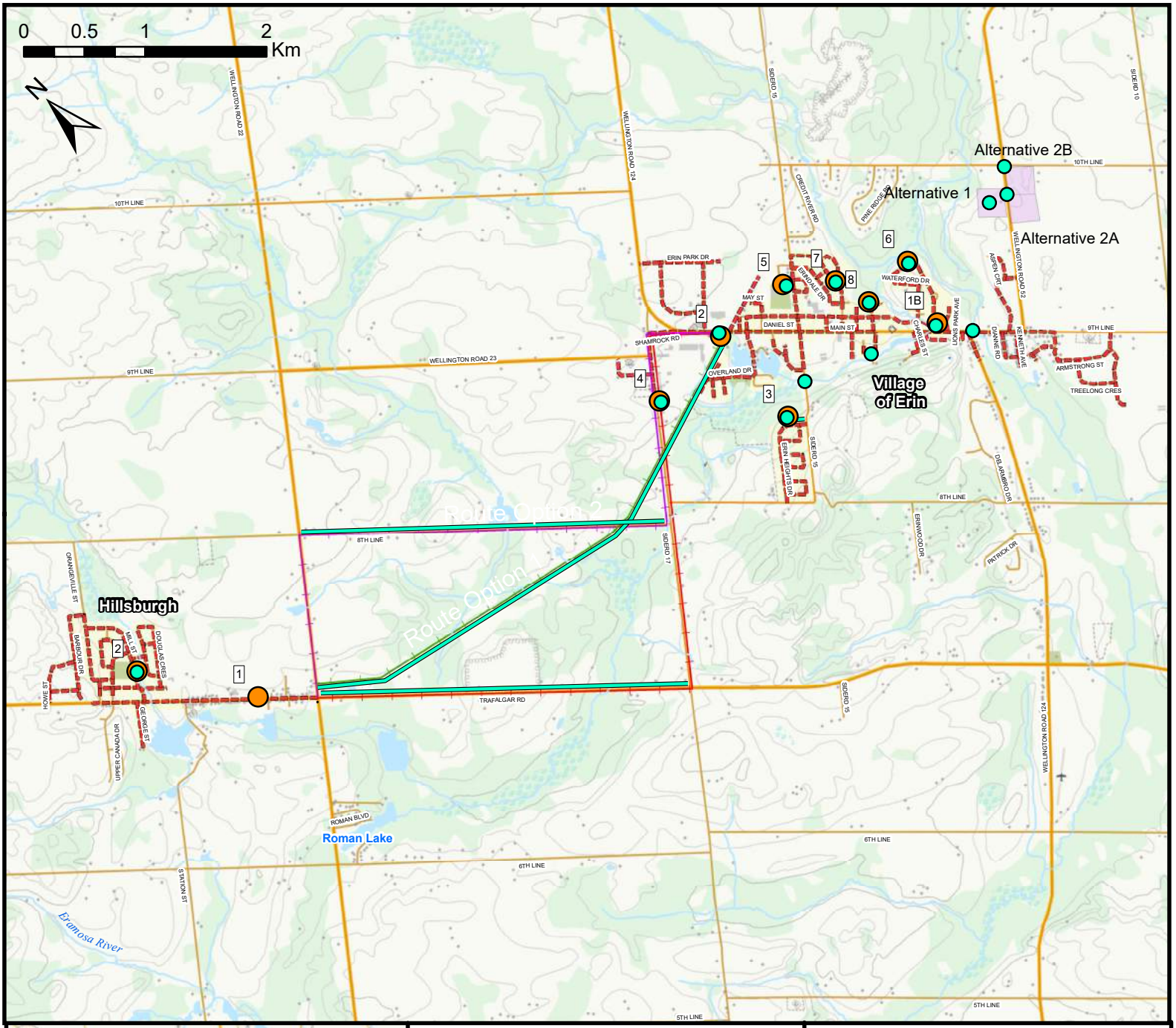
- At seven locations proposed for SPS in Erin Village;
- At SPS #2 in Hillsburgh;
- Along the proposed forcemain from SPS #3 to Dundas St. W. in Erin Village;
- At the Dundas St. W. marsh along the Credit River in Erin;
- At Riverside Park in Erin
- At three potential locations for the WWTP; and
- Along Route Alternative 1 for the Hillsburgh to Village of Erin Connection Forcemain.

In addition, we drove along Route Alternatives 2 and 3 for the Hillsburgh to Village of Erin Connection Forcemain. These two alternatives were not intensively studied because the proposed routes are located along existing roads. We assumed that forcemain construction would occur solely within the existing footprint of these roads and their immediate rights of way, and thus would have limited impacts on the surrounding natural environment. One of the proposed SPS locations (the new Hillsburgh SPS #1) was not surveyed since the location was proposed after the field season.

We conducted both point counts and line transect surveys to accommodate the variety of locations to be sampled (Gregory et al. 2004). Five-minute point counts were carried out at smaller survey locations (each of the SPS sites, the Credit River site) and where access to the site was limited or could disturb birds (the Credit River marsh, WWTP sites). All birds seen or heard within 25-50 m of the observer were recorded during point counts. We carried out walking line transects along two proposed forcemain routes (from SPS #3 to Dundas St. and along Route Alternative 1), in which we slowly walked along the trail recording all birds heard or seen within 50 m of the route. For the Route Alternatives 2 and 3 we conducted line transects by car, slowly drove along the routes (at approximately 10-20 km/h) with the windows open, recording congregations of birds seen or heard within 100 m of the road.

The approximate location of all birds detected during surveys was marked on aerial photos of the study area. We noted any species designated as at risk federally and/or provincially, as well as species considered area sensitive (i.e., area sensitive species require large areas of continuous habitat for breeding and foraging; MNR 2000).

Surveys were conducted on June 1 and 21, 2017 between 05:45 and 11:45 h. Weather conditions during surveys ranged from clear to 50% overcast, with no wind to strong breezes, no precipitation, and temperatures between 6ºC and 19ºC.



Legend

- Roads
- Sewer
- Rivers
- Lakes
- Potential Pump Stations
- Potential WWTP Sites
- Forcemain Route Alternative 1
- Forcemain Route Alternative 2
- Forcemain Route Alternative 3
- Bird Survey Locations
- Bird Survey Transect

Figure 9:
Breeding Bird Surveys

Project: Town of Erin UCWS Class EA – Natural Environment

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Project Lead: Brent Parsons
Prepared by: Kris Hadley
Data Source: HESL,Ontario Land, ESRI
Coordinate System: NAD 1983 UTM Zone 17N

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2.2.2.5 Species at Risk

We recorded all species at risk detected during field work and conducted a background review (see Section 2.1) to determine potential species at risk that could occur in the study area. Species at risk are designated federally by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and under the federal *Species at Risk Act*, and provincially by the Committee on the Status of Species at Risk in Ontario (COSSARO; under Ontario's *Endangered Species Act*).

3. Results

3.1 Aquatic Ecology

3.1.1 Fisheries

3.1.1.1 Background Review

The watershed supports 60 fish species (MNR and CVC 2002), of which 15 have been collected in the study area (CVC et al. 2011; Table 2). The study reach supports cold, cool and warm water species that are sensitive, moderately tolerant and tolerant to stressors according to CVC classifications (CVC et al. 2011; Table 2). CVC also characterized fish communities in the West Credit River near the 10th Line between 1999 and 2009 and noted that there was "good" health after the first seven years of sampling based on Index of Biological Integrity (IBI) scores, likely because ubiquitous groundwater upwellings in the area are able to moderate any negative impacts of runoff from Erin Village and from its two online impoundments. In January 2009, CVC collected 15 Rainbow Trout (*Oncorhynchus mykiss*), one Brown Trout (*Salmo trutta)* and 209 Brook Trout from the area (Table 2). IBI scores calculated from sampling halfway between the 10th Line and Winston Churchill Boulevard in 2008 indicated fish health as "fair" with Brook Trout dominating the catch.

Brook Trout were stocked from the 1940s to 1981 and the study reach of the West Credit River currently supports a self-reproducing population. MNR and CVC (2002) identify the protection of Brook Trout as a fisheries objective in the Credit River and they are an indicator species of pristine, coldwater habitat.

Table 2. Fish Species List for the West Credit River at 10th Line and Winston Churchill (CVC 2011).

Fish Species	Preferred Thermal Regime	Sensitivity	Number of Fish Collected		
			1980-1999[a]		2009
			10th Line	Winston Churchill	10th Line
Brook Trout	Cold water	Sensitive	2	37	209
Pearl Dace	Cool water	Moderately tolerant		2	
Central Mudminnow	Cool water	Moderately tolerant		2	
Northern Redbelly Dace	Cool water	Moderately tolerant	4		
Rainbow Trout	Cold water/ Cool water	Sensitive			15
Brown Trout	Cold water/ Cool water	Sensitive			1
White Sucker	Warm water	Tolerant	7		
Bluntnose Minnow	Warm water	Tolerant	4		
Fathead Minnow	Warm water	Tolerant	1	20	
Blacknose Dace	Warm water	Tolerant	13	62	
Longnose Dace	Warm water	Sensitive	1		
Creek Chub	Warm water	Tolerant	9		
Brown Bullhead	Warm water	Tolerant		10	
Brook Stickleback	Warm water	Tolerant		1	
Pumpkinseed	Warm water	Tolerant	3	1	

Notes: a – From CVC 2011 – sampling years not provided

3.1.2 Benthic Invertebrates

3.1.2.1 Background Review

Benthic invertebrates were sampled halfway between the 10th Line and Winston Churchill Boulevard in 2007 and 2008, and at the 10th Line from 1999-2006 through CVC's Integrated Management Plan (CVC et al. 2011). Samples were collected in July or August using a travelling kick-and-sweep collection technique in all microhabitats with a 500 µm D-net. Replicates were composited and the first 300 animals were picked from each sample and assessed through biological metrics (Table 3; Appendix A).

Table 3. CVC Benthic Invertebrate Sampling Results from Station 50115003 (10th Line) and 15-04-01 (between 10th Line and Winston Churchill Boulevard).

Station	Year	Taxa Richness	EPT Taxa Richness	% EPT	% Oligochaeta	% Chironomidae	Shannon Diversity	HBI
10th Line	1999	51	20	40	3	29	3.5	5.43
	2000	47	15	36	2	47	4.95	5.06
	2001	53	23	51	10	25	4.83	4.40
	2001	52	18	29	8	41	5.15	5.45
	2002	53	17	22	5	54	3.99	6.02
	2003	47	14	46	5	24	4.63	5.54
	2004	32	13	46	10	22	3.80	5.25
	2005	57	18	43	6	22	4.71	4.55
	2006	61	22	38	5	21	4.59	5.15
	Average (1999-2006)	50	18	39	6	32	4.46	5.20
Halfway between 10th Line and Winston Churchill Boulevard	2008	53	12	38	3	10	4.27	3.84

Taxa richness ranged from 32 to 61 at 10th Line with an average of 50 taxa, while 53 taxa were collected downstream in 2008. Average EPT taxa and % EPT at the 10th Line were 18 and 39 respectively, and 12 and 38 halfway between the 10th Line and Winston Churchill Boulevard in 2008. % *Oligochaeta* at the 10th Line ranged from 2 to 10% and averaged 6%, while % *Oligochaeta* further downstream in 2008 was 3%. % *Chironomidae* was much higher at the 10th Line (average = 32%) than the sample collected further downstream in 2008 (10%). Shannon Diversity was similar between the two sites: 4.46 on average at the 10th Line and 4.27 further downstream in 2008. The average HBI score of 5.2 indicates "fair" water quality with "fairly substantial pollution likely", which is in contrast to the cold water and high oxygen conditions in this reach (HESL 2017). The HBI was lower halfway between the 10th Line and Winston Churchill Boulevard (3.84) indicating that water quality was "very good', a likely response to the large groundwater inputs along this reach.

3.1.2.2 Field Investigations

Sampling locations are presented in Figure 6, habitat characteristics are described in Table 4 and biological metric results are provided in Table 5. The first 100 animals were to be picked from each replicate sample in accordance with OBBN protocol, but greater than 100 were picked and identified from every sample. Site comparison, therefore focused on the proportionate metrics: % EPT, % Chironomidae, Shannon Diversity and HBI.

All samples were extremely productive – the required sample size of at least 100 invertebrates was obtained from 1-9% of the volume of each sample. There was variance between the triplicate samples taken at each of the WCB and CR10 sites but, overall, the sites were similar (Table 5). More individuals were counted at the WCB sites but there were fewer taxa (127 individuals and 20 taxa at WCB compared to 110 and 26 at CVR10). The number and percentage of EPT taxa and diversity were higher at CR10 but the average HBI indices and scores of "good" water quality were the same at each site. The relatively high changes in benthic assemblages within replicate sites was likely habitat related. For example, Site CR10-A was located in a riffle as opposed to a more depository run, and riffles generally support a more diverse benthic assemblage because of higher dissolved oxygen concentrations and other important habitat variables.

Table 4. Habitat Characteristics at Sampling Locations.

Sample Site	Substrate	Morphology	Aquatic Vegetation	Woody Debris
CR10-A	Rocky with some sand	Riffle	None	Moderate
CR10-B	Rocky substrates moderately covered in periyphton	Sluggish run	None	Moderate
CR10-C	Rocky substrates moderately covered in periphyton and underlying sand	Run	Moderate (Water Celery (*Vallisneria Americana)*, Lake Watercress (*Nasturtium officinale*)	Abundant
WCB-A	Rocky substrates largely covered with periphyton and underlying sand	Riffle	None apart from periphyton	None
WCB-B	Rocky substrates largely covered in periphyton, sand and organics	Run	Sparse	Abundant
WCB-C	Mainly organics with sand deposits	Run	Very abundant (Sago Pondweed (*Stuckenia pectinate*), Lake Watercress, Curly Leaved Pondweed (*Potamogeton crispus*), Water Celery, Milfoil spp. (*Myriophyllum*)	Sparse

Table 5. Benthic Invertebrate Biological Metric Results.

Biological Metric	CR10-A	CR10-B	CR10-C	CR10 average	WCB-A	WCB-B	WCB-C	WCB average
Abundance	115	112	103	110	141	119	120	127
Richness	27	24	27	26	22	23	15	20
EPT Taxa Richness	12	7	9	9	8	4	4	5.33
% EPT	40.87	23.21	49.51	37.87	34.75	13.45	49.17	32.45
% Chironomidae	38.26	69.64	38.83	48.91	48.23	50.42	40.00	46.22
Diversity	2.90	2.47	2.61	2.66	2.54	2.52	1.71	2.26
HBI - Family biotic index	2.77	4.53	5.80	4.37	3.50	4.56	5.01	4.36
HBI - Water quality	Excellent	Good	Fairly Poor	Good	Excellent	Good	Fair	Good
HBI - Degree of organic pollution	Organic pollution unlikely	Some organic pollution probable	Substantial pollution likely	Some organic pollution probable	Organic pollution unlikely	Some organic pollution likely	Fairly substantial pollution likely	Some organic pollution probable

The benthic communities differed slightly between the sampling locations as communities contained greater % EPT taxa and diversity on average at sites located adjacent to the 10th Line. Assemblages near the 10th Line are supported by more habitat features such as rocky riffles which support diverse assemblages.

3.1.3 Aquatic Habitat

3.1.3.1 Background Review

MNR and CVC (2002) note that the upper section of the Credit River watershed has baseflow which is maintained from springs and groundwater discharge, and generally good water quality. There is a quick recovery of temperatures and Brook Trout populations near 10th Line after impacts associated with impoundments in Erin as groundwater baseflows improve along with a confluence of other tributaries (CVC 2011). Fish can migrate into the study area from Belfountain, which is 6.5 km downstream and is all coldwater habitat (CVC et al. 2011). The best Brook Trout populations and spawning areas are in the subwatershed downstream of Erin Village. Between the 10th Line and 400 m downstream, >10 redds were surveyed by CVC while 5-10 redds were surveyed between 400 and 800 m downstream of the 10th Line.

Water temperatures were collected from the West Credit River downstream of 10th Line and Winston Churchill Boulevard in 2008 as part of the SSMP (CVC et al. 2011) and in 2016 as part of the ACS (HESL 2017; Table 6). In 2008, the average daily maximum temperature and seasonal maximum increased from upstream to downstream, but was below CVC's average daily target of 20ºC and seasonal maximum target of 26ºC for water temperatures in coldwater habitat. In 2016, the average daily maximum temperature decreased between 10th Line and Winston Churchill, but both sites exceeded the average daily maximum target of 20ºC. The seasonal maximum temperatures were both below the seasonal maximum target of 26ºC. The average daily maximum water temperature at 10th Line was approximately 3ºC higher at the two sites in 2016 than 2008, however groundwater discharge between 10th Line and Winston Churchill had a moderating effect on the water temperatures downstream in 2016.

Table 6. Water Temperatures Monitored in 2008 (CVC et al. 2011) and 2016 (HESL 2017) from within the Study Area.

	2008 (CVC et al. 2011)[a]			**HESL (2016)[b]**		
Site	Average Daily Max (Target: 20ºC)	Seasonal Max (Target: 26ºC)	Percent Exceedance over 26°C	Average Daily Max (Target: 20ºC)	Seasonal Max (Target: 26ºC)	Percent Exceedance over 26°C
10th Line	16.7	20.4	0	22.0	24.3	0
Winston Churchill Blvd.	17.8	21.7	0	20.9	23.7	0

Notes: a – June to September 2008 (dates note provided), b - June 10 to August 25, 2016

3.1.3.2 Field Investigations

Winston Churchill Boulevard

The West Credit River transitioned from a shallow run approximately 50 m downstream of Winston Churchill Boulevard to a riffle within 10 m of the culvert. The shallow run contains wetted widths of approximately 10-12 m, water depths up to 0.5 m deep and rocky substrates such as small boulders, cobble and gravel partially covered in periphyton, with underlying sand and organic substrates found in the depository areas. Riparian vegetation was dominated by Eastern White Cedar (*Thuja occidentalis*) which provided up to 70% canopy coverage (Photograph 1). Instream cover consisted of abundant woody debris and sparse accumulations of Lake Watercress (*Nasturtium officinale*) and Pickerelweed (*Pontederia cordata*). The riffle located within 10 m on either side of the culvert was dominated by cobble with underlying sands and shallow water depths (<0.3 m). Cover habitat was limited to branches and limited overhanging vegetation.

The riffle transitioned into a deeper (up to 1 m), more depository run approximately 10 to 70 m upstream of Winston Churchill Boulevard (Photograph 2). Substrates were mixed and contained a greater proportion of sand and unconsolidated organic substrates than found in the downstream riffle. A thick mat of submerged macrophytes was observed running from 30 m to 80 m upstream of the culvert; species included Lake Watercress (*Nasturtium officinale*), Curly-Leaf Pondweed (Potamogeton crispus), Water Celery (Vallisneria sp.), Sago Pondweed (*Stuckenia pectinata)* and Milfoil (Myriophyllum spp; Photograph 3). The river transitioned back into riffle habitat like that observed downstream of Winston Churchill Boulevard 70+ m further upstream from Winston Churchill Boulevard.

10th Line

The West Credit River contained riffle run morphology from 100 m downstream of 10th Line to 10th Line. The channel was approximately 11-12 m wide with average depths of approximately 0.5 m. Substrates were predominantly coarse gravel and cobble, and sands with some organic material located in quiescent areas. Cover was provided by abundant woody debris along log deflectors and overhanging Eastern White Cedar. The rifle habitat transitioned through a partial beaver dam to a sluggish run 60 m downstream of 10th Line. Substrates were sandy with some cobble and gravel, and unconsolidated organics at the river edges. Patches of Canada Waterweed (*Elodea canadensis*), Lake Watercress (*Nasturtium officinale*), and Water Celery (*Vallisneria spp.)* were noted in this section. The channel transitioned back into riffle/shallow run habitat closer to the 10th Line with dominant rocky substrates and underlying sand, abundant woody debris and sporadic accumulations of macrophytes (Photographs 4 and 5).

Photograph 1. A view of the West Credit River facing downstream, approximately 30 m east of Winston Churchill Blvd. Note the mixed substrates, abundant woody debris and dense overhanging White Cedar.

Photograph 2. A view of the West Credit River facing upstream from the western end of the culvert beneath Winston Churchill Blvd. Periphyton covered rocky substrates were dominant in this riffle habitat with underlying sands.

Photograph 3. A view of the river facing upstream approximately 30 m west of Winston Churchill Blvd. highlighting more quiescent conditions and accumulations of submerged macrophytes along the river margins.

Photograph 4. Riffle habitat located approximately 30 m downstream of the 10th Line.

Photograph 5. A view of the West Credit River facing the 10th Line from approximately 20 m downstream.

3.1.4 Spawning Assessment

Brook Trout spawning redds are shown on Figure 5 and described in Table 7. Ninety-four redds were observed in 16 areas within the study reach. Of the 94 redds, 61 were classified as definite (Category 1), 15 as probable (Category 2), and 10 as possible (Category 3) based on redd formation and presence or absence of Brook Trout. Observed redds were located between 350 m downstream of Winston Churchill Boulevard and 75 m downstream of the 10th Line, with the majority of redds located greater than 300 m downstream of 10th Line and 200 m upstream of Winston Churchill Boulevard. Redds were generally located in cobble, gravel and sandy substrates.

Many spawning Brook Trout were observed on and adjacent to redds and migrating throughout the West Credit River (Photograph 6) during the November 2016 survey. Fish presence at individual redds is likely under-representative because of disturbance from the presence of the biologists (Table 7). Many redds were freshly cleaned off and spawning behaviour such as males nipping one another was evident in many locations (Photograph 7).

Table 7. Spawning Assessment Results.

Site ID	# Redds	Redd Category	Fish Presence
A	8	3	Many
B	7	1	Many
C	6	1	Yes
D	1	3	No
E	2	1	Juveniles
F	12	1	Yes
G	3	3	Yes
H	9	1	Yes
I	4	1	No
J	2	3	Yes
K	1	1	Yes
L	5	2	Juveniles
M	4	3	Juveniles
N	10	2	Yes
O	17	1	Many
P	3	1	No

Photograph 6. Spawning Brook Trout were abundant throughout much of the study reach.

Photograph 7. Many Brook Trout redds were freshly cleaned by spawning females.

3.2 Terrestrial Ecology

3.2.1 Natural Heritage Designations

West Credit River Provincially Significant Wetland (PSW) Complex

The West Credit River Provincially Significant Wetland (PSW) Complex covers a relatively large area between Hillsburgh and the Village of Erin (Figure 10**)**. This wetland complex is largely comprised of coniferous and mixed swamps. The dominant coniferous species is Eastern White Cedar, while Balsam Fir (*Abies balsamea*) is commonly observed, and Black Spruce (*Picea mariana*) is occasionally present (CVC et al. 2011). Organic soils are commonly recorded within this wetland complex and large amounts of groundwater are known to discharge throughout the area (CVC et al., 2011).

West Credit River at Hillsburgh Environmentally Significant Area (ESA)

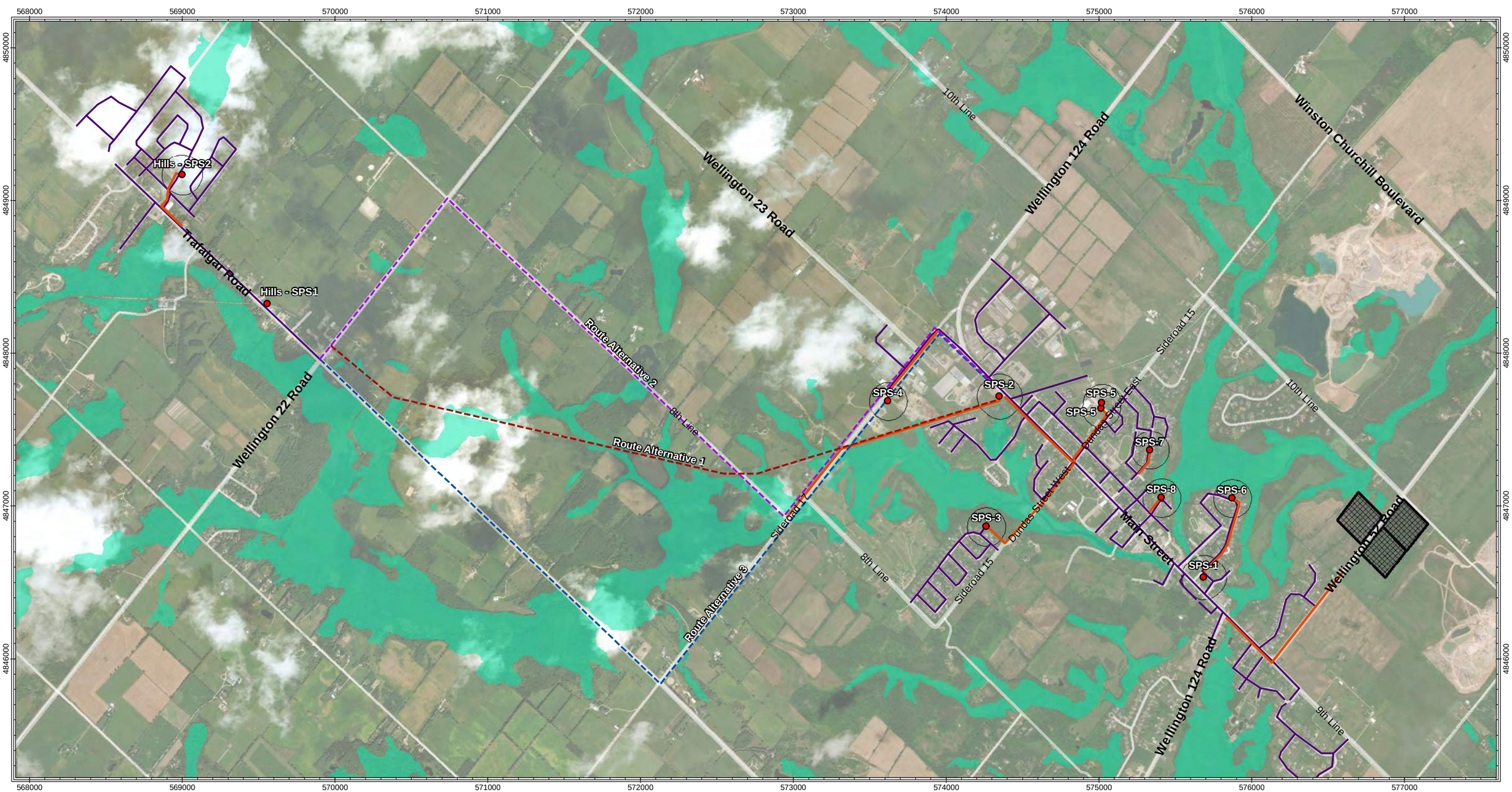
Environmentally Significant Areas (ESA) within CVC's watershed are specially protected areas which comprise ecosystem features or functions of ecological importance. The ESA meets one or several of the following criteria: part of a distinctive or unusual landform, significant hydrological function, critical wildlife habitat, contains provincially or regionally rare species or communities, high species diversity, and aesthetic value in the context of the surrounding landscape (CVC et al. 2011).

The West Credit River at Hillsburgh ESA is part of the West Credit River Wetland Complex. It is characterized as an undisturbed forested valley with the presence of coniferous swamps and provides important habitat for rare species and important groundwater discharge for the West Credit River (CVC et al. 2011). This ESA is found within the study area to the south of Hillsburgh on either side of Wellington Road 24. The northern section of the ESA parallels the Cataract-Elora Trail.

Credit River Watershed and Region of Peel Natural Areas Inventory (NAI)

The NAI is a comprehensive watershed and municipal wide biological resource inventory for key natural areas. Much of the information available in the NAI dates back to work completed for ESA reports, wetland evaluations and Forest Resource Inventories (FRI) completed in the 1970's and 1980's. More recent and ongoing information has been collected resulting in detailed information on flora, fauna and vegetation communities for many NAI. Much of this information is available for natural heritage features within the study area and has been used to supplement the current study. This information will also be of use as the EA advances to the detailed design stage. The following specific NAI Site Summaries were updated in October 2011 and have been referenced for this study:

- Eight Line – 17 Sideroad (NAI Area #6497)
- Eight Line – Dundas W (NAI Area #6273)
- Main – Dundas – Woolen Mills (NAI Area #6500, 6609)
- Sixth Line – 24 Sideroad (NAI Area #6336, 6523)
- Sixth Line – Wellington 22 (NAI Area #6293, 6294, 6499, 6517, 6519)
- Trafalgar – 22 Sideroad (NAI Area #6498)



Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

Legend

- SPS location
- SPS locations buffer (120 m)
- Forcemain
- Gravity Sewer
- Potential WWTP site
- Route Alternative 1
- Route Alternative 2
- Route Alternative 3
- Provincially Significant Wetland

N

COORDINATE SYSTEM:
NAD 1983 UTM ZONE 17N

SCALE: 1:24000

0 0.5 1
kilometres

West Credit River Provincially Significant Wetland Complex

FIGURE 10

Document Path: C:\Egnyte\Shared\Projects\Active\13183 - HESL\13183 - Town of Erin Sewage Treatment\Mapping\Draft\mxd\13183_ErinWWTP_Infra_Overview.mxd

3.2.2 Vegetation Communities

Field investigations identified 22 different vegetation communities in total. The following number of different vegetation communities were identified at each site:

- Eight at the proposed SPS in Erin Village;
- Two at the proposed SPS in Hillsburgh (the old SPS #1 and SPS#2);
- Two at the potential locations for the WWTP; and
- 15 along Route Alternative 1 for the Hillsburgh to Village of Erin Connection Forcemain.

These communities and their corresponding boundaries are illustrated on ELC Maps 1 to 11H (Appendix B) with vegetation community descriptions provided below in Table 8 and photographs in Appendix B.

Both upland and wetland vegetation communities have been recorded within the proposed sites. The limits of wetland communities were identified and mapped to the extent possible recognizing that site level access was limited in most areas. Aerial photo interpretation and background mapping, including the MNRF PSW mapping, was used in the assessment of wetland limits. All wetland communities identified in Table 8 are part of the West Credit River PSW Complex.

Table 8. Vegetation Community Descriptions.

ELC vegetation communities	Sites	Description
CUM1-1: Dry-moist Old Field Meadow	Erin Village SPS #2; Erin Village SPS #4; Erin Village SPS #5; Erin Village SPS #6; WWTP; Route Alternative 1	Canopy sparsely vegetated with various species of trees including Manitoba Maple (*Acer negundo*), Trembling Aspen (*Populus tremuloides*), and Eastern White Cedar (*Thuja occidentalis*), usually providing less than 10% cover at a height of 6 to 25 m. The subcanopy is occasionally vegetated with Choke Cherry (*Prunus virginiana*), Tartarian Honeysuckle (*Lonicera tatarica*), and European Buckthorn (*Rhamnus cathartica*), typically providing less than 10% cover at a height of 2 to 6 m. Understory is dominated by Canada Goldenrod (*Solidago canadensis*), Wild Carrot (*Daucus carota*), Smooth Brome (*Bromus inermis*), Redtop (*Agrostis gigantea*), New England Aster (*Symphyotrichum novae-angliae*), and Common Milkweed (*Asclepias syriaca*), providing greater than 60% cover at a height of 1 to 2 m. The ground layer is sparsely vegetated with Bird's-foot Trefoil (*Lotus corniculatus*), Tufted Vetch (*Vicia cracca*), and grasses, providing greater than 60% cover at a height of 0.2 to 0.5 m. All sites listed with this vegetation community differ slightly, however, no notable attributes were identified at any of these location with the exception of large sized communities such as the potential WWTP provide habitat for grassland birds discussion in Sections 3.2.4.
CUP3: Coniferous Plantation	Forcemain Route Alternative 1	Canopy is predominantly composed of White Spruce (*Picea glauca*) with occurrences of White Pine (*Pinus stobus*) providing greater than 60% cover at a height of 6 to 25 m. The subcanopy, understory, and ground layer are essentially un-vegetation.
CUP3-2: White Pine Coniferous Plantation	Forcemain Route Alternative 1	Canopy is composed of White Pine (*Pinus stobus*) with White Spruce (*Picea glauca*), providing greater than 60% cover at a height of 6 to 25 m. The subcanopy is composed of Eastern White Cedar and White Ash (*Fraxinus americana*) samplings, providing a less than 10% cover at a height of 2 to 6 m. The understory and ground layer are essentially un-vegetation.

ELC vegetation communities	Sites	Description
CUW1: Mineral Cultural Woodland	Erin Village SPS #1A; Erin Village SPS #1B; Erin Village SPS #8; Forcemain Route Alternative 1	The canopy is composed of numerous species including Trembling Aspen, White Ash, Manitoba Maple, Sugar Maple (*Acer saccharum*), and Black Cherry (*Prunus serotina*), providing 35 to 60% cover at a height of 6 to 25 m. The subcanopy is composed of Manitoba Maple, Eastern White Cedar, Sugar Maple samplings and Trembling Aspen sampling, ranging from 10 to 60% cover at a height of 2 to 6 m. The understory is typically composed of Alternate-leaved Dogwood (*Cornus alternifolia*), Red-osier Dogwood (*Cornus sericea*), European Buckthorn, and Eastern White Cedar samplings, ranging from 10 to 60% cover at a height of 1 to 2 m. The ground layer is predominantly composed of Garlic Mustard (*Alliaria petiolata*), Field Horsetail (*Equisetum arvense*), Canada Goldenrod, and Riverbank Grape (*Vitis riparia*), providing greater than 60% cover at a height of 0.5 to 1 m. Although the Erin SPS-8 site is highly disturbed with frequent dumping of yard waste, Spotted Jewelweed (*Impatiens capensis)* was recorded in the understory layer beyond the proposed footprint for the SPS. This may be indicative of a seepage location which will be discussed in greater detail in the Impact Assessment section below.
FOC: Coniferous Forest	Erin Village SPS #7; Erin Village SPS #8	Vegetation community assessment was conducted based on desktop assessment due to limited access.
FOC2-2: Dry-fresh White Cedar Coniferous Forest	Forcemain Route Alternative 1	The canopy is dominated with Eastern White Cedar with occurrences of Black Cherry and Trembling Aspen, providing greater than 60% at a height of 6 to 25 m. The subcanopy is composed on Eastern White Cedar samplings providing 10 to 25% cover at a height of 2 to 6 m. The understory is composed of White Ash providing less than 10% cover at a height of 1 to 2 m. The ground layer is comprised of Sedges (*Carex sp*.) and Spotted Geranium (*Geranium maculatum*), providing less than 10% cover at a height of less than 0.2 m.
FOC4-1: Fresh-moist Cedar Coniferous Forest	Forcemain Route Alternative 1	The canopy is dominated by Eastern White Cedar providing greater than 60% cover at a height of 6 to 25 m. The understory is composed of Choke Cherry proving less than 10% cover at a height of 1 to 2 m. The ground layer is essentially un-vegetated.
FOD5-8: Dry-fresh Sugar Maple - White Ash Deciduous Forest	Erin Village SPS #3	The canopy is dominated by White Ash and Sugar Maple, providing greater than 60% cover at a height of 6 to 25 m. The subcanopy is composed of White Ash with European Buckthorn providing 25 to 60% cover at a height of 2 to 6 m. The understory is composed of Alternate-leaved Dogwood and Black Raspberry (*Rubus occidentalis*) providing 10 to 25% cover at a height of 1 to 2 m. The ground layer is vegetated by Garlic Mustard, Broad-leaved Enchanter's Nightshade (*Circaea canadensis*), and Sugar Maple seedlings, providing 10 to 25% cover at a height of 0.2 to 0.5 m.
FOD7: Fresh-moist Lowland Deciduous Forest	Hillsburgh SPS #2	The canopy is predominantly composed of Balsam Poplar (*Populus balsamifera*) and Manitoba Maple with occurrences of Norway Maple (*Acer platanoides*) and Willows (*Salix sp*.), providing greater than 60% cover at a height of 6 to 25 m. The subcanopy is composed of Manitoba Maple, Norway Maple, and Willow trees, providing 25 to 60% cover at a height of 2 to 6 m. The understory is comprised on Purple Loosestrife (*Lythrum salicaria*), Reed Canary Grass (*Phalaris arundinacea*), and European Buckthorn, providing 25 to 60% cover at a height of 0.5 to 1 m. The ground layer is Spotted Jewelweed and grasses, providing greater than 60% cover at a height of 0.2 to 0.5 m.
FOM3-2: Dry-fresh Sugar Maple – Hemlock Mixed Forest	Forcemain Route Alternative 1	The canopy is dominated by Sugar Maple with occurrence of Eastern Hemlock (*Tsuga canadensis*), providing greater than 60% cover at a height of 6 to 25 m. The subcanopy is solely composed of Sugar Maple saplings, providing 10 to 25% cover at a height of 2 to 6 m. The understory layer is essentially

ELC vegetation communities	Sites	Description
		unvegetated while the ground layer is comprised of grasses and Sedges, providing 10 to 25% cover at less than 0.2 m in height.
FOM4-2: Dry-fresh White Cedar – Poplar Mixed Forest	Erin Village SPS #2; Forcemain Route Alternative 1	The canopy is composed of Eastern White Cedar, Elm (*Ulmus sp*.), Norway Maple, Balsam Poplar and White Pine, providing greater than 60% cover at a height of 6 to 25 m. The subcanope is composed of Eastern White Cedar, Manitoba Maple, European Buckthorn, and Norway Maple, providing 25 to 60% cover at a height of 2 to 6 m. The understory is predominantly comprised of Manitoba Maple samplings, providing 10 to 25% cover at a height of 1 to 2 m. The ground layer is dominated by Garlic Mustard with greater than 60% cover and a height of 0.5 to 1 m. This vegetation community is heavily disturbed.
FOM5-2: Dry-fresh Poplar Mixed Forest	Forcemain Route Alternative 1	The canopy is composed of Trembling Aspen and Balsam Poplar with occurrences of White Spruce, providing greater than 60% cover at a height of 6 to 25 m. The subcanopy is comprised of White Ash and Eastern White Cedar, providing 25 to 60 % cover at a height of 2 to 6 m. The understory is comprised of Red-osier Dogwood and Willow shrubs, providing greater than 60% cover at a height of 1 to 2 m. The ground layer is predominantly composed of Field Horsetail and Woodland Strawberry (*Fragaria vesca*) with 10 to 25% cover at a height of 0.2 to 0.5 m.
MAS2-1: Cattail Mineral Shallow Marsh	Forcemain Route Alternative 1	The canopy is typically comprised of Trembling Aspen of Willow, providing less than 10% cover at a height of 2 to 6 m. The understory is dominated by Narrow-leaved Cattail (*Typha angustifolia*) with occurrences of Red-osier Dogwood, Purple Loosestrife, as well as Common Reed (*Phragmites autralialis*) and Spotted Joe Pye Weed (*Eutrochium maculatum*) in some cases. This layer provides greater than 60% cover at a height of 1 to 2 m. The ground layer is sparse vegetation with Field Horsetail and Devil's Beggarticks, and Watershield (*Brasenia schreberi*), providing less than 10% cover at a height of 0.2 to 0.5 m.
SWC: Coniferous Swamp	Erin Village SPS #6	Vegetation community assessment was conducted based on desktop assessment due to limited access.
SWC1-2: White Cedar – Conifer Mineral Coniferous Swamp	Forcemain Route Alternative 1	The canopy is dominated by White Spruce providing greater than 60% cover, greater than 25 m in height. The subcanopy is predominantly comprised of Eastern White Cedar and Tamarack, providing greater than 60 % cover at a height of 6 to 25 m. The understory is primarily composed of Eastern White Cedar, providing 10 to 25% cover at a height of 1 to 2 m. The ground layer is comprised of Sedges, grasses, Field Horsetail, and ferns, providing 10 to 25% cover at a height of 0.2 to 0.5 m.
SWC3-2: White Cedar – Conifer Organic Coniferous Swamp	WWTP; Forcemain Route Alternative 1	The canopy is composed of Tamarack, Trembling Aspen, Eastern White Cedar, and White Spruce, providing greater than 60% cover at a height of 6 to 25 m. The subcanopy is comprised of Eastern White Cedar and Tamarack as well as some pockets of Common Reed, providing 25 to 60% cover at a height of 2 to 6 m. The understory is primarily composed of Eastern White Cedar, Balsam Fir (*Abies balsamea*), Red-Osier Dogwood and Spotted Jewelweed, providing less than 10% cover ranging from 0.5 to 1 m in height. The ground layer is composed of moss, Field Horsetail, Bulblet Fern (*Cystopteris bulbifera*), Sensitive Fern (*Onoclea sensibilis*), Wild Calla (*Calla palustris*), and Rushes (*Juncus sp*.), providing less than 10% cover at a height of 0.2 to 0.5m.
SWD4-1: Willow Mineral Deciduous Swamp	Forcemain Route Alternative 1	The canopy is composed of Balsam Poplar, Weeping Willow (Salix babylonica), and Trembling Aspen, providing 25 to 35% cover at a height of 6 to 25 m. The subcanopy is composed of Willow species and Trembling Aspen, with 25 to 60% cover and ranging from 2 to 6 m in height. The understory is composed of Red-Osier Dogwood, Spotted Jewelweed, Spotted Joe Pye Weed, and Broad-leaved Cattail (*Typha latifolia*), providing greater than 60% cover at a height of 1 to 2 m. The ground layer less than 10% covered by Field Horsetail at a height of 0.2 to 0.5m.

ELC vegetation communities	Sites	Description
SWM: Mixed Swamp	Erin Village SPS #1B; Erin Village SPS #6	Vegetation community assessment was conducted based on desktop assessment due to limited access.
SWM3-2: Poplar Conifer Mineral Mixed Swamp	Forcemain Route Alternative 1	The canopy is dominated by Trembling Aspen, providing 25 to 60% cover at greater than 25 m in height. The subcanopy is composed of Green Ash, Eastern White Cedar, and Eastern Hemlock, providing greater than 60% cover at a height of 6 to 25m. The understory is composed on Alternate-leaved Dogwood and Choke Cherry, providing 10 to 25% cover at a height of 1 to 2 m. The ground layer is composed of Barren Strawberry (*Geum fragarioides*), and Sedges, providing 10 to 25% cover at a height of 0.2 to 0.5m.
SWT2-2: Willow Mineral Thicket Swamp	Forcemain Route Alternative 1	The canopy is composed of Willow species and Easter White Cedar at a height of 2 to 6 m and providing greater than 60% cover. The subcanopy is primarily composed of Red-osier Dogwood and Narrow-leaved Cattail, providing 10 to 25% cover at a height of 1 to 2m. The understory is composed of Sedges and Marsh Fern (*Thelypteris palustris*), providing 10 to 25% cover at a height of 0.5 to 1m. The ground layer is primarily composed of Devil's Beggarticks, providing 10 to 25% cover at a height of 0.2 to 0.5 m.

3.2.3 Vascular Plants

The botanical inventory resulted in the identification of 165 species of vascular plants from the combined survey sites. Fifty-nine (36%) of the recorded species are non-native to Ontario. The majority of the non-native species were recorded from the perimeter of the survey sites where there is greater disturbance.

Ten plants recorded are listed as locally or regionally uncommon or rare in Peel Region, CVC watershed, and/or Ecodistrict 6E-7 (Table 9; Varga et al. 2000; CVC 2002). No other provincially or nationally rare species were recorded. A complete list of the flora identified from the study area is provided in Appendix B, which includes a summary of species locations by survey site.

Table 9. Rare/Uncommon Plants Recorded from the Study Area.

Scientific Name	Common Name
Brasenia schreberi	Watershield
Calla palustris	Wild Calla
Carex flava	Yellow Sedge
Chelone glabra	Turtlehead
Cypripedium pubescens var. pubescens	Large Yellow Lady's-slipper
Galium asprellum	Rough Bedstraw
Galium tinctorium	Stiff Marsh Bedstraw
Geranium maculatum	Wild Geranium
Picea glauca	White Spruce
Ranunculus hispidus var. hispidus	Bristly Buttercup

3.2.4 Breeding Amphibians

Six amphibian species were heard calling in the study area during surveys: American Toad (*Anaxyrus americanus*), Gray Treefrog (*Hyla versicolor*), Spring Peeper (*Pseudacris crucifer*), Western Chorus Frog (*Pseudacris triseriata*), Northern Leopard Frog (*Lithobates pipiens*) and Green Frog (*Rana clamitans*; Table 10, Appendix C). Amphibians were detected at 15 out of the 18 survey stations. Five species were heard calling on April 26 (all except Gray Treefrog), all species were heard calling on May 30, four species were heard on May 31 (American Toad, Gray Treefrog, Spring Peeper and Green Frog) and only one species (Green Frog) was heard calling on June 27.

Table 10. Amphibian Species Recorded in the Amphibian Breeding Surveys.

Species	Survey Stations														
	2	3	4	5	6	7	8	9	10	12	13	14	15	16	17
American Toad	✓	✓	✓	✓						✓			✓	✓	
Gray Treefrog				✓		✓			✓	✓	✓	✓	✓	✓	
Spring Peeper		✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓
Western Chorus Frog			✓						✓						
Northern Leopard Frog			✓		✓			✓						✓	
Green Frog			✓		✓				✓	✓		✓			

Notes: only stations where amphibians were heard calling are presented

Western Chorus Frogs were heard calling at station 4, which is a cattail mineral shallow marsh next to the Cataract-Elora Trail (Forcemain Alternative 1), and at station 10, a lowland creek along Trafalgar Rd. (Forcemain Alternative 3). They are listed as a threatened species nationally under the federal *Species at Risk Act* (SARA) but are not listed provincially (COSEWIC 2008)[1]. The Great Lakes/St. Lawrence – Canadian Shield population (which occurs in the study area) has experienced a 43% population decline in Ontario over the past decade due to habitat loss and fragmentation (COSEWIC 2010). Compared with other frog species, Western Chorus Frog has relatively low mobility and high fidelity to natal ponds, making it particularly sensitive to degradation of habitat (COSEWIC 2008).

Western Chorus Frogs breed in temporary wetlands and shallow portions of permanent wetlands that dry up in the summer (COSEWIC 2008). Breeding wetlands are located in open habitat, such as forest clearings, wet meadows, fallow lands and shrubby areas (COSEWIC 2015). Chorus Frogs forage within 250-300 m of breeding wetlands and hibernate within 100-200 m of them, in soft soil, existing burrows, or

[1] *SARA prohibitions on harming listed species or damaging or destroying their habitat apply only on federal lands.*

under rocks, dead trees or decaying leaves (COSEWIC 2015). The species is threatened by activities likely to destroy or degrade its habitat, including construction and maintenance of linear infrastructure (e.g., roads, trails, utility and energy pipelines), urban development, agricultural intensification, and wetland alteration (e.g., levelling, drainage and channelization; Environment Canada 2015).

3.2.5 Breeding Birds

A total of 53 bird species were documented in the study area, including five species at risk and 13 area sensitive species (Table 11, Appendix D). Species at risk and area sensitive species were found primarily along the proposed Forcemain Route Alternative 1 (Cataract-Elora Trail), along the proposed forcemain from SPS #3 to Dundas St. W., and at the three proposed locations for the WWTPs.

Table 11. Bird Species of Conservation Concern Recorded in the Breeding Bird Surveys.

Bird Species	Location	Species at Risk Status	Area Sensitive
Eastern Wood-pewee (*Contopus virens)*	Along Forcemain Alternative 1	Special Concern (COSEWIC, COSSARO)	No
Barn Swallow (*Hirundo rustica*)	At Erin Village SPS# 4, Along Forcemain Alternative 1	Threatened (COSEWIC, COSSARO)	No
Golden-winged Warbler (*Vermivora chrysoptera*)	Along Forcemain Alternative 1	Threatened (COSEWIC and SARA), Special Concern (COSSARO)	No
Bobolink (*Dolichonyx oryzivorus*)	At potential WWTP site on south side of Wellington Rd 52 (Site 2A)	Threatened (COSEWIC, COSSARO)	Yes
Eastern Meadowlark (*Sturnella magna*)	At potential WWTP sites on north and south side of Wellington Rd 52 (Sites 1, 2A and 2B)	Threatened (COSEWIC, COSSARO)	Yes
Yellow-bellied Sapsucker (*Sphyrapicus varius*)	Along Forcemain from Erin Village SPS #3 to Dundas St W	N/A	Yes
Hairy Woodpecker (*Picoides villosus*)	At Erin Village SPS #3, Along Forcemain Alternative 1	N/A	Yes
White-breasted Nuthatch (*Sitta carolinensis*)	Along Forcemain from Erin Village SPS #3 to Dundas St W, Along Forcemain Alternative 1	N/A	Yes

Bird Species	Location	Species at Risk Status	Area Sensitive
Brown Creeper (*Certhia americana*)	Along Forcemain Alternative 1	N/A	Yes
Winter Wren (*Troglodytes hiemalis*)	Along Forcemain Alternative 1	N/A	Yes
Veery (*Catharus fuscescens*)	Along Forcemain Alternative 1	N/A	Yes
Black-throated Green Warbler (*Setophaga virens*)	Along Forcemain Alternative 1	N/A	Yes
Black-and-white Warber (*Mniotilta varia*)	Along Forcemain Alternative 1	N/A	Yes
American Redstart (*Setophaga ruticilla*)	At Hillsburgh SPS #2, Along Forcemain from Erin Village SPS #3 to Dundas St W, Along Forcemain Alternative 1	N/A	Yes
Ovenbird (*Seiurus aurocapillus*)	At Erin Village SPS #3, Along Forcemain from Erin Village SPS #3 to Dundas St W	N/A	Yes
Savannah Sparrow (*Passerculus sandwichensis*)	At potential WWTP sites on north and south side of Wellington Rd 52 (Sites 1 and 2B), Along Forcemain Alternative 1	N/A	Yes

Most of the bird species recorded in the Town of Erin sites (i.e., at the proposed SPS sites in Hillsburgh and the Village of Erin, along the forcemain from SPS #3 to Dundas St. W., at the Credit River marsh, and at Riverside Park) were typical of forest edge, open field habitat, and urban areas (e.g., Mourning Dove, *Zenaida macroura*; Blue Jay, *Cyanocitta cristata*; American Robin, *Turdus migratorius*; European Starling, *Sturnus vulgaris*; American Goldfinch, *Spinus tristis*; Appendix D). Several species associated with aquatic habitats were documented in wetland or riverine habitats, such as Belted Kingfisher (*Ceryle alcyon*) Northern Waterthrush (*Parkesia noveboracensis*), Red-winged Blackbird (*Agelaius phoeniceus*), and Common Grackle (*Quiscalus quiscula*).

Many of the same species recorded in urban areas were also documented at the proposed WWTP sites (e.g., American Robin, European Starling, Red-winged Blackbird, American Goldfinch), as well as birds typical of agricultural fields and hedgerow habitats (e.g., Eastern Kingbird, *Tyrannus tyrannus*; Bobolink, Eastern Meadowlark, and Savannah Sparrow).

The greatest diversity of bird species was observed along Forcemain Alternative 1, reflecting the wide variety of habitats this route traverses (Photographs 8 and 9). These species included birds that are

characteristic of parks, residential areas, edges and thickets (e.g., Black-capped Chickadee, *Poecile atricapillus*; Gray Catbird, *Dumetella carolinensis*; Indigo Bunting, *Passerina cyanea*), open woodlands, forest clearings and agricultural woodlots (e.g., Great-crested Flycatcher, *Myiarchus crinitus*; Red-eyed Vireo, *Vireo olivaceus*; Ovenbird), orchards, meadows and fields (e.g., Killdeer, *Charadrius vociferous*; Yellow Warbler, *Setophaga petechia*; Field Sparrow, *Spizella pusilla*), and wetlands and wooded swamps (e.g., Brown Creeper; House Wren, *Trolgodytes aedon*; Veery).

Eastern Wood-pewee, found in the forest along Forcemain Alternative 1, is designated as a special concern species both federally and in Ontario. It breeds in a wide variety of deciduous, coniferous and mixed forest habitats, including mature woodlands, urban shade trees, woodlots and orchards (McCarty 1996). Although it is considered one of the most common and widely distributed songbirds in eastern North America, it has experienced ongoing population declines in Canada and the United States over the past 40 years. Causes of the decline are not well understood, but may be linked to habitat loss and degradation, increased predation, and reduced availability of insect prey (Government of Ontario 2017a).

Barn Swallow is listed as a threatened species federally and in Ontario. Individuals were observed foraging at SPS #3 and in a marsh beside Forcemain Alternative 1. The species relies on human structures (e.g., barns, bridges, and eaves) for nesting habitat, and forages in open habitat near water (e.g., fields, parks, roadways; Brown and Brown 1999). Barn Swallow has experienced drastic population declines since the mid-1980s, which are believed to be caused by loss of nesting and foraging habitat (as farms modernize and farmland is converted to urban development) and reduction in the availability of insect prey (due to the application of agricultural pesticides; Government of Ontario 2017b).

Golden-winged Warbler was heard calling in the open field habitat along Forcemain Alternative 1. It is designated as a threatened species nationally and a special concern species in Ontario. The small songbird nests in shrubby habitat, in open areas often surrounded by mature forest, such as clearcuts, abandoned farmland and field edges (Confer et al. 2011; Government of Ontario 2017c). The species is declining in Canada and the United States because of loss of habitat, hybridization with Blue-winged Warbler (*Vermivora cyanoptera*), and nest parasitism by Brown-headed Cowbird (*Molothrus ater*; Government of Ontario 2017c).

Bobolink and Eastern Meadowlark are threatened species both nationally and provincially. These grassland birds were observed in the open fields proposed as potential sites for the WWTP (Bobolink at two proposed sites on the south side of the road and Eastern Meadowlark at all three proposed sites on both the north and south sides of the road). Both species breed in a wide range of open farmland, including pastures, meadows, hayfields and overgrown fields (Cornell University 2015; Government of Ontario 2017d,e). The two species are experiencing population declines in eastern North America primarily due to habitat loss and degradation (through mowing of hay during the breeding period, over-grazing by livestock, urban development, and reforestation; COSEWIC 2011; Ontario 2017d,e).

The habitat requirements of area sensitive birds vary by species. For example, Yellow-bellied Sapsucker generally has a territory of 2 to 5 ha and depends on dead trees greater than 25 cm diameter at breast height for breeding. Brown Creeper and Black-throated Green Warbler need at least 30 ha of continuous forest habitat, while Savannah Sparrow requires grassland areas of at least 50 ha. Winter Wren is an area sensitive species typically associated with interior forest, and thus depends on habitat at least 100 m from the forest edge (MNR 2000).

Photograph 8. Early successional scrub habitat along Cataract-Elora Trail (Forcemain Alternative 1).

Photograph 9. Coniferous forest habitat along Cataract-Elora Trail (Forcemain Alternative 1).

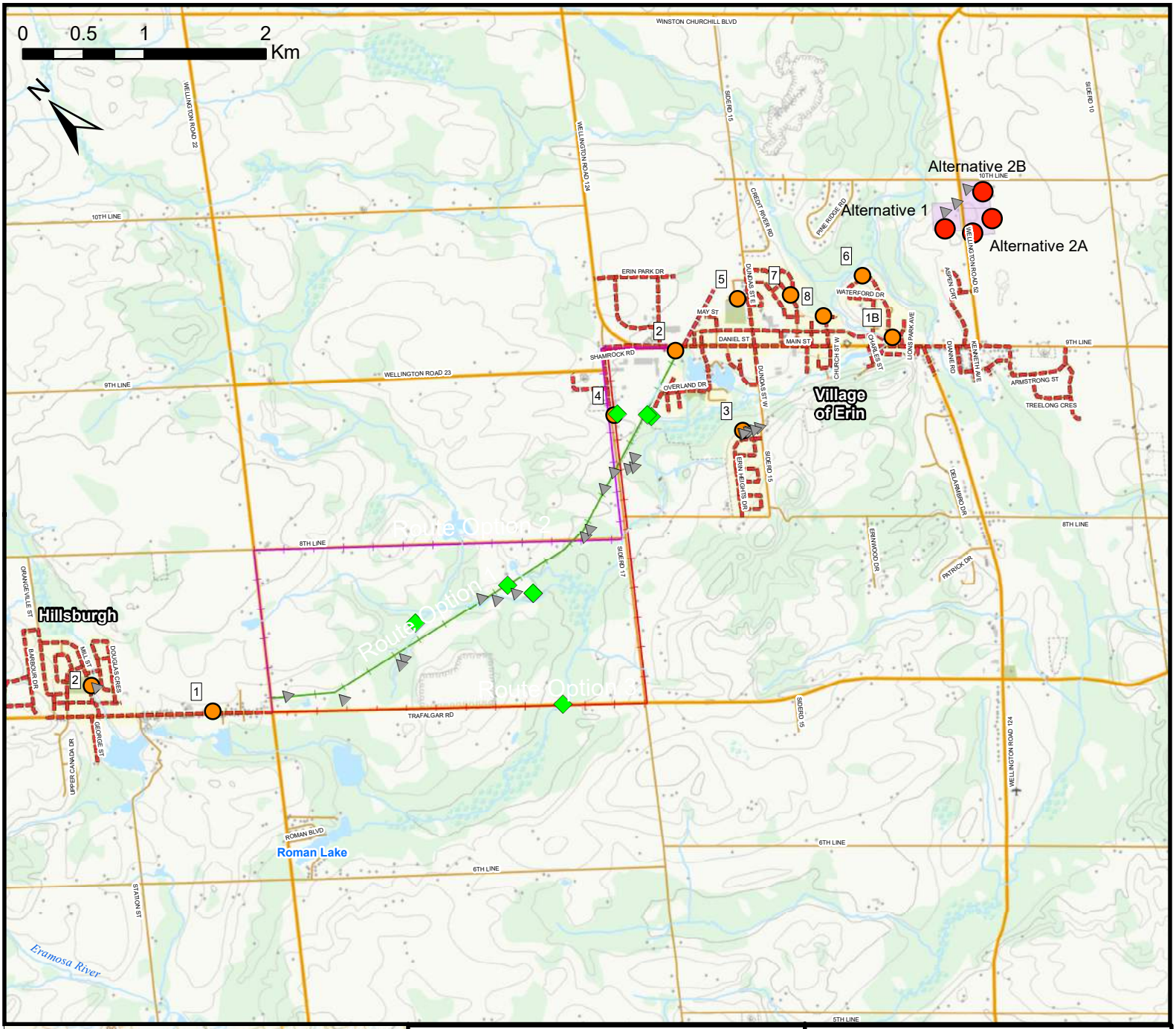
3.2.6 Species at Risk

The Ontario Ministry of Natural Resources and Forestry (MNRF) reports 27 species at risk in the Wellington Region (MNRF 2017b). Four of these species were documented in the study area (Snapping Turtle; Barn Swallow, Bobolink, and Eastern Meadowlark; Figure 11). Eight other species have potential habitat in the study area: Jefferson's Salamander (*Ambystoma jeffersonianum*), Eastern Ribbonsnake (*Thamnophis sauritus*), Blanding's Turtle (*Emydoidea blandingii*), Northern Map Turtle (*Graptemys geographica*), Short-eared Owl (*Asio flammeus*), Henslow's Sparrow (*Ammodramus henslowii*), Yellow-breasted Chat (*Icteria virens*), and Rusty-patched Bumblebee (*Bombus afinis*; Table 12).

Seven species at risk were recorded within the Erin SSMP study area, which includes the study area of the present report (CVC et al. 2011). Two of these species (Snapping Turtle and Western Chorus Frog) were documented in our surveys (Figure 11). All the other species have potential habitat in the study area: Red-shouldered Hawk (*Buteo lineatus*), Chimney Swift (*Chaetura pelagica*), Canada Warbler (*Cardellina canadensis*), Hooded Warbler (*Setophaga citrina*), and Monarch Butterfly (*Danaus plexippus*; Table 12). A baby Snapping Turtle (*Chelydra serpentina*; designated as Special Concern provincially and nationally) was observed along the edge of the Cataract-Elora trail (Forcemain Alternative 1) during breeding bird surveys on June 1, 2017 (Photograph 10; Figure 11).

NHIC records three provincially tracked species at risk in the study area: Bobolink, Eastern Meadowlark, and Gypsy Cuckoo Bumblebee (*Bombus bohemicus*; although this record was from 1979; MNRF 2014a).

The Ontario Breeding Bird Atlas lists 124 bird species in the two 10 km^2 squares (17NJ64 and 17NJ74) that encompass the study area, including 10 species at risk (Bird Studies Canada et al. 2006). Four of these species were documented in the study area (Eastern Wood-pewee, Barn Swallow, Bobolink and Eastern Meadowlark; Figure 11). A further five of these species at risk have potential habitat in the study area: Short-eared Owl, Chimney Swift (*Chaetura pelagica*), Wood Thrush (*Hylocichla mustelina*), Canada Warbler, and Grasshopper Sparrow (*Ammodramus savannarum*; Table 12).



Legend

- Roads
- Sewer
- Rivers
- Lakes
- Species at Risk + Area Sensitive Species
- Species at Risk
- Area Sensitive Species
- Potential Pump Stations
- Potential WWTP Sites
- Forcemain Route Alternative 1
- Forcemain Route Alternative 2
- Forcemain Route Alternative 3

Figure 11:
Species at Risk and Area Sensitive Bird Species Documented in the Study Area

Project: Town of Erin UCWS Class EA – Natural Environment

Project #: J160005

Project Lead: Brent Parsons
Prepared by: Kris Hadley
Data Source: HESL,Ontario Land, ESRI
Coordinate System: NAD 1983 UTM Zone 17N

Hutchinson Environmental Sciences Ltd.

Table 12. Habitat Description and Availability for Species at Risk with Potential to Occur in the Study Area.

Species at Risk	Status	Habitat Description	Potential to Occur in Study Area
Jefferson's Salamander	Endangered (provincially and nationally)	Mature deciduous or mixed forests containing, or adjacent to, breeding ponds	Along Forcemain Alternative 1
Eastern Ribbonsnake	Special Concern (provincially and nationally)	Wetland edges and forest	Along Forcemain Alternative 1, along Forcemain from Erin Village SPS #3 to Dundas St W
Blanding's Turtle	Threatened (provincially and nationally)	Wetlands and shallow ponds	Along Forcemain Alternative 1
Northern Map Turtle	Special Concern (provincially and nationally)	Large rivers and lakes	Credit River
Red-shouldered Hawk	Special Concern (nationally)	Mature deciduous or mixed forest, wooded swamps	Along Forcemain Alternative 1
Short-eared Owl	Special Concern (provincially and nationally)	Grasslands, old pastures, agricultural fields, marshes	Along Forcemain Alternative 1, at potential WWTP sites
Chimney Swift	Threatened (provincially and nationally)	Urban areas, often near water	Hillsburgh and Village of Erin
Wood Thrush	Special Concern (provincially) and Threatened (nationally)	Mature deciduous and mixed forest	Along Forcemain Alternative 1
Canada Warbler	Special Concern (provincially) and Threatened (nationally)	Wet forest, forest wetlands and swamps, riparian thickets	Along Forcemain Alternative 1
Hooded Warbler	Threatened (nationally)	Mature deciduous or mixed forest, ravine edges	Along Forcemain Alternative 1

Species at Risk	Status	Habitat Description	Potential to Occur in Study Area
Yellow-breasted Chat	Endangered (provincially and nationally)	Thickets and shrubs in overgrown clearings	Along Forcemain Alternative 1, at potential WWTP Site 1
Henslow's Sparrow	Endangered (provincially and nationally)	Tall grasslands in abandoned farm fields, pastures, wet meadows	Along Forcemain Alternative 1, at potential WWTP Site 1
Grasshopper Sparrow	Special Concern (provincially and nationally)	Open grasslands, hayfields, pasture	Along Forcemain Alternative 1, at potential WWTP Site 1
Gypsy Cuckoo Bumblebee	Endangered (provincially and nationally)	Open meadows, agricultural and urban areas, woodlands	Along Forcemain Alternatives 1-3, at 3 potential WWTP sites, at all SPS sites
Rusty-patched Bumblebee	Endangered (provincially and nationally)	Mixed farmland, urban areas, open woods, marshes	Along Forcemain Alternatives 1-3, at 3 potential WWTP sites, at all SPS sites
Monarch Butterfly	Special Concern (provincially and nationally)	Abandoned farmland, meadows, roadsides	Along Forcemain Alternatives 1-3, at 3 potential WWTP sites

Photograph 10. Baby Snapping Turtle found along Cataract-Elora Trail (Forcemain Alternative 1).

4. Impact Assessment

4.1 Sensitivity Assessment on Natural Environment

4.1.1 Aquatic Ecology

4.1.1.1 Potential Effluent Outfalls

Construction of the effluent outfall, discharge of effluent from the WWTP, and the potential for bypasses of partially treated effluent, have the potential to negatively impact aquatic ecology in the short-term through construction related impacts associated with earthworks and sedimentation, and in the long-term from effluent discharge. Receiving Water Assessments or Assimilative Capacity Studies typically describe effluent limits suffcient to ensure that effluent is not directly toxic, determine the characteristics of the mixing zone and calculate water quality at the point of complete mixing. Water quality modelling results are compared to Provincial Water Quality Objectives (PWQO) or Canadian Water Quality Guidelines to determine the potential for any impacts to aquatic biota. Water quality objectives and guidelines are protective of all forms of aquatic life and all aspects of the aquatic life cycles during indefinite exposure to water (MOE 1994). There is an additional requirement that the effluent stream, at the point of discharge, not be acutely lethal to aquatic life.

The size and shape of the effluent plume and water quality in the mixing zone was modelled using the CORMIX water quality model, and oxygen and temperature modelling of the discharge was modelled using the Qualk2K model (HESL 2017). The 10th Line was used as the modelled effluent outfall location, but the results can be conservatively applied at Winston Churchill Boulevard since there is approximately 15% more dilution potential at Winston Churchill Boulevard due to inputs of groundwater between the two locations.

HESL (2017) included the following conclusions which are most relevant to aquatic life, including fisheries and sensitive Brook Trout habitat in the study area:

- For the Full Build Out summer low flow scenario, dissolved oxygen concentrations were predicted to decrease by 1.33 mg/L to a minimum concentration of 6.39 mg/L at a distance approximately 700 m downstream of the WWTP discharge location and then begin recovering. As such, dissolved oxygen concentrations were predicted to remain well above the PWQO of 5 mg/L for cold water biota at river temperatures of 20°C and 25°C.
- Given that the maximum summer water temperature for the WWTP effluent of 19°C proposed by BM Ross (2014) is below the 75th percentile West Credit River water temperature of 21.18°C, the input from the WWTP effluent will slightly cool the river temperatures downstream of the outfall.
- A total ammonia effluent limit of 2.1 mg/L or less would meet the requirement for non-lethality during the summer discharge period. The distance to meet the PWQO for un-ionized ammonia at is 153 m from the outfall at full build out and through implementation of a multiport diffuser. The mixing zone does not occupy the complete width of the river and meets all MOECC requirements for mixing zones (MOE 1994).

The effluent limits proposed for the Erin WWTP are provided in Table 13.

Table 13. Proposed Erin WWTP Effluent Limits.

Parameter	Stage 1 (Effluent flow of 3,380 m^3/d)	Full Build Out (Effluent flow of 7,172 m^3/d)
pH	Within range of 7 – 8.6	
Total suspended solids	5 mg/L	
Total phosphorus	0.07 mg/L	0.045 mg/L
Total ammonia nitrogen	1.2 mg/L summer: 2 mg/L winter	0.6 mg/L summer: 2 mg/L winter
Nitrate nitrogen	5 mg/L	
E.coli	100 cfu/100 mL	
Dissolved oxygen	4 mg/L	
5-day carbonaceous biochemical oxygen demand (CBOD5)	5 mg/L	

The effluent limits recommended in HESL (2017) are protective of all fish at all critical life stages (MOE 1994) and so meet the requirements for protection of aquatic habitat. Mitigation to achieve an even higher level of protection, in consideration of the resident population of Brook Trout is described in Section 4.3.

Bypasses of untreated or partially treated WWTP effluent are minimized through the design and contingency features incorporated into WWTP design and are a rare event. Bypasses are short-term events and are most likely to occur when storm events, coupled with infiltration, overwhelm plant capacity. In these cases, assimilation volumes in the river will be high and will dilute effluent to non-lethal conditions. The degraded state will be temporary, such that no residual impacts are expected.

4.1.1.2 Sewers and Forcemains Near Open-Water Habitat

It is proposed that gravity sewers will be installed through the West Credit River at Dundas St. W, Charles St., Millwood Road and the Main Street within the Town of Erin. The West Credit River supports a sensitive coldwater fish population as noted previously and construction could result in sedimentation through earthworks and habitat disruption through temporary dewatering. Effective mitigation includes tunnelling beneath the river which requires no dewatering and no disruption of habitat and the use of sediment and erosion control measures installed on land to prevent sediments entering the river.

4.1.2 Terrestrial Ecology

The main anticipated impacts to the terrestrial environment and species would be associated with site preparation, and construction and would include temporary habitat disruption, but no long-term loss for infrastructure such as sewers and forcemains built below grade. All proposed forcemain routes are located within existing right of ways (roads and hiking trail) and thus both infrastructure and associated impacts are not expected to extend into surrounding natural habitats. Construction of pumping stations and the WWTP itself would involve temporary habitat disruption during construction and small permanent losses of habitat within the immediate infrastructure footprint.

Direct loss of habitat will therefore occur within the footprint of some development (e.g., WWTP sites, SPS sites), while habitat degradation could occur in surrounding habitat, if its ecological function deteriorates as a result of the development.

The fields proposed for the WWTP sites provide important breeding habitat for several grassland bird species of conservation concern (Bobolink, Eastern Meadowlark, Savannah Sparrow, House Wren). These and other bird species associated with open country have very specific habitat requirements that limit their distribution (MNRF 2014b). Loss of grassland and shrubland habitat results in loss of nesting territories, cover, and food available for these breeding birds, which ultimately leads to reduced reproductive success. Site alteration surrounding the development footprint can also change vegetation composition or structure of remaining habitat, which can have further negative impacts on these species (although natural succession of fields to forest over time would also have this effect). The fields adjacent to Forcemain Alternative 1 also provide important breeding habitat to grassland species of conservation concern (Savannah Sparrow, House Wren, and Golden-winged Warbler).

The forests adjacent to Forcemain Alternative 1 provide important breeding habitat to area sensitive forest bird species (e.g., Veery, Winter Wren, Black-throated Green Warbler). These species require large mature woodlands with interior habitat to provide shelter, nesting habitat and food. Development that results in removal of forest cover or encroachment into the forest causes a disproportionately large loss of interior habitat on which these species depend. In addition to the direct effects of habitat loss, development adjacent to forest habitat can result in increased predation, competition, nest parasitism and disturbance for forest breeding birds (MNRF 2014b).

All of the wetland communities identified from the various study sites are part of the West Credit River PSW Complex. The hydrological setting and function association with the wetland communities includes surface water and in some cases groundwater dependence. For example, the open water wetland community (OAO) to the south of Erin Village SPS #2 is a surface water dependent feature. The coniferous swamp community (SWC3-2) located to the north of the proposed WWTP site (Site 1) supports deeper organic soils and likely has groundwater input supporting the feature. In order to maintain the wetlands and their ecological functions in the study area, the associated water levels and hydrological regime must be maintained.

Amphibians occurring in habitat adjacent to the proposed forcemain routes may also be affected by the proposed development. Amphibians rely on wetlands for breeding and foraging, and upland habitat (often forest) for foraging and over-wintering. They may therefore be subject to habitat loss and degradation throughout their life cycle. Amphibians will be influenced by changes to water quality and quantity in wetlands (e.g., excess nutrients or sedimentation, loss of groundwater flow or increased surface flow) as well as loss and alteration of forest habitat. In addition, amphibian movement corridors between lowland and upland habitat can be affected by development, which may act as a barrier to dispersal, and cause direct mortality. In the case of the forcemain, this would only be a concern during the construction phase of the development.

Vernal pools are generally small to medium sized areas of temporary standing water found in forest depressions or other upland areas on the natural landscape and provide breeding amphibian habitat opportunities. The sensitive period for maintaining water quantity and quality is from April to into June (depending on the species and onset of spring conditions). The overland sheet flow from the lands adjacent

to amphibian habitat contributes to the hydrological maintenance and is an important consideration in maintaining these features. Design and construction activities should ensure that the wetland hydrology is maintained during and post-construction. Pre- and post-construction monitoring of the wetland hydrology is recommended.

Disturbance due to increased human activity during development (especially during the site preparation and construction phases, but also due to ongoing maintenance once the infrastructure is in place) can also negatively impact terrestrial ecology. The increased presence of humans, as well as machine noise, dust and activity, may disturb amphibians and birds during the sensitive breeding period, potentially causing them to avoid or abandon breeding in a disturbed area during construction.

4.2 Screening Criteria to Assess Different Alternatives

4.2.1 Aquatic Ecology

A variety of criteria were used as indicators of rarity and sensitivity in the West Credit River. Water temperature and dissolved oxygen are important indicators of habitat for sensitive, coldwater fish species such as Brook Trout, and data were collected in 2016 to inform the ACS (HESL 2017) as both parameters were assessed.

Brook Trout redds were extremely abundant in the study reach and the study area provides productive habitat for this critical life stage. The number of redds within the mixing zone, and within the reach of dissolved oxygen sag were evaluated (HESL 2017).

Benthic invertebrates provide a bioassessment tool for benthic habitat and water quality and a food source for resident fish species. Two proportionate biological metrics were evaluated to characterize the community: % EPT and diversity as they represent differing measures of rarity and sensitivity.

4.2.2 Terrestrial Ecology

Several criteria were selected as indicators of sensitivity for the terrestrial ecology component, relating to species of conservation concern and important natural heritage features that support native biodiversity and ecological integrity:

- Species of Conservation Concern
    - Species at Risk;
    - Area Sensitive Breeding Bird Species;
    - Regional, Local and Watershed Level Rare and Uncommon Plant Species.
- Important Natural Heritage Features
    - Provincially Significant Wetlands;
    - Significant Wildlife Habitat;
    - Environmentally Significant Areas;
    - Interior Forest Core Habitat; and
    - Priority Natural Areas.

The proposed locations for the WWTPs and the forcemain route between Hillsburgh and the Village of Erin were screened for environmental sensitivity using these criteria. In each case, the alternative with the least

number of sensitive features was highlighted as the preferred choice for infrastructure siting. We recognize, however, that appropriate and effective mitigation is available to manage construction-related impacts and so the screening is most important for those sites and project activities or infrastructure that represent permanent landscape alterations.

4.2.2.1 Species of Conservation Concern

Species at risk are native species that have been listed as at risk of extinction (or extirpation) in Ontario and/or in Canada and fall under three risk status categories:

- Endangered (face imminent risk of extinction or extirpation);
- Threatened (likely to become endangered if steps are not taken to address threats);
- Special Concern (not currently threatened or endangered but may become so due to a combination of biological traits and threats).

Area sensitive wildlife require large continuous areas of suitable habitat to sustain their populations over the long-term. These species experience population declines when suitable habitat is fragmented and reduced in size, due to increased competition, predation and nest parasitism (MNR 2000). Area sensitive bird species rely on large continuous habitat areas for successful breeding. Area-sensitive forest species typically need core areas of forest interior that are at least 100 m from the forest edge in addition to the overall size of habitat. Habitat closer to the forest edge tends to have higher rates of nest predation and nest parasitism, as well as altered microclimate (e.g., temperature, moisture, wind) that can negatively affect reproduction rates of these bird species. Similarly, in grassland area sensitive species, large areas provide greater protection from disturbance, more opportunities for nesting, and increased distance from the edge effects of forest boundaries (i.e., nest predation and nest parasitism; MNR 2000).

Regional, local and watershed level rare and uncommon plant species are indicators of potential sensitive habitat (e.g., organic wetlands) or vegetation communities that have limited disturbance and a higher floristic quality than surrounding areas.

4.2.2.2 Important Natural Heritage Features

Provincially significant wetlands (PSWs) are evaluated based on their significance in maintaining natural ecological processes, and in providing benefits to humans (MNRF 2014c). They are protected from development and site alteration under Ontario's Provincial Policy Statement (PPS; MMAH 2014).

Significant wildlife habitat is defined under the PPS as habitat that supports plants, animal and other organisms and that is ecologically important (e.g., seasonal concentration areas, rare vegetation communities, specialized habitat, animal movement corridors). MNRF has developed guidance on the identification and protection of different types of significant wildlife habitat (MNR 2000; MNRF 2015). Certain criteria must be met for wildlife habitat to qualify as significant (e.g., Area Sensitive Bird Breeding Habitat must have at least three of the listed bird species present; MNRF 2015). Significant wildlife habitat is protected from development and site alteration under the PPS.CVC has identified several additional significant habitat areas in the Town of Erin (CVC et al. 2011). Environmentally Significant Areas (ESAs) are defined as areas where ecosystem features or functions require special protection. To be designated, ESAs must meet one or more of the following ecologically important criteria:

- Part of a distinctive or unusual landform;
- Provide an important hydrological function;
- Represent critical wildlife habitat;
- Contain provincially or regionally rare species or ecological communities;
- Have high species diversity; and
- Be of high aesthetic value.

Interior Forest Core Habitat are forest patches that contain forest at least 100 m from the forest edge. Environment Canada (2004) recommends that at least 10% of forest cover within a watershed be over 100 m from the edge (core habitat), and that at least 5% of forest cover be over 200 m from the edge (deep core habitat) to protect against negative edge effects. Values in the Erin study area fall well below these targets (4.6% and <1% respectively; CVC et al. 2011).

CVC identifies Priority Natural Areas as significant natural areas because of their community diversity, core habitat, relative community size, and special features (CVC et al. 2011). High Priority Areas are essential for maintaining the ecological health of the subwatershed, such as:

- Natural communities or patches containing a special feature;
- Natural communities that are significant because of size;
- Natural communities that are core areas or contribute to the core (i.e., 100 m around core habitat, 200 m around deep core habitat);
- Forest and wetland communities that have high species diversity (CVC et al. 2011).

Medium Priority Areas are also significant, but require additional study to determine their overall role in the subwatershed (CVC et al. 2011).

4.3 Preferred Alternatives

4.3.1 Potential Effluent Outfalls

The potential effluent outfall locations at 10th Line and Winston Churchill Boulevard were evaluated through the following criteria characterizing aquatic ecology conditions: water temperature, dissolved oxygen, Brook Trout redds and benthic invertebrate biological metric results (Table 14). Criteria were weighted based on an assessment of rarity and sensitivity of each criterion. Water temperature and dissolved oxygen data were gathered from HESL (2017) and compared at each site.

Water temperatures were cooler in the summer at Winston Churchill Boulevard, as measured as maximum water temperature and 75th percentiles, because groundwater upwellings are abundant in the study reach. Dissolved oxygen concentrations were slightly higher as well at Winston Churchill Boulevard because of upstream groundwater inputs (HESL 2017). These provide more resilience and potential for assimilation of effluent and any associated changes in temperature and oxygen demand.

Only three Brook Trout redds were observed in the potential mixing zone within 153 m of the 10th Line. Dissolved oxygen was modelled to decline slightly downstream of the outfall. More Brook Trout redds (39) were observed within the oxygen sag zone downstream of the 10th Line than downstream of Winston Churchill Blvd (15). The benthic invertebrate assemblage at the 10th Line contained a greater proportion of

sensitive invertebrates as measured by %EPT and a more diverse assemblage as measured by the Shannon Index.

The preferred location based on our assessment of criteria in the West Credit River is Winston Churchill Boulevard because of the presence of more sensitive aquatic features and functions at the 10th Line and the density of Brook Trout redds downstream. Treated effluent discharged at the 10th Line would flow downstream through the sensitive study area to Winston Churchill Blvd. and beyond but an outfall location at Winston Churchill Blvd. would avoid the most sensitive area altogether, initial mixing would occur within the culvert where habitat has already been impacted and there is ~ 15% more assimilation flow (HESL 2017).

Table 14. Screening Criteria to Assess Effluent Outfall Locations.

Criteria	Details	10th Line	Winston Churchill Boulevard
Water Temperature	Maximum Water Temperature - June to August (°C)	24.3	23.7
	75% Water Temperature - June to August (°C)	20.7	19.6
Dissolved Oxygen	75% Dissolved Oxygen Concentration - June to August (mg/L)	7.93	8.5
Brook Trout Redds	# redds within mixing zone (153 m)	3	0
	# redds within modelled dissolved oxygen sag (700 m)	39	15
Benthic Invertebrate assemblage	% *Ephemeroptera*, *Plecoptera* and *Trichoptera*	37.9	32.5
	Shannon Index to measure community diversity	2.66	2.26
	Preferred Location		✓

4.3.2 Potential WWTP Sites

Two species at risk, Bobolink and Eastern Meadowlark, were detected during bird surveys of the three proposed WWTP sites (Table 11). On June 1, 2017 both species were heard in the fields on the south side of Wellington Road 52 where two proposed sites for the WWTP are located (Sites 2A and B), and Eastern Meadowlark was also heard on the north side of Wellington Road 52 within the third proposed WWTP site (Site 1). On June 21, 2017 Bobolink and Eastern Meadowlark were only heard in the south fields (Sites 2A and B).

The fields on the south side of Wellington Road 52 (Sites 2A and B) represent potential breeding habitat for both Bobolink and Eastern Meadowlark. These species breed in grassland habitat, such as farm fields, uncut pastures and meadows. The field on the north side of Wellington Road 52 (Site 1) appears less suitable as breeding habitat, since it is more overgrown, with scattered shrubs. The fact that an Eastern Meadowlark was heard in this field only on the first visit suggests that the species is likely not using this habitat for breeding.

Bobolink and Eastern Meadowlark are threatened species under Ontario's *Endangered Species Act*. As such, certain provisions apply to development that will damage or destroy the habitat of these birds. No permit is required if the area to be developed is equal to or less than 30 hectares, but the following rules must be followed:

- The work and affected species must be registered with the MNRF before the work begins;
- A habitat management plan must be prepared and followed;
- Habitat for the affected species must be created or enhanced, and managed;
- A written undertaking must be submitted to MNRF indicating that any habitat created or enhanced will be managed over time;
- No activity likely to damage or destroy habitat, or kill, harm or harass individuals of the affected species will be carried out between May 1 and July 31;
- Reasonable steps will be taken to minimize adverse effects on the affected species (e.g., locating access routes outside of the birds' habitat);
- Records relating to the work and habitat must be prepared and maintained; and
- Sightings of rare species must be reported (and registration documents updated, as needed).

Additional details on these rules and related requirements are available at: https://www.ontario.ca/page/bobolink-and-eastern-meadowlark-habitats-and-land-development.

Savannah Sparrow, an area sensitive species, was also recorded in the fields of the three proposed WWTP sites (Sites 1 and 2B; Table 11). Its breeding habitat is considered Significant Wildlife Habitat (Open Country Bird Breeding Habitat) because this type of habitat is declining across Ontario and North America (MNRF 2015). As such, development and site alteration are only permitted if there will be no negative impacts on the natural features or their ecological functions (MMAH 2014).

One rare and uncommon plant species was observed within Site 1 (Wild Geranium, Appendix B), while four rare and uncommon plant species were associated with the adjacent West Credit PSW complex: Yellow Sedge, Turtlehead, White Spruce, and Bristly Buttercup (Appendix B).

Each of the three proposed WWTP site locations contained sensitive features. Site 1 provided significant wildlife habitat for an area sensitive grassland species (Savannah Sparrow), and had a rare and uncommon plant growing on site (Wild Geranium). Although Eastern Meadowlark was heard on site early in the breeding habitat, the vegetation characteristics of the site are not ideal habitat for the species, and it is unlikely to breed here. Site 1 is also located next to the West Credit PSW, which supports amphibian populations. Sites 2A and 2B had two species at risk present (Bobolink and Eastern Meadowlark), and one area sensitive grassland bird species (Site 2B).

We recommend the north field (Site 1) as the preferred choice for the location of the WWTP site (Table 15). This site is the best choice to minimize negative effects on natural features and their ecological functions because it will avoid suitable breeding habitat for two species at risk. However, Site 1 does provide suitable breeding habitat for the area sensitive Savannah Sparrow, and thus qualifies as Significant Wildlife Habitat under the PPS. It also contains a rare and uncommon plant species (Wild Geranium), and is adjacent to a PSW. If recommended mitigation measures are adopted (such as minimizing development footprint and locating it directly along road, avoiding construction during wildlife breeding periods, limiting clearing of

successional vegetation, See Section 4.4.3) adverse impacts on the species of conservation concern located on site (as well as the adjacent West Credit PSW complex) can be avoided.

Table 15. Screening Criteria to Assess Alternative WWTP Site Locations.

Natural Heritage Feature	Criteria	Details	Site 1	Site 2A	Site 2B
Species of Conservation Concern	Species at Risk (SAR)	Presence of provincially and/or nationally designated SAR (i.e., Endangered, Threatened, Special Concern)	Yes	Yes	Yes
	Area Sensitive Breeding Bird Species	Presence of area sensitive bird species	Yes	No	Yes
	Rare and Uncommon Plant Species	Presence of rare and uncommon plant species	Yes	No	No
Important Natural Heritage Features	Provincially Significant Wetlands (PSWs)	Presence of PSWs	No*	No	No
	Significant Wildlife Habitat (SWH)	Presence of SWH	Yes	No	Yes
	Environmentally Significant Areas (ESAs)	Presence of ESAs	No	No	No
	Interior Forest Core Habitat	Presence of interior forest	No	No	No
	Priority Natural Areas (PNAs)	Presence of PNAs	No	No	No
		Preferred Location	✓		

*PSW is adjacent to site.

4.3.3 Potential Forcemain Routes

4.3.3.1 Forcemain Alternative 1

Five species at risk, Snapping Turtle, Western Chorus Frog, Eastern Wood-pewee, Barn Swallow, and Golden-winged Warbler, were found along or adjacent to the Cataract Elora Trail (Forcemain Alternative 1), as well as nine area sensitive bird species. A Snapping Turtle was found on the trail, and Western

Chorus Frog were heard in an adjacent wetland. All of the bird species were using habitat adjacent to the trail (in some cases more than 100 m away), not the trail itself.

The forest habitat adjacent to the trail qualifies as Significant Wildlife Habitat because of the presence of several area sensitive forest bird species (i.e., Veery, Black-throated Green Warbler and Winter Wren; MNRF 2015).

The grassland habitat adjacent to the trail qualifies as Significant Wildlife Habitat because of the presence of area sensitive Savannah Sparrow (Open Country Bird Breeding Habitat) and the species at risk Golden-winged Warbler (Shrub/Early Successional Bird Breeding Habitat).

Siting and construction of the forcemain along the trail would not cause significant disturbance to these bird species if the construction footprint is limited to the existing trail area itself, and timing of construction is restricted to of outside the breeding bird period. There would be no long-term effects on habitat after the construction period provided that measures for sediment and erosion management and control are followed.

The forcemain alignment along the Cataract-Elora Trail (Route Alternative 1) parallels several areas of the West Credit River PSW Complex, the Credit River West-Hillsburgh ESA and sensitive terrestrial and aquatic features (Table 16). These areas include undisturbed forested valley with coniferous swamps, and provide important habitat for rare species and important groundwater discharge for the West Credit River (CVC et al. 2011). Construction dewatering and discharge may alter wetland characteristics but may be mitigated by the design and construction techniques, including:

- Ensuring any dewatering is regulated through a Permit to Take Water and that the discharge water quality meets applicable guidelines;
- Maintaining effective erosion and sediment controls within construction zones (shafts and open cuts) and staging and stockpiling areas;
- Topsoil management for effective restoration, particularly at open cut crossings.
- Tunneling routed to avoid intercepting any perched water table in adjacent wetlands.
- Direct dewatering discharge to affected wetlands following temperature and clarity controls.

Seven rare and uncommon plant species were documented along the proposed route: Watershield, Wild Calla, Turtlehead, Large Yellow Lady's-slipper, Stiff Marsh Bedstraw, Wild Geranium, and White Spruce (Appendix B).

Table 16. Summary of Natural Heritage Features along Route Alternative 1.

Route	Potential Groundwater Functions	Wetland	Watercourse	ESA
Route Alternative 1	High water table is expected in the White Cedar - Conifer Organic Coniferous Swamp (located east and west of Sideroad 17) due to the nature of this vegetation community.	Directly adjacent to West Credit PSW Complex which supports amphibian habitat (unit 21 south of trail).	Proposed route will require several (4) watercourse crossings	Directly adjacent to West Credit River – Hillsburgh ESA.

Several forest patches along the proposed route provide Interior Forest Core Habitat (100 m from the edge; CVC et al. 2011).

Most of the proposed route is located within habitat designated as either High Priority or Medium Priority Natural Areas (CVC et al. 2011).

4.3.3.2 Forcemain Alternative 2

All of the screening indicators were negative for the Forcemain Alternative 2, meaning that none of these sensitivity factors for terrestrial ecology were found along the proposed route. Intensive surveys for vegetation, amphibians and birds were not conducted along this alternative, as the route would be located along an existing road and its right of way. It is not anticipated that forcemain placement would have a significant impact on the surrounding natural environment if its footprint remains within the existing road corridor. For example, any birds occurring along the road are already exposed to disturbance from road traffic and associated human activity, and any additional disturbance due to the forcemain would be limited to its construction phase.

4.3.3.3 Forcemain Alternative 3

The Western Chorus Frog, a species at risk, was heard calling in a wetland adjacent to Trafalgar Rd., the proposed location for Forcemain Alternative 3. Intensive surveys for other taxa (i.e., vegetation, birds) were not conducted along this alternative because it would be located along an existing road and its right of way. It is not anticipated that there would be significant impacts on the surrounding natural environment if the footprint of the forcemain remains with this existing corridor, and mitigation measures are implemented to prevent damage and disturbance to adjacent aquatic habitat (where amphibians occur).

Table 17. Screening Criteria to Assess Forcemain Routes between Hillsburgh and the Village of Erin.

Natural Heritage Feature	Criteria	Details	Route 1	Route 2	Route 3
Species of Conservation Concern	Species at Risk (SAR)	Presence of provincially and/or nationally designated SAR (i.e., Endangered, Threatened, Special Concern)	Yes	No	Yes
	Area Sensitive Breeding Bird Species	Presence of area sensitive bird species	Yes	No	No
	Rare and Uncommon Plant Species	Presence of rare and uncommon plant species	Yes	Not Surveyed	Not Surveyed
Important Natural Heritage Features	Provincially Significant Wetlands (PSWs)	Presence of PSWs	Yes	No	No
	Significant Wildlife Habitat (SWH)	Presence of SWH	Yes	No	No
	Environmentally Significant Areas (ESAs)	Presence of ESAs	Yes	No	No
	Interior Forest Core Habitat	Presence of interior forest	Yes	No	No
	Priority Natural Areas (PNAs)	Presence of PNAs	Yes	No	No
		Preferred Location		✓	

Based on the absence of sensitive features found along Forcemain Alternative 2, this proposed route was selected as the preferred choice (Table 17). Although our assessment concludes that a forcemain located along Route 2 will avoid any interaction with breeding habitats of Western Chorus Frog, Snapping Turtle; Eastern Wood-pewee, and Golden-winged Warbler, these habitats are not present within (but are adjacent to) the forcemain footprint along Route 1 and so that alternative could also be used with no direct disturbance of habitat, provided appropriate mitigation measures are implemented (e.g., limit disturbance to trail footprint, time construction to avoid breeding periods, See Section 4.4.2 and 4.4.3).

4.3.4 Potential SPS Sites

Most of the proposed SPS sites would have relatively small footprints (e.g., six sites in Erin Village will be 5 m x 5 m in size) and many would be located in open urban settings close to roads. However, several SPS sites would occur near sensitive natural heritage features, such as wetlands and watercourses, and several species of conservation concern were recorded in proximity to SPS sites. Consequently, recommended mitigation measures should be followed during construction and operation of the SPS sites to minimize and avoid adverse impacts on the natural environment (See section 4.4.2).

Three amphibian species were recorded near the Erin Village SPS#2 site (American Toad, Gray Treefrog and Spring Peeper), within the adjacent West Credit River Wetland Complex. The footprint of the SPS would be located entirely within an open old field, which is not suitable habitat for amphibian species.

Five area sensitive breeding bird species were recorded in the forest where SPS #3 and an associated forcemain would be located (Yellow-bellied Sapsucker, Hairy Woodpecker, White-breasted Nuthatch and American Redstart). The forcemain routing would occur along an existing forest trail and the SPS would have a relatively small footprint (5 m x 5 m). Both structures would likely not have adverse effects on the area sensitive species providing their development footprints are minimized, tree clearing is limited, and construction occurs outside the breeding period.

Barn Swallows (a threatened species) were observed foraging on the wing in the vicinity of SPS#4 in the Village of Erin. The proposed footprint of this SPS is relatively small (5 m x 5 m) and not close to any obvious breeding habitat for the species. Consequently, SPS#4 is not expected to negatively impact Barn Swallow populations.

One area sensitive species, American Redstart, was recorded at the proposed Hillsburgh SPS#1 on Mill St. The species breeds at woodland edges but requires large areas of continuous forest (greater than 100 ha; OMNR 2000). The footprint of the proposed SPS is larger than SPS proposed for elsewhere in the Town of Erin (20 m x 20 m), but would be situated in an open park area surrounded by houses and a baseball diamond. It is not likely that the SPS would have negative impacts on the species.

Table 18. Screening to Assess Alternative SPS Sites for Potential Impacts to PSW and ESA.

Sites		Potential Groundwater Functions	Wetland	Watercourse	ESA	Recommendation
Hillsburgh	**Old SPS #1**	High water table expected at this site due to the nature of the White Cedar - Conifer Organic Coniferous Swamp (SWC3-2)	West Credit River PSW Complex. Supports amphibians.	N/A	South side of Wellington 22 Rd is within West Credit River - Hillsburgh ESA	Not Recommended - Removed from Consideration

Sites		Potential Groundwater Functions	Wetland	Watercourse	ESA	Recommendation
		vegetation community				
	SPS #2	N/A	No wetland present No amphibian habitat.	Proposed site is located in close proximity to watercourse (approx. 5m).	N/A	Near water works timing and Erosion and Sediment Controls
Erin	**SPS #1A**	N/A	West Credit River Wetland Complex. Riparian wetland vegetation within proposed site. Amphibian habitat not assessed at this location.	Existing watercourse present within proposed site.	Brisbane Swamp ESA located adjacent (south of Wellington 52 Rd and east of Wellington 124 Rd.)	Not Recommended - Removed from consideration
	SPS #1B	N/A	Portion of West Credit River Wetland Complex associated with the watercourse within 120 m. No amphibian habitat associated with watercourse.	Proposed site is located in close proximity to watercourse (approx. 20 m) but is bisected by existing road.	N/A	Design to maintain wetland hydrology. Tree removal to be completed outside of migratory bird timing window
	SPS #2	N/A	Open water vegetation community associated part of West Credit River Wetland Complex, amphibian	N/A	N/A	Design to maintain any surface water contribution to wetland and maintain water quality during discharge.

Sites		Potential Groundwater Functions	Wetland	Watercourse	ESA	Recommendation
			habitat is located within 120 m of proposed site.			
	SPS #3	N/A	N/A	N/A	N/A	Tree removal to be completed outside of migratory bird timing window
	SPS #4	N/A	N/A	N/A	N/A	
	SPS #5	N/A	N/A	N/A	N/A	Tree removal to be completed outside of migratory bird timing window
	SPS #6	N/A	West Credit River Wetland Complex within 120 m. Amphibian habitat not assessed at this location.	N/A	N/A	Design to maintain wetland hydrology and water quality from discharge. Tree removal to be completed outside of migratory bird timing window
	SPS #7	N/A	West Credit River Wetland Complex within 120 m.	N/A	N/A	Design to maintain wetland hydrology and water quality from discharge.
	SPS #8	Presence of Spotted Jewelweed nearby indicates potential groundwater seepage	Proposed site adjacent to West Credit River Wetland Complex. Supports amphibian habitat.	N/A	N/A	Design to maintain wetland amphibian habitat hydrology and water quality from discharge. Tree removal to be completed outside of migratory bird timing window

4.4 Recommended Mitigation Measures

4.4.1 Potential Effluent Outfalls

The following mitigation measures should be considered during detailed site design at latter stages in the EA to minimize impacts associated with construction of effluent outfalls and effluent dispersal.

- Any in-stream work should adhere to Fisheries and Oceans Canada's in-stream construction timing windows for spring (March 15 to July 15) and fall spawners (October 1 to May 31) to protect the sensitive life stages of spawning and rearing for resident species such as Rainbow and Brook Trout.

- An Erosion and Sediment Control Plan should be developed to prevent runoff and solids from entering the river. A construction mitigation plan should be developed (CISEC Canada 2012) to:

    - Utilize a multi-barrier approach;
    - Retain existing vegetation;
    - Minimize land disturbance area;
    - Slow down and retain runoff to promote settling;
    - Divert runoff from problem areas;
    - Minimize slope length and gradient of disturbed areas;
    - Maintain overland sheet flows and avid concentrate flows; and
    - Store/stockpile soil away from watercourses, drainage features, and tops of steep slopes
    - Use trenchless technology where possible.

A variety of best management practices (BMPs) can be employed to accomplish these goals depending on the site conditions. The effectiveness of BMPs is contingent on proper installation and maintenance, including inspection, details of which should be monitored by a certified environmental professional.

- Effluent will be treated to the limits proposed in HESL (2017) following approval by MOECC and will be regulated through the Environmental Compliance Approval (ECA) for the Erin WWTP. This will assure that effluent is not acutely lethal at the point of discharge, that water quality in the West Credit River meets water quality objectives, will minimize the mixing zone and ultimately avoid impacts to aquatic life.

- A monitoring plan should be developed in combination with the regulatory WWTP effluent monitoring to assess the response of the river to the effluent discharge. The monitoring plan will ultimately be reviewed by CVC and regulated through the ECA and should include an assessment of fisheries, benthic invertebrates and aquatic habitat with sufficient effort to allow for natural variability to be controlled and allow for a sensitive determination of any impact.

4.4.2 Potential WWTP Sites, Forcemain Routes and SPS Sites

Several BMPs should be incorporated into the site preparation, construction and maintenance of all infrastructure to minimize and avoid negative impacts on natural features and their ecological functions.

4.4.2.1 Site Selection

The size and location of the development can influence its impact on the surrounding environment. At each site the development footprint should be kept as small as possible to minimize the amount of natural habitat affected. Locating the development along the edge of the habitat (e.g., close to the road for SPS and WWTP sites) is preferable to having it centrally located within a site, since this avoids habitat fragmentation. Development should not be located where it will disturb or destroy habitat of species at risk. Therefore, we recommend that the WWTP be located at Site 1 to avoid breeding habitat of Bobolink and Eastern Meadowlark. In the case of the forcemain route, development should occur within the footprint of the existing road or trail alternative, so that surrounding natural habitat is not disturbed by the addition of this infrastructure feature.

Additional mitigation will be required depending on the alternatives selected. For instance, in the case of Forcemain Route Alternative 1, development should be restricted to the existing trail area only so it does not encroach on species at risk habitat. Furthermore, we recommend that the Route Alternative 1 bypass the portion of the trail between Sideroad 17 and Main St. so that the wetland adjacent to the trail (where Western Chorus Frog was heard and Barn Swallow was observed) is not disturbed. Instead, the forcemain route could go along Sideroad 17 to Main St.

Where construction activities such as trenching or shaft locations are adjacent to, or within, natural vegetation areas, the limits of disturbance should be clearly flagged and identified in advance of any construction activity. Vegetation and tree protection barriers/exclusion fencing should be installed using methods suitable to the site conditions and as approved by the agencies.

While we have presented generic and effective mitigation measures, we recognize that mitigation measures specific to the natural heritage features and functions of the preferred alternatives will need to be confirmed at detailed design stage. This may include specialized protection measures for rare plants or sensitive habitat features such as breeding amphibian areas. The use of trenchless tunneling construction methodology could be considered in highly sensitive areas.

4.4.2.2 Timing

Construction and maintenance activities should be scheduled for times of the year that avoid or minimize wildlife disturbance (e.g., outside migration and breeding periods) and environmental damage (e.g., not during high runoff periods in spring and fall).

Amphibian and reptile populations are active from March to October in southern Ontario (MNRF 2016). It is recommended that construction activity be scheduled outside of these periods to avoid disturbance of these species and their habitats and movement corridors. The sensitive period for maintaining water quantity and quality breeding amphibian habitat is from April to into June (depending on the species and onset of spring conditions).

The federal *Migratory Birds Convention Act (1994)* protects the nests, eggs and young of most bird species from harm or destruction. The breeding bird season for the Erin study area extends from early April through late August for most species (ECCC 2017). As a result, clearing of vegetation should be scheduled outside of these periods. For any proposed clearing of vegetation within these dates, or where birds may be

suspected of nesting outside these typical dates, an ecologist should undertake detailed nest searches immediately prior to any site alteration to ensure that no active nests are present.

4.4.2.3 Landscaping and Restoration

The preferred location for the WWTP is Site 1, which is surrounded by shrubby field habitat that is not actively farmed. This early successional habitat is often viewed as marginal habitat when in fact it provides important breeding habitat for a variety of grassland bird species, many of which are experiencing declines across North America (including the area sensitive species Savannah Sparrow). When development occurs within such habitat, the tendency is to manage the surrounding landscape to rid it of its natural vegetation, and replace with manicured lawns or tree cover. We therefore recommend that grassland and shrubland habitat be maintained around the development footprint to preserve the critical ecological function of the early successional habitat present at Site 1. As time goes on, active management may be required to prevent the natural successional process from replacing grasses and shrubs with trees.

The project should include topsoil management in areas where construction will disturb a natural vegetation community. For example, the top 20 – 30 cm of any stripped topsoil should be retained, stored, and used in restoration works so that the native and local seedbank is retained. Site-specific restoration and edge management plans should be developed specific to the vegetation community types (e.g., wetland or forest).

4.4.2.4 Stormwater Management

Any development that occurs adjacent to wetlands should adopt appropriate stormwater management measures to ensure water quality and hydroperiod are not adversely affected. This would normally involve developing and following sediment and erosion control plans and obtaining and following the requirements of a Permit to Take Water from MOECC for any dewatering activities. A site-specific assessment of mitigation required to avoid adverse effects to wetland and terrestrial communities should be completed as part of the detailed design. Mitigation measures should incorporate an assessment of the hydrological and ecological conditions that are to be maintained.

4.4.3 Sewers and Forcemains

Where sewers and forcemains are installed at water crossings the following mitigation measures should be implemented to minimize impacts:

- Any in-stream work should adhere to Fisheries and Oceans Canada's in-stream construction timing windows for spring (March 15 to July 15) and/or fall spawners (October 1 to May 31) to protect the sensitive life stages of spawning and rearing for resident species.

- An Erosion and Sediment Control Plan should be developed to help mitigate the impacts of development by encouraging infiltration of stormwater to the subsurface per recommendations in 4.4.1.

- Sewers and forcemains should be installed via directional drilling where possible. If open trenching is utilized, a fish rescue should be completed from isolated waterbodies by a professional to avoid fish kills.

5. Summary and Conclusions

An inventory and assessment of the natural environment was undertaken as part of Phase 3 of the UCWS Class EA for a communal wastewater collection, treatment and disposal system for Hillsburgh and the Village of Erin. The effects of the alternative design concepts on the natural environment (fisheries and aquatic resources, amphibians, birds, and vegetation communities) were evaluated and recommendations for mitigation to minimize negative effects were provided.

5.1 Summary of Baseline Conditions

5.1.1 Aquatic Ecology

The study area contains a cold-water thermal regime, mixed rocky substrates, a diverse benthic invertebrate assemblage and ample cover habitat that in turn, support a robust population of sensitive coldwater fish species and critical Brook Trout spawning habitat as proven by the observation of 94 Brook Trout redds in 2016. The most productive Brook Trout spawning reaches and the best Brook Trout populations in the West Credit River are located downstream of Erin Village (CVC et al. 2011) and the longest contiguous Brook Trout habitat in the Credit River watershed is the West Credit River between Erin and Belfountain.

5.1.2 Terrestrial Ecology

The study area encompasses a variety of vegetation communities representing both upland and wetland environments, including agricultural landscapes, deciduous, coniferous and mixed forests, and swamp and marsh. The West Credit PSW Complex extends throughout much of the area, and includes the West Credit River at Hillsburgh ESA, which is characterized by coniferous swamps and an undisturbed forested valley that provide important habitat for rare species and important groundwater discharge for the West Credit River. A total of 165 species of vascular plant species were recorded in the study area, comprised mainly of native species, ten of which are recognized as locally or regionally rare.

Six amphibian species were heard calling in the study area, including one federally threatened species, Western Chorus Frog, along Forcemain Alternatives 1 and 3. Fifty-three bird species were documented in the area, including five species at risk (Eastern Wood-pewee, Barn Swallow, Golden-winged Warbler along Forcemain Alternative 1; Bobolink, and Eastern Meadowlark at proposed WWTP sites). Thirteen area sensitive bird species (which rely on large continuous areas of suitable habitat for breeding) were also recorded throughout the study area. Snapping Turtle, a special concern species, was observed along Forcemain Alternative 1.

5.2 Impact Assessment and Preferred Alternatives

The potential effluent outfall locations at 10th Line and Winston Churchill Blvd. were evaluated based on aquatic ecology criteria. The preferred outfall location is Winston Churchill Boulevard to avoid the more sensitive and rare aquatic features and functions at 10th Line.

The three WWTP site locations were evaluated based on presence of provincially and/or nationally designated SAR, sensitive bird species, and significant habitat. The screening criteria indicated that the north field (Site 1) is the preferred choice for the location of the WWTP site, based on the presence of two species at risk in suitable breeding habitat in Sites 2A and 2B. However, Site 1 does provide suitable breeding habitat for the area sensitive Savannah Sparrow, and thus qualifies as Significant Wildlife Habitat under the PPS. As such, development and site alteration are only permitted if there will be no negative impacts on the natural features or their ecological functions. Furthermore, Site 1 contained a rare and uncommon plant species (Wild Geranium), and is located next to the West Credit PSW Complex. Appropriate mitigation measures were therefore recommended to ensure no negative effects on species of conservation concern and important natural heritage features in the vicinity.

Three forcemain route alternatives were evaluated based on presence of provincially and/or nationally designated SAR, sensitive bird species, and significant habitat. All proposed routes are located within existing right of ways (roads or hiking trail). Although Forcemain Alternative 2 (along a road) avoids the most sensitive habitats, Alternative 1 (along the hiking trail) is feasible with the implementation of the mitigation techniques identified in this report and a deviation from the proposed route. We recommend that, should this alternative be selected, the route go along Sideroad 17 to Main St. and bypass the portion of the trail between Sideroad 17 and Main St. so that the wetland adjacent to the trail is not disturbed.

Mitigation measures and BMPs should be defined for the specific features of the preferred alternatives when they are selected and during detailed design. These should be incorporated into the site preparation, construction and maintenance of all infrastructure to minimize and avoid negative impacts on natural features and their ecological functions.

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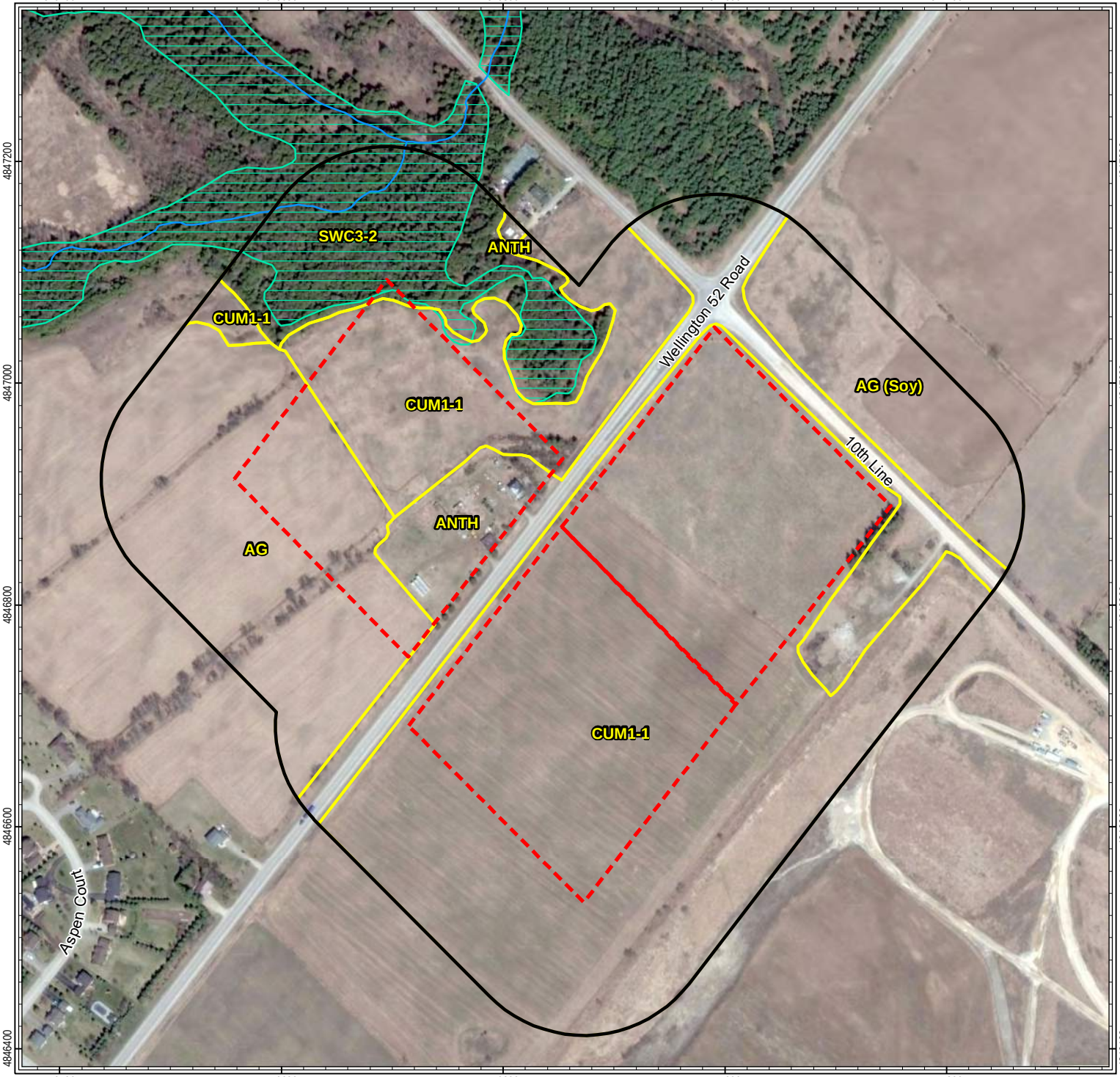
Appendix A. Benthic Invertebrate Results, August 2017

GROUP	FAMILY	TAXON	10A	10 B	10 C	WCB A	WCB B	WCB C
ACARI	Hygrobatidae	Hygrobates sp	1		1			
	Lebertiidae	Lebertia sp			1			
	Sperchontidae	Sperchon sp				1		
AMPHIPODA	Hyalellidae	Hyalella azteca					6	
DECAPODA	Cambaridae	Orconectes sp juv	1		1			
COLEOPTERA	Elmidae	Dubiraphia sp larvae		4	4		2	4
		Optioservus sp larvae	11		3	9	1	
		Optioservus fastiditus	5					
		Stenelmis sp larvae	2	4				
		Stenelmis crenata	2					
DIPTERA	Athericidae	Atherix sp larvae	1					
	Ceratopogonidae	Ceratopogonidae type IV					1	
	Chironomidae							
	Chironominae	Cladopelma sp		2	1	1	5	
		Cryptochironomus sp		4			5	1
		Dicrotendipes sp					1	
		Microtendipes sp			1			
		Paralauterborniella sp		4				
		Paratendipes sp					9	1
		Polypedilum aviceps gp	11	2	3	1		1
		Cladotanytarsus sp		40	17		26	37
		Paratanytarsus sp			1			
		Rheotanytarsus sp	3			11	2	
		Stempellinella sp					2	
		Tanytarsus sp	9	5				
	Diamesinae	Pagastia sp	10	1	1	32	2	
	Orthocladiinae	Brillia sp			1			
		Cricotopus trifascia gp				2		
		Orthocladius sp	5	3	8	4		
		Parametriocnemus sp		1				
		Psectrocladius sp				1		
		Thienemanniella sp						1
		Tvetenia sp	6	2		16	1	4
		Orthocladiinae early instars		6			1	2
	Tanypodinae	Ablasbesmyia mallochi		3	2		1	
		Procladius sp		1			5	
		Tanypodinae early instars		4	5			1
	Ephydridae	Ephydridae				1		
	Simulidae	Simulium decorum				10		2
		Simulium venustum cplx						7
	Tipulidae	Antocha sp	1			2		
EPHEMEROPTERA	Baetidae	Acentrella sp	1		2	15		50
		Acerpenna pygmaea			1			
		Baetis sp juv ?flavistriga	19	2	1	3	3	6
	Caenidae	Caenis sp	4					1
	Ephemerellidae	pb Ephemerella sp juvs	1					
	Heptageniidae	Maccaffertium vicarium	2		1			
	Isonychiidae	Isonychia sp	4			15		
	Leptohyphidae	Tricorythodes sp	4	15	22	5	9	
HEMIPTERA	Corixidae	Corixidae nymphs					28	
		Palmacorixa nana					3	
MEGALOPTERA	Corydalidae	Nigronia serricornis				1		
	Sialidae	Sialis sp			1		2	
ODONATA	Aeshnidae	?Boyeria sp juv incpte			1			
PLECOPTERA	Leuctridae	Leuctra sp		1	1			
	Pteronarcyidae	Pteronarcys sp	1					
TRICHOPTERA	Glossosomatidae	Glossosoma sp	1					
	Hydropsychidae	Cheumatopsyche sp	3	1	3	6		
		Hydropsyche sp juv	3	1		3		2
		Hydropsyche slossonae	1			1		
	Hydroptilidae	Hydroptila sp		1	1	1		
	Leptoceridae	Mystacides sp juv		4	17		3	
		Oecetis sp		1	2			
	Philopotamidae	Chimarra sp	3					
	Polycentropodidae	Polycentropodidae early instars					1	
		TOTALS	115	112	103	141	119	120
		Percentage picked	7	9	5	1	2	1

Appendix B. Vegetation Community Data



LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

0 50 100 150
metres

N

Scale 1:5000 NAD 1983 UTM Zone 17N

DATA SOURCES: Natural Resources Canada (National Road Network - Ontario). Base Imagery ©2017 Google (CNES / Airbus, DigitalGlobe, First Base Solutions). Additional Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

Potential WWTP Site

MAP 1

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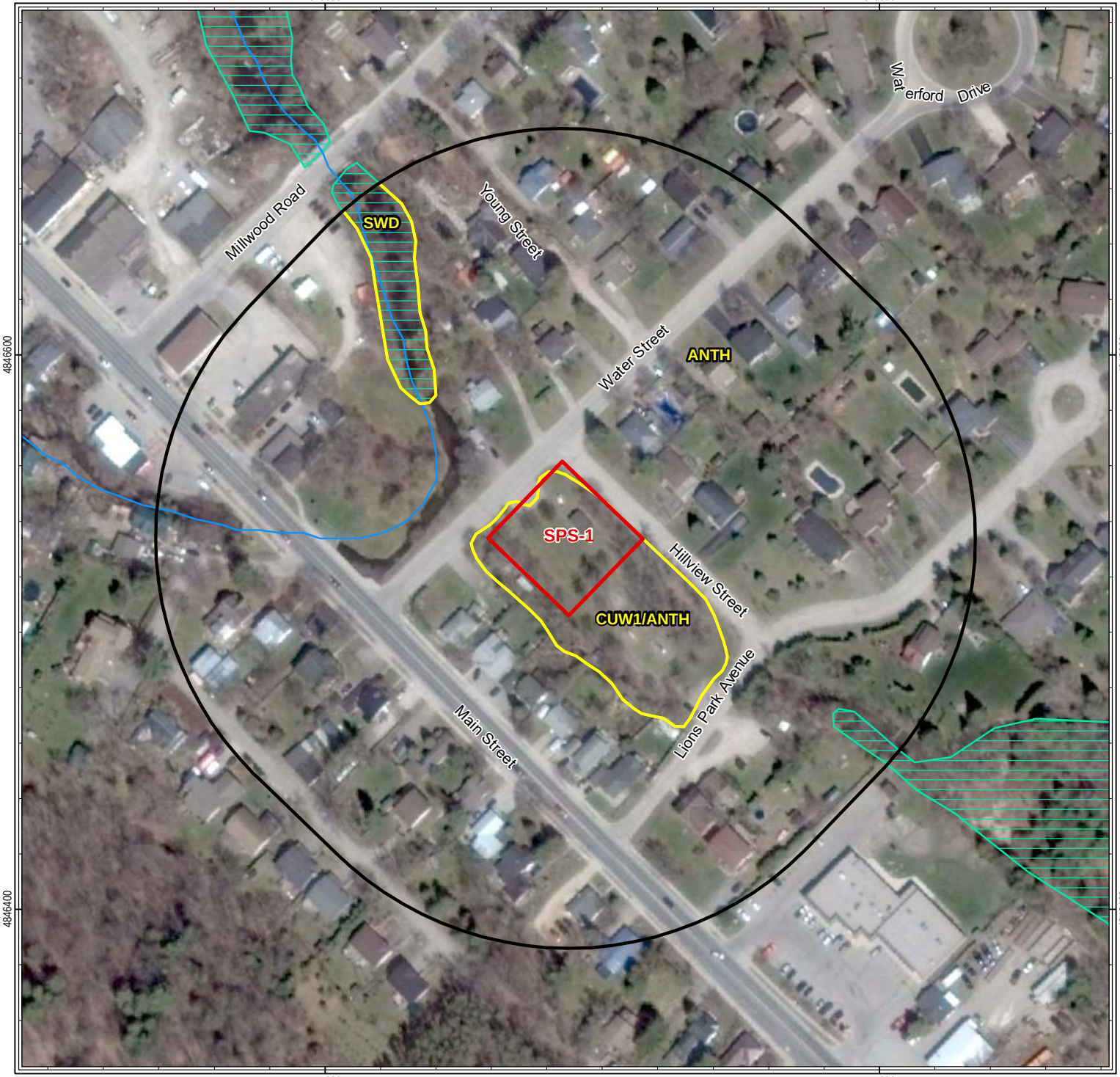

LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

0 25 50
metres

N

Scale 1:2000 NAD 1983 UTM Zone 17N

DATA SOURCES: Natural Resources Canada (National Road Network - Ontario). Base Imagery ©2017 Google (CNES / Airbus, DigitalGlobe, First Base Solutions). Additional Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

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SPS-1

MAP 2

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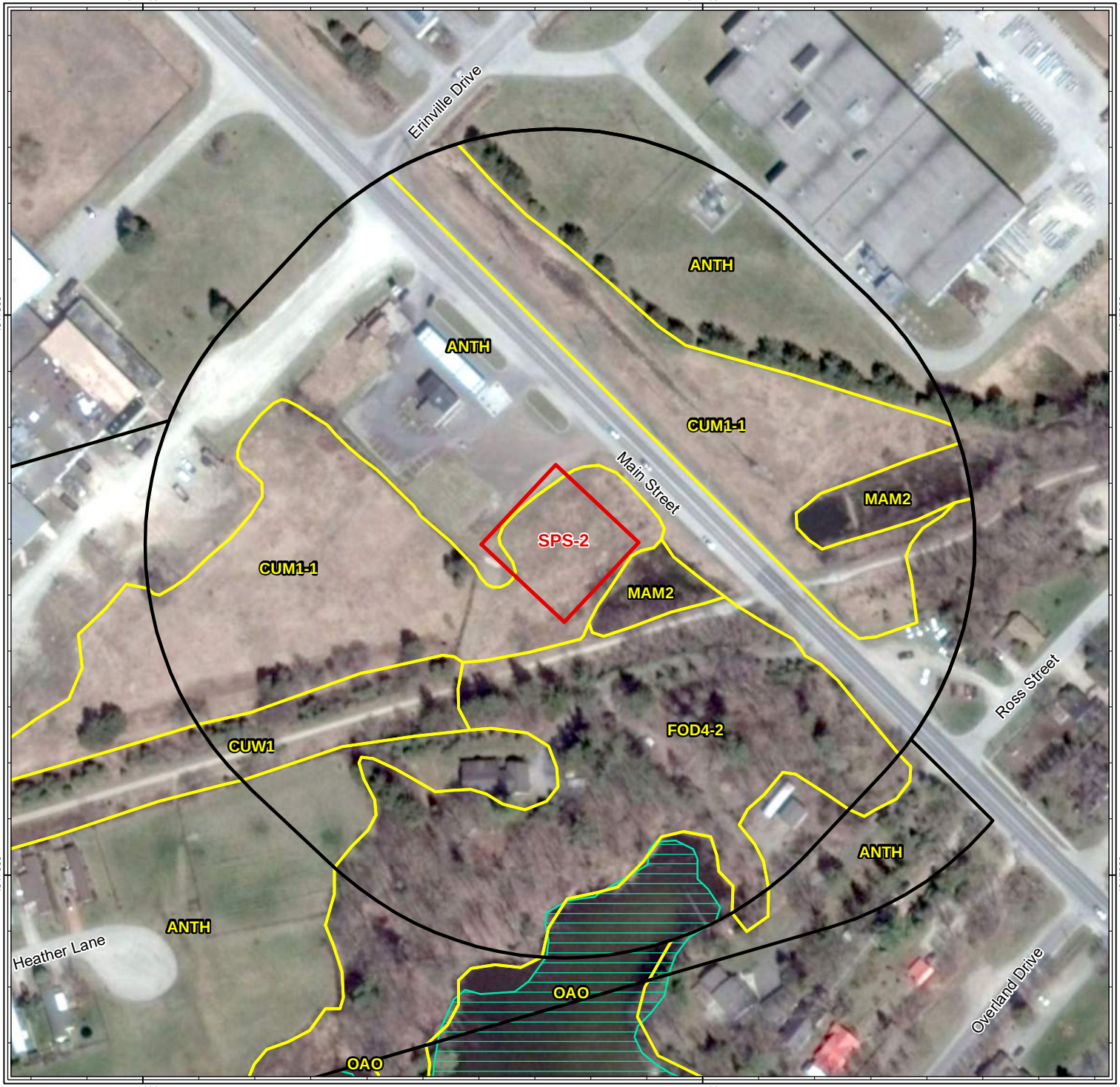

LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
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FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

0 25 50
metres

N

Scale 1:2000 NAD 1983 UTM Zone 17N

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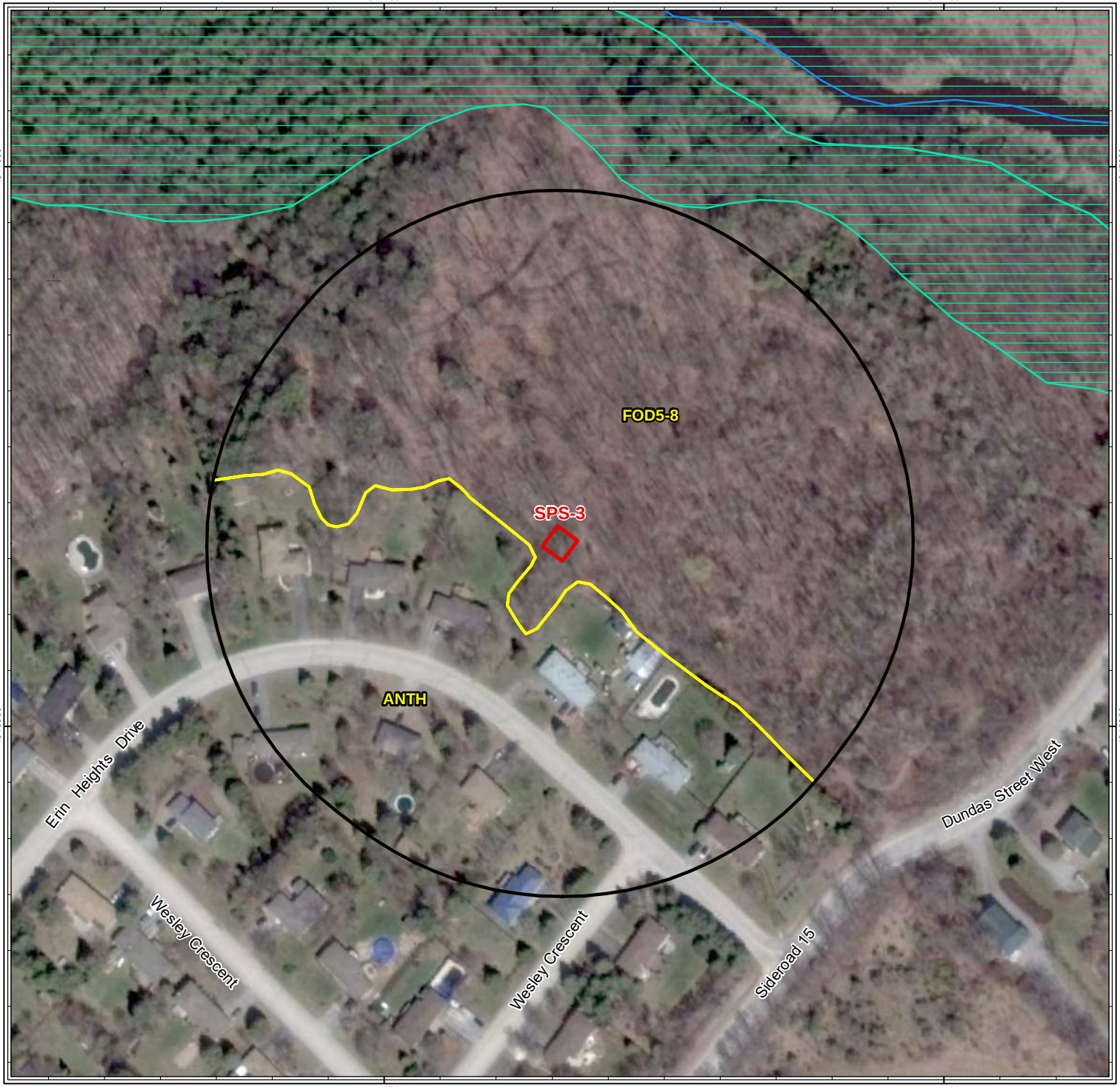
SPS-2

MAP 3



LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
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FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
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SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

N

0 25 50
metres

Scale 1:2000 NAD 1983 UTM Zone 17N

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SPS-3

MAP 4

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LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
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FOD7	Fresh-moist Low land Deciduous Forest Ecosite
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FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
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SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

N

0 25 50
metres

Scale 1:2000 NAD 1983 UTM Zone 17N

Hutchinson Environmental Sciences Ltd.

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SPS-4

MAP 5

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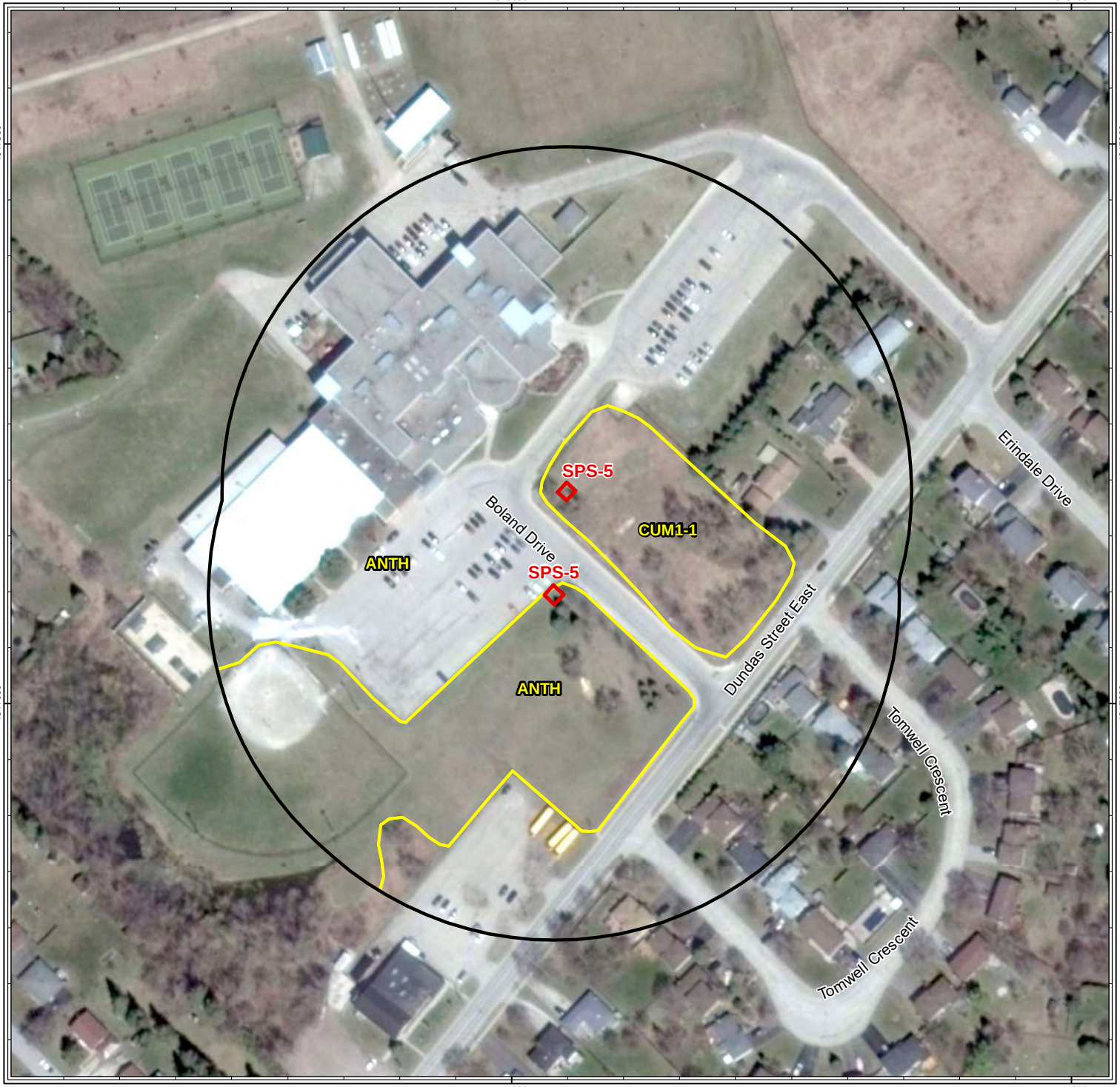

LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
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FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
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SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

0 25 50
metres

N

Scale 1:2000 NAD 1983 UTM Zone 17N

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

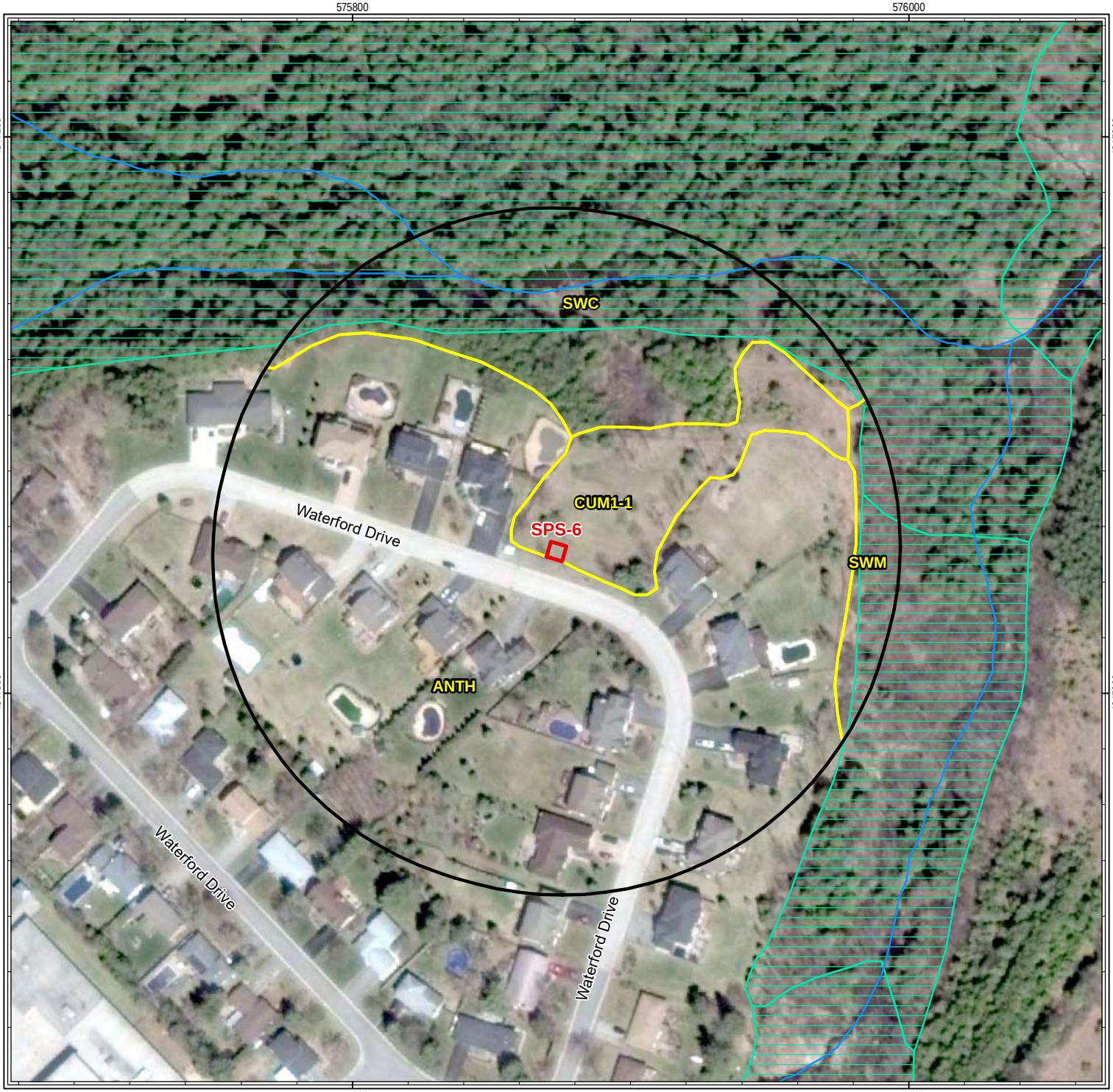
PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

SPS-5

MAP 6

Document Path: C:\Egnyte\Shared\Projects\Active\1318 - HES\13183 - Town of Erin Sewage Treatment\Mapping\Draftmxd\ELC Maps\13183_ELC_Map6.mxd



LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

0 25 50
metres

N

Scale 1:2000 NAD 1983 UTM Zone 17N

DATA SOURCES: Natural Resources Canada (National Road Network - Ontario). Base Imagery ©2017 Google (CNES / Airbus, DigitalGlobe, First Base Solutions). Additional Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

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DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

SPS-6

MAP 7

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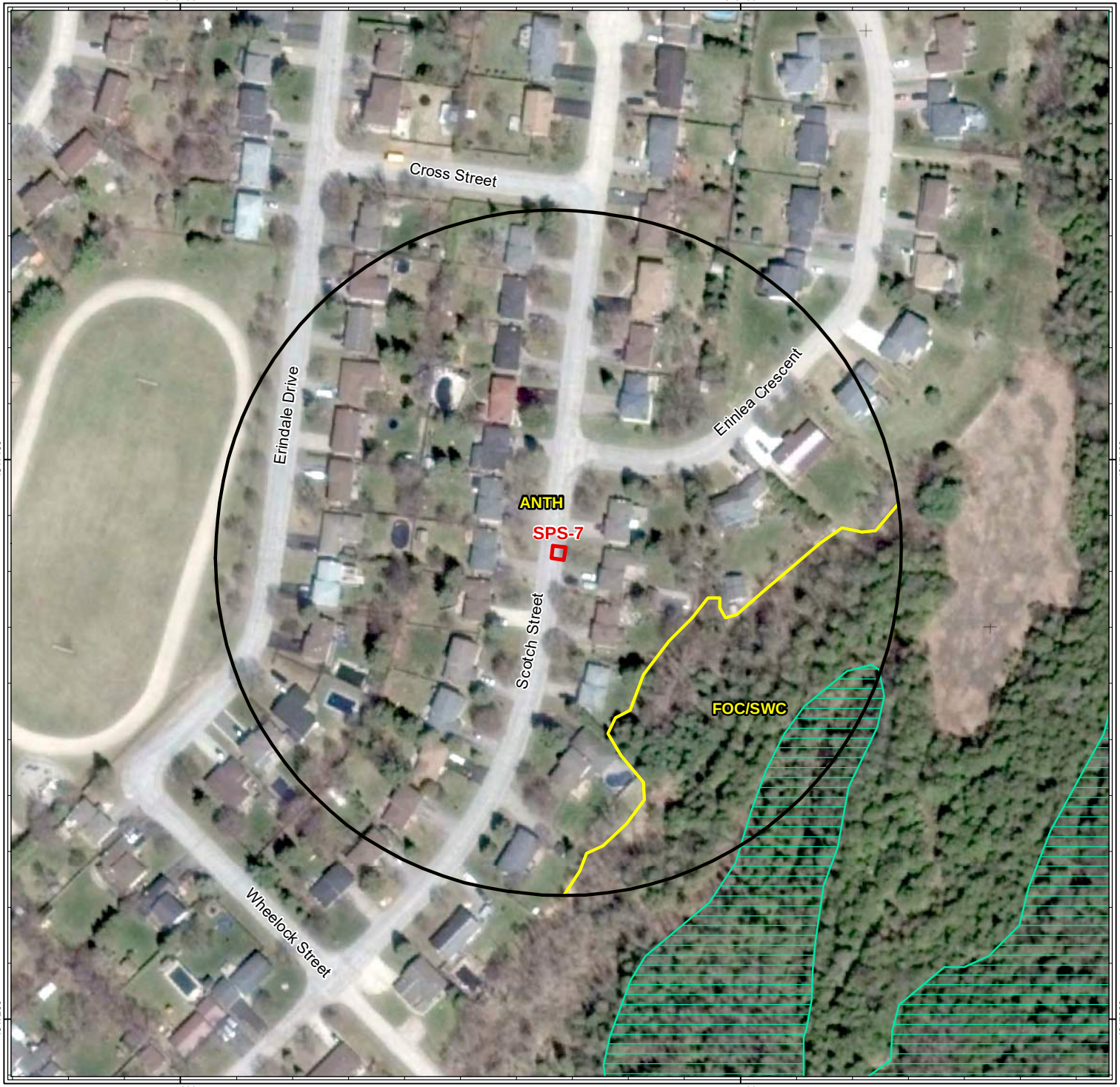

LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

0 25 50
metres

N

Scale 1:2000 NAD 1983 UTM Zone 17N

DATA SOURCES: Natural Resources Canada (National Road Network - Ontario). Base Imagery ©2017 Google (CNES / Airbus, DigitalGlobe, First Base Solutions). Additional Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

SPS-7

MAP 8

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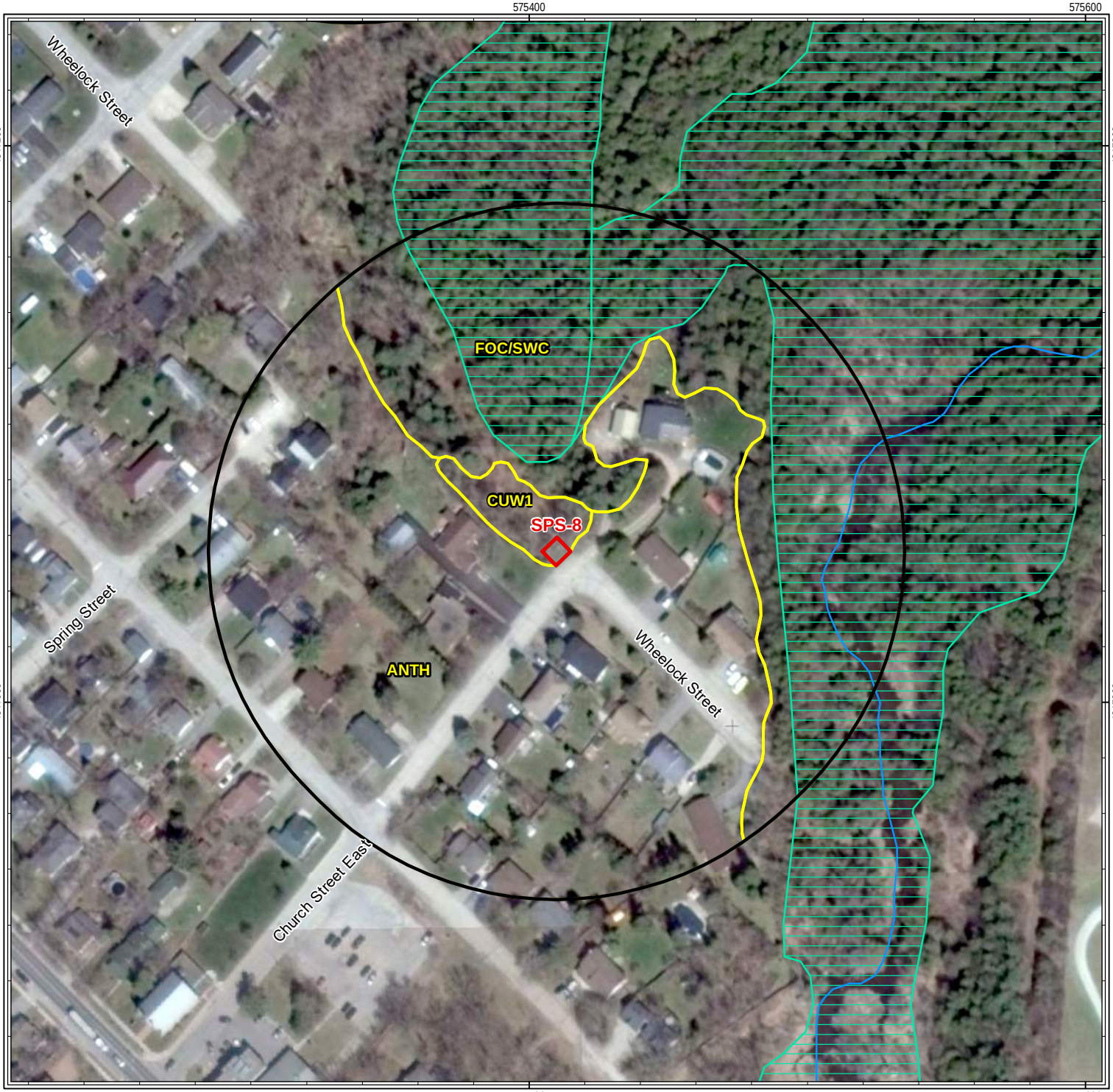

LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

N

0 25 50
metres

Scale 1:2000 NAD 1983 UTM Zone 17N

DATA SOURCES: Natural Resources Canada (National Road Network - Ontario). Base Imagery ©2017 Google (CNES / Airbus, DigitalGlobe, First Base Solutions). Additional Service Layer Credits:

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Project: Town of Erin Sewage Treatment

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PROJECT: 13183
DATE: Dec 15, 2017

SPS-8

MAP 9

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LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

N

0 25 50
metres

Scale 1:2000 NAD 1983 UTM Zone 17N

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

Hills - SPS2

MAP 10

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LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

N

0 50 100

metres

Scale 1:3000 NAD 1983 UTM Zone 17N

DATA SOURCES: Natural Resources Canada (National Road Network - Ontario). Base Imagery ©2017 Google (CNES / Airbus, DigitalGlobe, First Base Solutions). Additional Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

Route Alternative 1

MAP 11A

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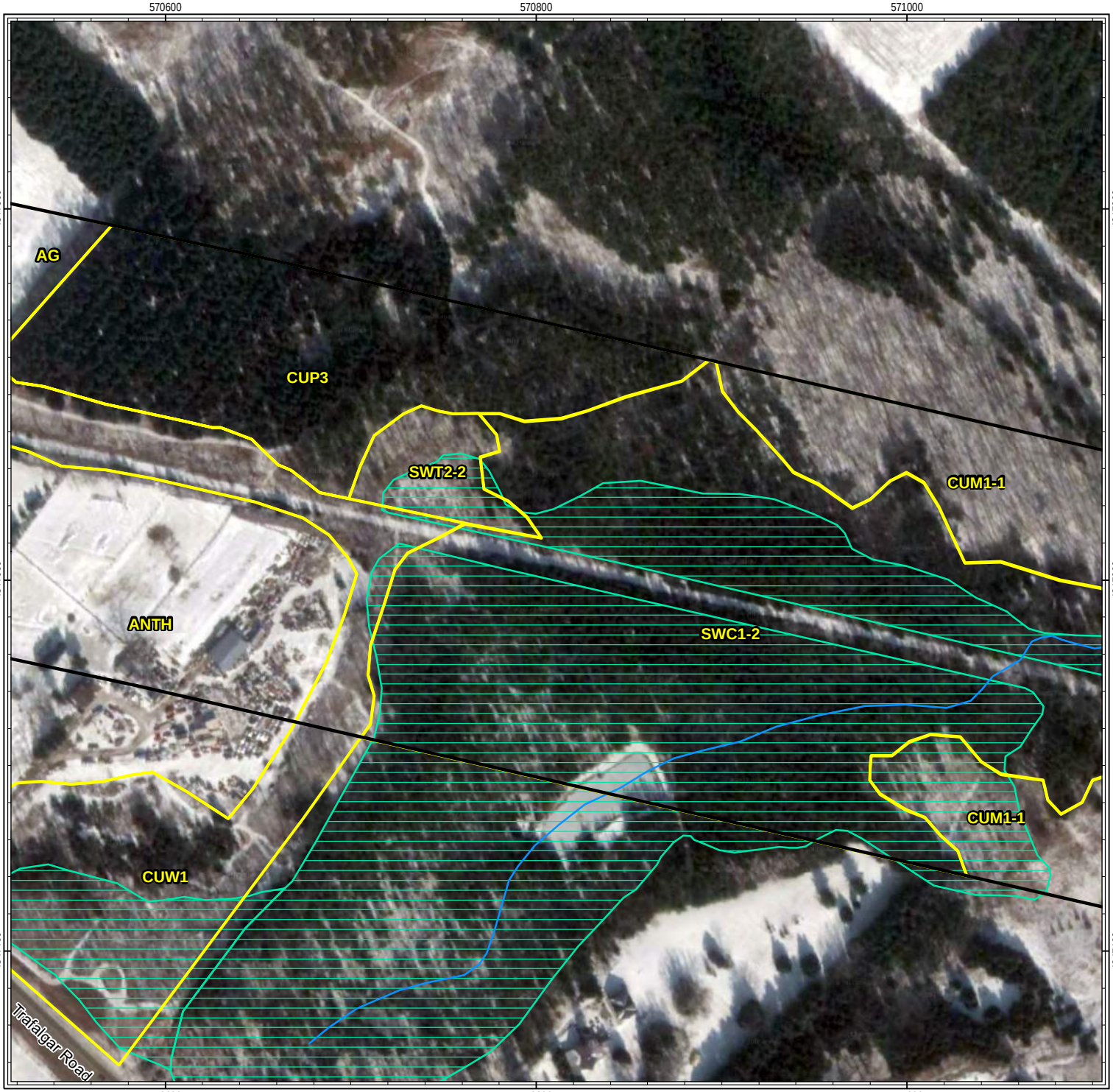

LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

N

0 50 100

metres

Scale 1:3000 NAD 1983 UTM Zone 17N

DATA SOURCES: Natural Resources Canada (National Road Network - Ontario). Base Imagery ©2017 Google (CNES / Airbus, DigitalGlobe, First Base Solutions). Additional Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

Route Alternative 1

MAP 11B

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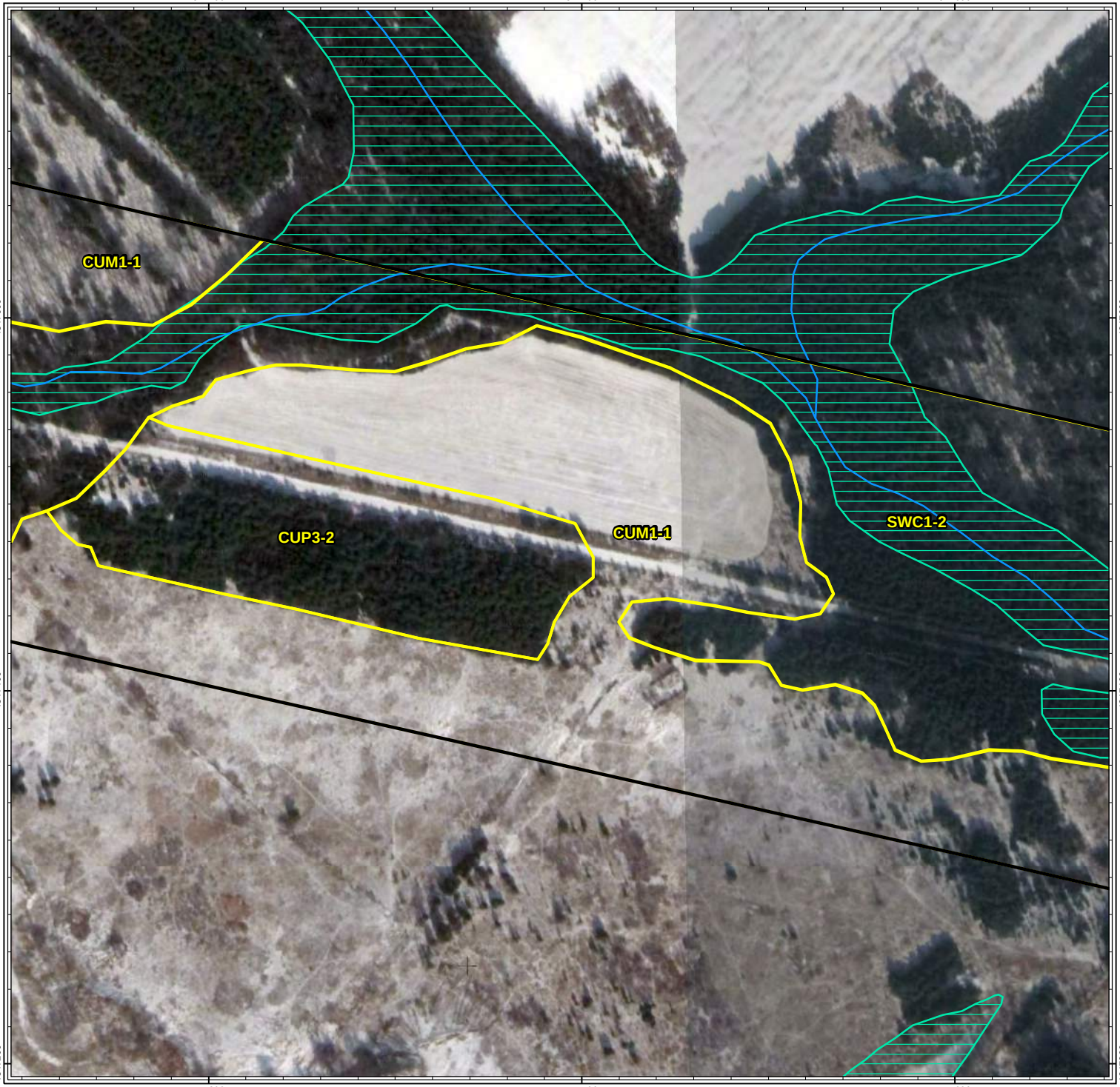

LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

N

0 50 100

metres

Scale 1:3000 NAD 1983 UTM Zone 17N

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

Route Alternative 1

MAP 11C

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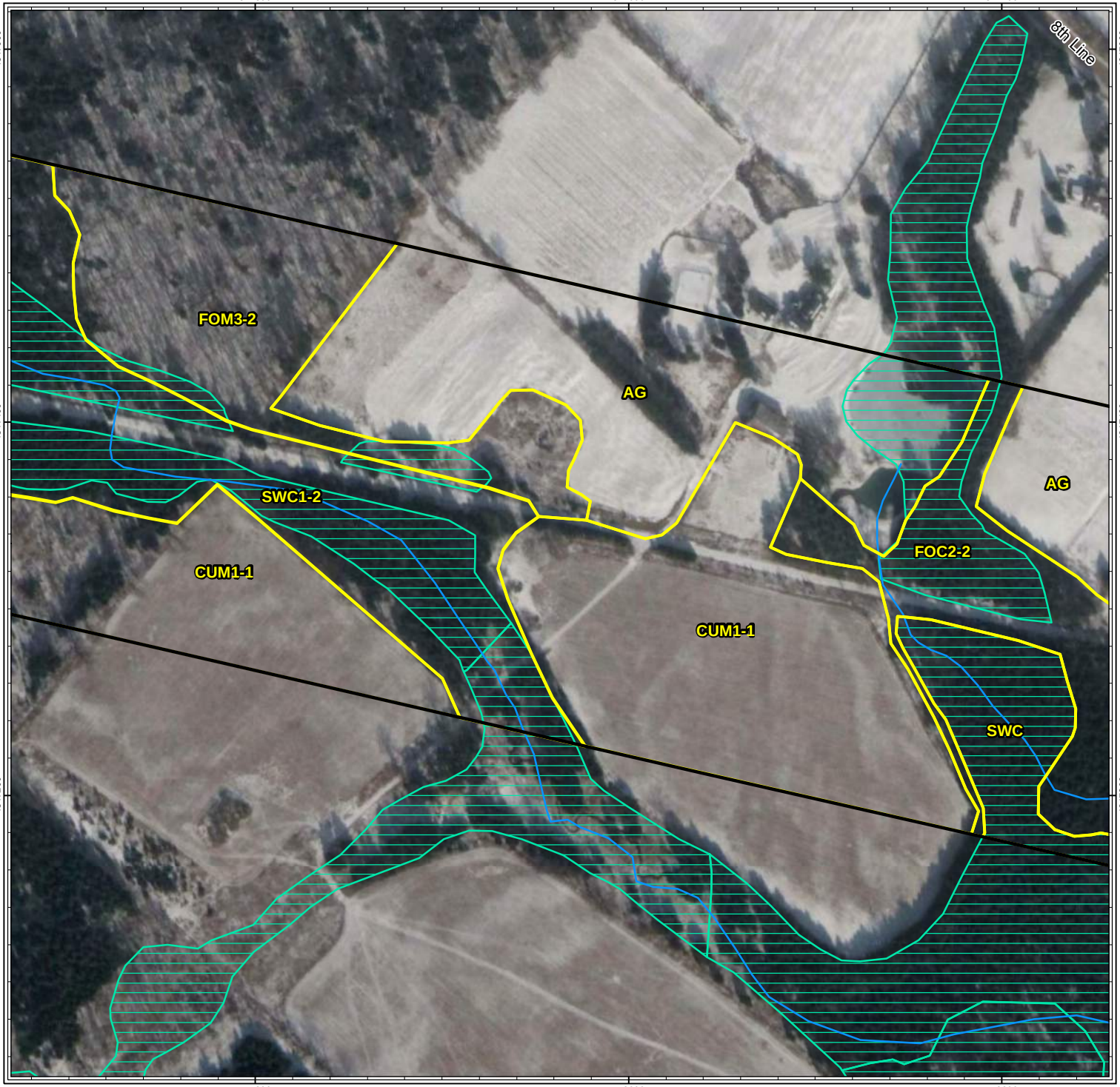

LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

N

0 50 100

metres

Scale 1:3000 NAD 1983 UTM Zone 17N

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Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

Route Alternative 1

MAP 11D

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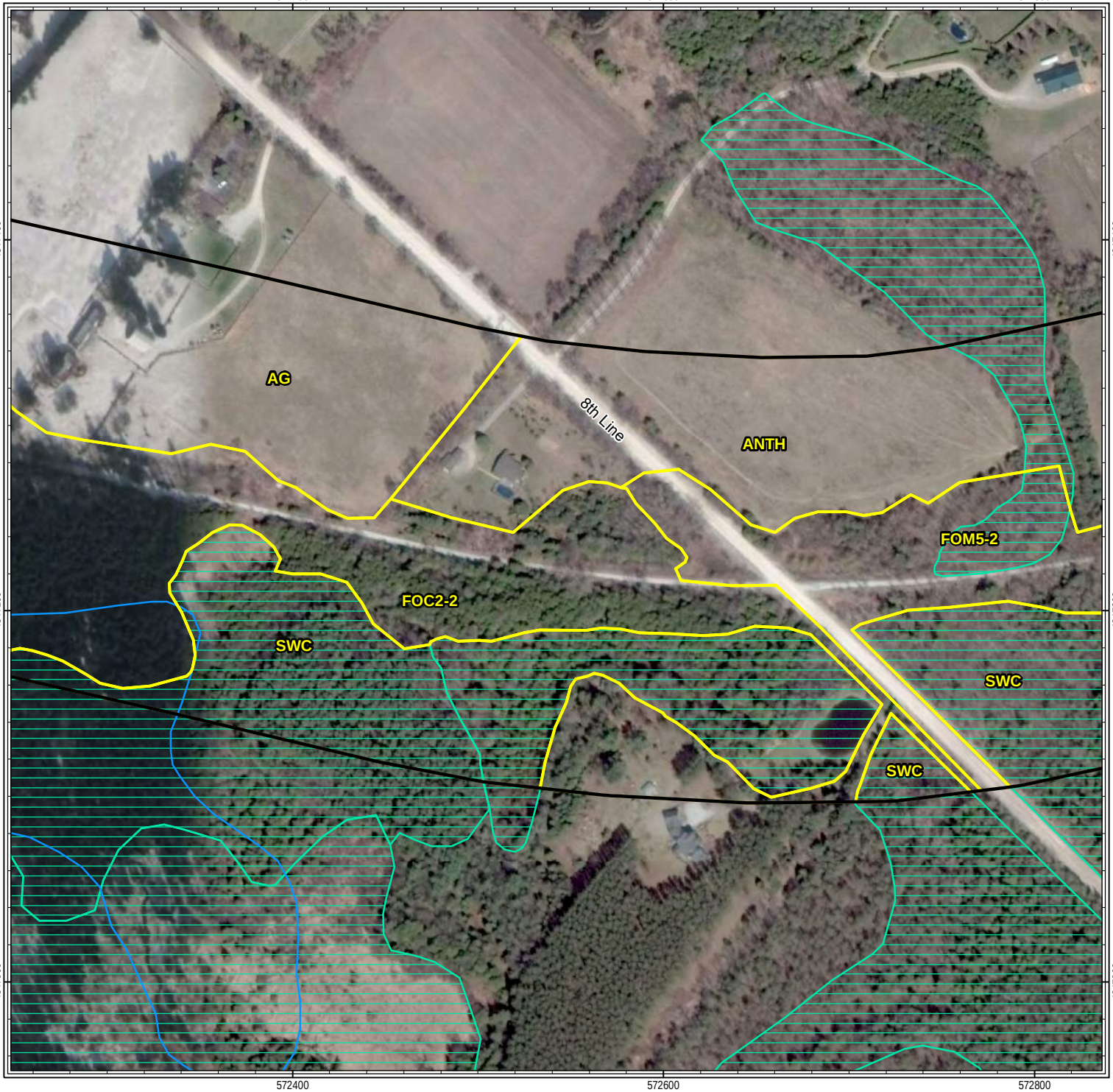

LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

N

0 50 100

metres

Scale 1:3000 NAD 1983 UTM Zone 17N

DATA SOURCES: Natural Resources Canada (National Road Network - Ontario). Base Imagery ©2017 Google (CNES / Airbus, DigitalGlobe, First Base Solutions). Additional Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

Route Alternative 1

MAP 11E

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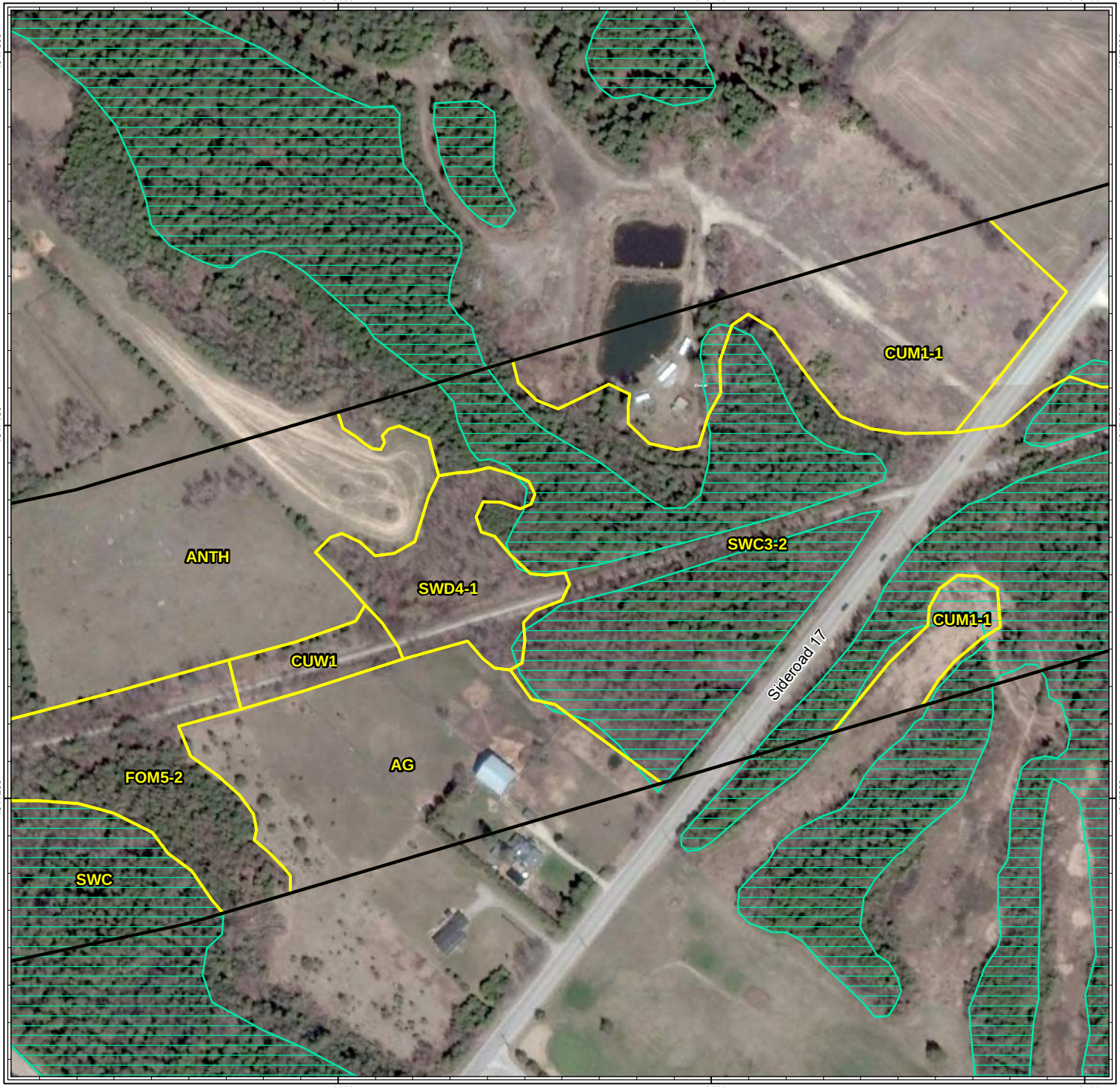

LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

0 50 100
metres

N

Scale 1:3000 NAD 1983 UTM Zone 17N

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
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PROJECT: 13183
DATE: Dec 15, 2017

Route Alternative 1

MAP 11F

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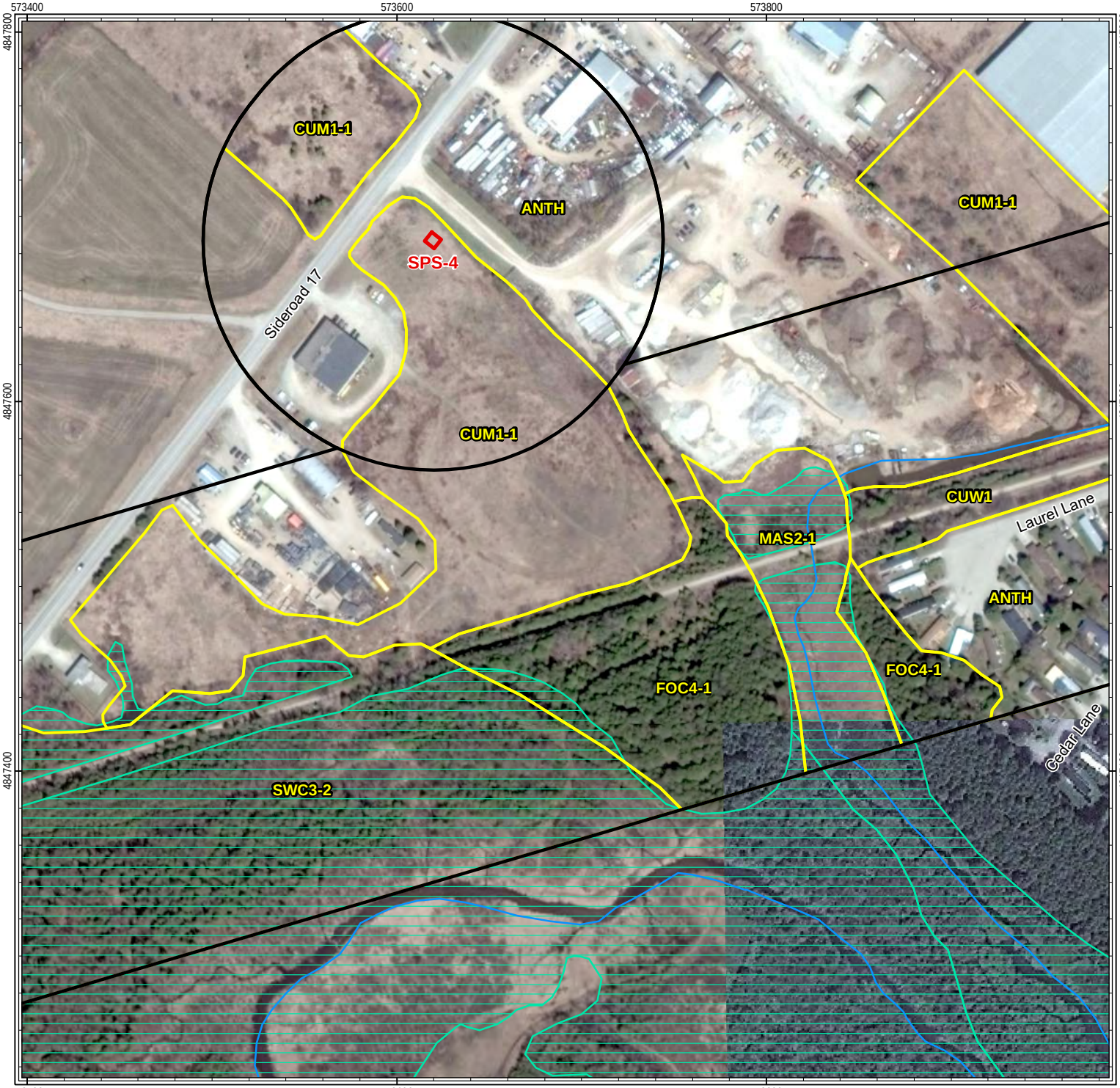


LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
FOM5-2	Dry-fresh Poplar Mixed Forest

Cultural (CU)

CUM1-1	Dry-moist Old Field Meadow
CUP3	Coniferous Plantation
CUP3-2	White Pine Coniferous Plantation
CUW1	Mineral Cultural Woodland

Wetland System

Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

N

0 50 100

metres

Scale 1:3000 NAD 1983 UTM Zone 17N

DATA SOURCES: Natural Resources Canada (National Road Network - Ontario). Base Imagery ©2017 Google (CNES / Airbus, DigitalGlobe, First Base Solutions). Additional Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

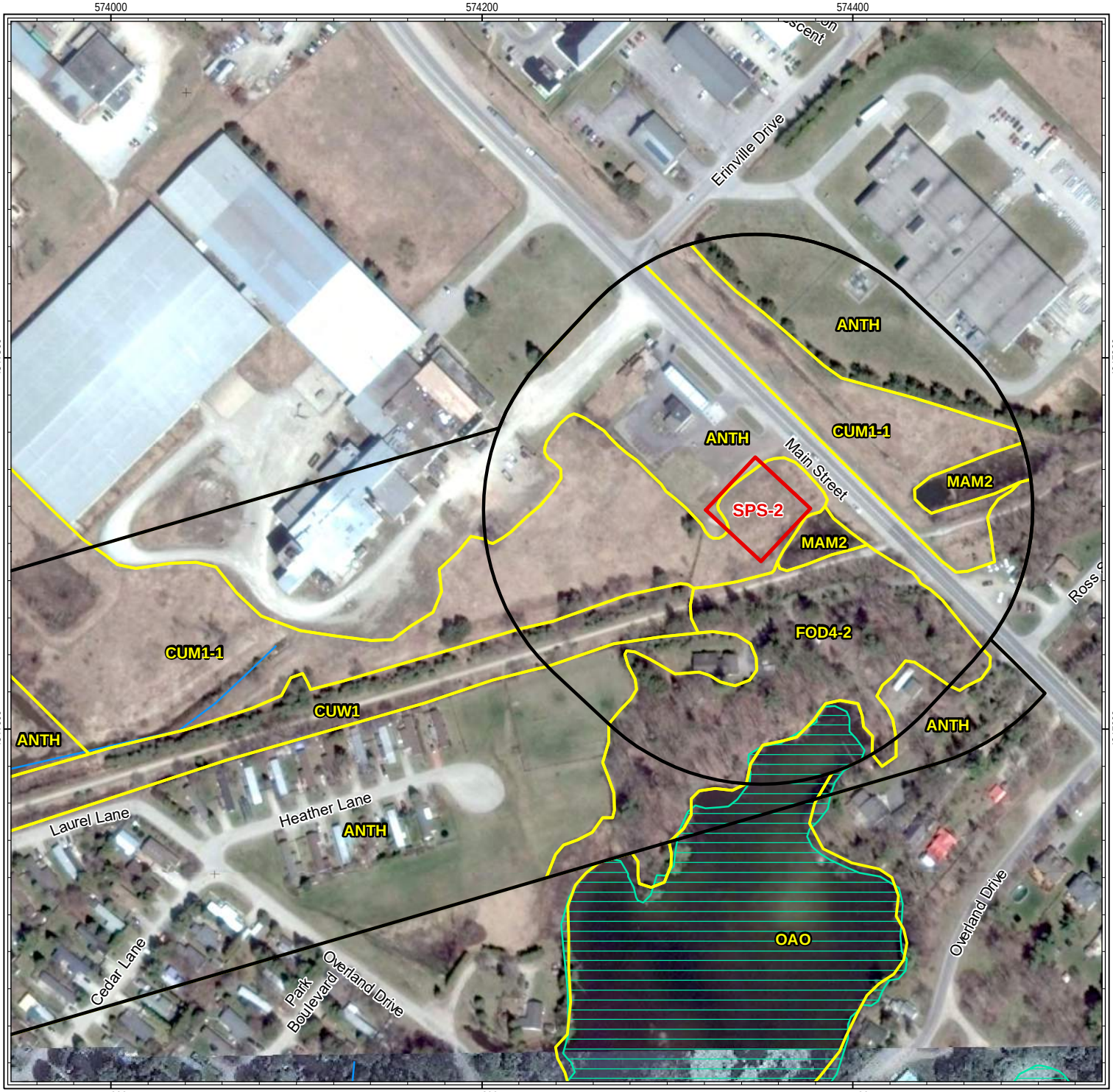
PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

Route Alternative 1

MAP 11G

Document Path: C:\Egnyte\Shared\Projects\Active\1318 - HES\1\13183 - Town of Erin Sewage Treatment\Mapping\Draftmxd\ELC Maps\13183_ELC_Map12G.mxd



LEGEND

- SPS Location
- Study Area (120 m buffer)
- ELC Community
- Provincially Significant Wetland
- Watercourse (OHN)

VEGETATION COMMUNITIES

Terrestrial System

Forest (FO)

FOC	Coniferous Forest
FOC2-2	Dry-fresh White Cedar Coniferous Forest
FOC4-1	Fresh-moist Cedar Coniferous Forest
FOD	Deciduous Forest
FOD4-2	Dry-fresh White Cedar – Poplar Mixed Forest Type
FOD5-8	Dry-fresh Sugar Maple – White Ash Deciduous Forest
FOD7	Fresh-moist Low land Deciduous Forest Ecosite
FOM3-2	Dry-fresh Sugar Maple – Hemlock Mixed Forest
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Swamp (SW)

SWC	Coniferous Swamp
SWC1-2	White Cedar – Conifer Mineral Coniferous Swamp
SWC3-2	White Cedar – Conifer Organic Coniferous Swamp
SWD	Deciduous Swamp
SWD4-1	Willow Mineral Deciduous Swamp
SWM	Mixed Swamp
SWT2-2	Willow Mineral Thicket Swamp

Marsh (MA)

MAS2	Mineral Meadow Marsh
MAS2-1	Cattail Mineral Shallow Marsh

Other

AG	Agricultural
ANTH	Anthropogenic
OAO	Open Aquatic

0 50 100
metres

N

Scale 1:3000 NAD 1983 UTM Zone 17N

Hutchinson Environmental Sciences Ltd.

Project: Town of Erin Sewage Treatment

PREPARED BY:

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

DRAWN: B. Elder
CHECKED: D. Janas
PROJECT: 13183
DATE: Dec 15, 2017

Route Alternative 1

MAP 11H

Document Path: C:\Egnyte\Shared\Projects\Active\1318 - HES\L\13183 - Town of Erin Sewage Treatment\Mapping\Draftmxd\ELC Maps\13183_ELC_Map12H.mxd

Photograph 1. **CUM1-1: Dry-moist Old Field Meadow (Route Alternative 1).**

Photograph 2. **CUP3: Coniferous Plantation (Route Alternative 1).**

Photograph 3. **CUP3-2: White Pine Coniferous Plantation (Route Alternative 1).**

Photograph 4. **CUW1: Mineral Cultural Woodland (Route Alternative 1).**

Photograph 5. **FOC2-2: Dry-fresh White Cedar Coniferous Forest (Route Alternative 1).**

Photograph 6. **FOC4-1: Fresh-moist Cedar Coniferous Forest (Route Alternative 1).**

Photograph 7. **FOD5-8: Dry-fresh Sugar Maple – White Ash Deciduous Forest (Erin SPS-3).**

Photograph 8. **FOD7: Fresh-moist Lowland Forest (Hillsburgh SPS-2).**

Photograph 9. **FOM3-2: Dry-fresh Sugar Maple – Hemlock Mixed Forest (Route Alternative 1).**

Photograph 10. **FOM4-2: Dry-fresh White Cedar – Poplar Mixed Forest (Route Alternative 1).**

Photograph 11. **FOM5-2: Dry-fresh Poplar Mixed Forest (Route Alternative 1).**

Photograph 12. **MAS2-1: Cattail Mineral Shallow Marsh (Route Alternative 1).**

Photograph 13. **SWC1-2: White Cedar – Conifer Mineral Coniferous Swamp (Route Alternative 1).**

Photograph 14. **SWC3-2: White Cedar – Conifer Organic Coniferous Swamp (Route Alternative 1).**

Photograph 15. **SWD4-1: Willow Mineral Deciduous Swamp (Route Alternative 1).**

Photograph 16. **SWM3-2: Poplar Coniferous Mineral Mixed Swamp (Route Alternative 1).**

Photograph 17. **SWT2-2: Willow Mineral Thicket Swamp (Route Alternative 1).**

Hillsburgh	Erin	Erin	Erin	Erin	Erin	Erin	Erin	Erin		WWTP	WWTP	WWTP	WWTP						
SPS-2	SPS-1	SPS-2	SPS-3	SPS-4	SPS-5	SPS-6	SPS-7	SPS-8	Route Alternative 1	Location 1	Location 1	Location 2B	Location 2A	ScientificName	CommonName	SRANK	Peel	CVC (Kaiser 2000)	CVC/PEEL STATUS (CVC 2002)
Anth	CUW1	CUM1-1	FOD5-8	CUM1-1	CUM1-1	CUM1-1	Anth	CUW1	All	CUM1-1	SWC3-2	CUM1-1	CUM1-1						
									x					Abies balsamea	Balsam Fir	S5			
	x	x			x			x	x					Acer negundo	Manitoba Maple	S5			
	x	x	x						x					Acer platanoides	Norway Maple	SE5			
					x				x					Acer X freemanii	Freeman's Maple	S5			
		x												Achillea millefolium var. millefoliu	Common Yarrow	SE?			
								x						Aegopodium podagraria	Goutweed	SE5			
														Agrostis sp	Bentgrass Species				
				x		x			x					Agrostis gigantea	Redtop	SE5			
											x			Agrostis stolonifera	Spreading Bentgrass	S5			
	x		x		x			x	x					Alliaria petiolata	Garlic Mustard	SE5			
														Alnus glutinosa	European Black Alder	SE4			
											x			Alnus incana spp. rugosa	Speckled Alder	S5			
														Ambrosia artemisiifolia	Annual Ragweed	S5			
											x			Anemone virginiana var. virginiana	Virginia Anemone	S5			
					x									Arctium minus	Lesser Burdock	SE5			
											x			Asclepias incarnata ssp. incarnata	Swamp Milkweed	S5			
		x		x					x					Asclepias syriaca	Common Milkweed	S5			
											x			Aster ericoides var. ericoides	Heath Aster	S5			
									x					Aster lateriflorus var. lateriflorus	Calico Aster	S5			
											x			Symphyotrichum lanceolatum var. l	Panicled Aster	S5			
				x					x					Symphyotrichum novae-angliae	New England Aster	S5			
									x					Symphyotrichum puniceum var. pur	Swamp Aster	SU			
											x			Athyrium filix-femina var. angustur	Lady-fern	S5			
									x					Betula alleghaniensis	Yellow Birch	S5			
									x					Betula papyrifera	Paper Birch	S5			
											x			Bidens cernua	Nodding Beggar's Ticks	S5			
									x					Bidens frondosa	Devil's Beggar's Ticks	S5			
									x					Brasenia schreberi	Watershield	S5	R1	R/L	rare
		x	x		x				x	x		x	x	Bromus inermis ssp. inermis	Smooth Brome	SE5			
									x					Calla palustris	Wild Calla	S5	U		
									x					Carex sp	Sedge Species				
									x					Cardamine diphylla	Broad-leaved Toothwort	S5			
											x			Carex flava	Yellow Sedge	S5	R8	L	rare
											x			Carex gracillima	Graceful Sedge	S5			
									x					Carex stricta	Tussock Sedge	S5			
		x		x										Centaurea jacea	Brown Knapweed	SE5			
									x		x			Chelone glabra	Turtlehead	S5	U		
								x						Chelidonium majus	Greater Celadine	SE5			
		x			x				x					Cichorium intybus	Chicory	SE5			
		x			x									Cirsium arvense	Crepping Thistle	SE5			
			x						x					Circaea lutetiana ssp. canadensis	Enchanter's Nightshade	S5			
					x									Cirsium vulgare	Bull Thistle	SE5			
											x			Clematis virginiana	Virginia Virgin-bower	S5			
						x								Convolvulus arvensis	Field Bindweed	SE5			

			x						x					Cornus alternifolia	Alternate-leaf Dogwood	S5			
									x					Cornus sericea ssp. sericea	Red-osier Dogwood	S5			
											x			Cuscuta sp	Dodder Species				
									x					Cypripedium pubescens var. pubesc	Large Yellow Lady's-slipper	S5	R5	L	rare
											x			Cystopteris bulbifera	Bulblet Fern	S5			
				x		x								Dactylis glomerata	Orchard Grass	SE5			
	x	x		x	x	x			x	x		x		Daucus carota	Queen Anne's Lace	SE5			
		x	x					x						Echinocystis lobata	Wild Mock-cucumber	S5			
		x				x								Echium vulgare	Common Viper's-bugloss	SE5			
									x					Elaeagnus umbellata	Autum Olive	SE3			
											x			Eleocharis sp	Spikerush Species				
		x												Elymus repens	Quack Grass	SE5			
									x					Epipactis helleborine	Eastern Helleborine	SE5			
									x					Equisetum arvense	Field Horsetail	S5			
					x									Erigeron annuus	White-top Fleabane	S5			
									x					Erythronium americanum ssp. amer	Yellow Trout-lily	S5			
									x		x			Eupatorium maculatum var. macula	Spotted Joe-pye Weed	S5			
									x					Euthamia graminifolia	Grass-leaved Goldenrod	S5			
x	x	x	x						x					Fraxinus americana	White Ash	S5			
											x			Fraxinus nigra	Black Ash	S5			
									x					Fraxinus pennsylvanica	Green Ash	S5			
x									x					Fragaria vesca ssp. americana	Woodland Strawberry	S5			
											x			Fraxinus sp	Ash Species				
													x	Galium sp	Bedstraw Species				
														Galium asprellum	Rough Bedstraw	S5	U		
									x					Galium palustre	Marsh Bedstraw	S5			
														Galium triflorum	Sweet-scent Bedstraw	S5			
									x	x				Geranium maculatum	Wild Geranium	S5	U		
								x						Geranium robertianum	Herb-robert	SE5			
									x		x			Glyceria striata	Fowl Manna Grass	S5			
									x	x				Hieracium caespitosum	Field Hawkweed	SE5			
		x												Hieracium lachenalii	Common Hawkweed	SE2?			
									x					Hydrophyllum virginianum	Virginia Waterleaf	S5			
				x	x				x					Hypericum perforatum	St. John's-wort	SE5			
			x					x	x		x			Impatiens capensis	Spotted Jewel-weed	S5			
									x					Iris sp	Iris Species				
	x								x	x				Juglans nigra	Black Walnut	S4			
									x		x			Juncus sp	Rush Species				
									x					Larix laricina	American Larch	S5			
											x			Leersia oryzoides	Rice Cutgrass	S5			
					x			x						Leonurus cardiaca ssp. cardiaca	Common Motherwort	SE5			
														Linaria vulgaris	Butter-and-eggs	SE5			
					x						x			Lonicera tatarica	Tartarian Honeysuckle	SE5			
		x		x					x					Lotus corniculatus	Bird's-foot Trefoil	SE5			
									x					Lythrum salicaria	Slender-spike Loosestrife	SE5			
														Malva moschata	Musk Mallow	SE5			
									x					Malus pumila	Common Apple	SE5			
											x			Matteuccia struthiopteris var. pensy	Ostrich Fern	S5			
x	x				x									Medicago lupulina	Black Medic	SE5			

															Medicago polymorpha	Multi-formed Medick	SEH			
		x													Melilotus alba	White Sweet Clover	SE5			
										x					Mentha arvensis	Corn Mint	S5			
					x										Mentha X piperita	Peppermint	SE4			
										x					Mitella nuda	Naked Bishop's-cap	S5			
												x			Nasturtium sp	Watercress Species				
		x								x		s			Onoclea sensibilis	Sensitive Fern	S5			
		x									x				Parthenocissus vitacea	Thicket Creeper	S5			
										x					Pastinaca sativa	Wild Parsnip	SE5			
		x								x		x			Phalaris arundinacea	Reed Canary Grass	S5			
		x			x										Phlox paniculata	Fall Phlox	SE3			
		x								x					Phleum pratense	Timothy	SE5			
										x					Phragmites australis	Common Reed	S5			
													x		Picea abies	Norway Spruce	SE3			
										x		x			Picea glauca	White Spruce	S5	R3	L	
					x										Picea pungens	Colorado Spruce	SE1			
x						x				x					Pinus strobus	Eastern White Pine	S5			
		x		x	x	x									Plantago lanceolata	English Plantain	SE5			
												x			Poa sp	Bluegrass Species				
x	x				x	x	x								Poa pratensis ssp. pratensis	Kentucky Bluegrass	S5			
		x								x					Populus balsamifera ssp. balsamifer	Balsam Poplar	S5			
				x						x					Populus tremuloides	Quaking Aspen	S5			
		x								x					Prunus serotina	Wild Black Cherry	S5			
			x	x	x					x					Prunus virginiana var. virginiana	Choke Cherry	S5			
x	x									x					Prunella vulgaris ssp. vulgaris	Common Heal-all	SE3			
	x														Quercus rubra	Northern Red Oak	S5			
										x					Ranunculus acris	Tall Buttercup	SE5			
												x			Ranunculus hispidus var. hispidus	Bristly Buttercup	S3	R2	P/R/L	rare
									x						Ranunculus recurvatus var. recurvat	Hooked Crowfoot	S5			
	x	x	x	x	x			x	x						Rhamnus cathartica	Buckthorn	SE5			
			x												Ribes cynosbati	Prickly Gooseberry	S5			
											x				Robinia pseudo-acacia	Black Locust	SE5			
			x							x					Rubus occidentalis	Black Raspberry	S5			
										x					Rubus pubescens	Dwarf Raspberry	S5			
		x			x					x					Rumex crispus	Curly Dock	SE5			
										x		x			Salix sp	Willow Species				
										x					Salix eriocephala	Heart-leaved Willow	S5			
										x					Salix pedicellaris	Bog Willow	S5		R/L	rare
										x					Salix X sepulcralis	Weeping Willow	SE2			
												x			Sambucus sp	Elderberry Species				
										x					Schoenoplectus tabernaemontani	Soft-stemmed Bulrush	S5			
															Solidago sp	Goldenrod Species				
	x	x		x	x						x		x		Solidago canadensis	Canada Goldenrod	S5			
					x			x				x			Solanum dulcamara	Climbing Nightshade	SE5			
										x		x			Solidago rugosa ssp. rugosa	Rough Goldenrod	S5			
			x		x										Sonchus arvensis ssp. arvensis	Field Sowthistle	SE5			
	x														Sorbus sp	Mountain-ash Species				
												x			Sparganium sp	Bur-reed Species				
															Spiraea alba	Narrow-leaved Meadow-swee	S5			

	x									x		x			Syringa vulgaris	Common Lilac	SE5			
x	x		x		x	x		x	x						Taraxacum officinale	Common Dandelion	SE5			
											x				Thalictrum pubescens	Tall Meadowrue	S5			
									x						Thelypteris palustris var. pubescens	Marsh Fern	S5			
				x					x	x	x				Thuja occidentalis	Northern White Cedar	S5			
	x														Tilia cordata	Small leaf Linden	SE1			
						x									Trifolium pratense	Red Clover	SE5			
															Trifolium repens	White Clover	SE5			
									x						Tsuga canadensis	Eastern Hemlock	S5			
									x		x				Tussilago farfara	Colt's Foot	SE5			
									x						Typha angustifolia	Narrow-leaved Cattail	S5			
									x						Typha latifolia	Broad-leaf Cattail	S5			
									x						Ulmus sp	Elm Species				
											x				Ulmus americana	American Elm	S5			
											x				Urtica dioica ssp. gracilis	Slender Stinging Nettle	S5			
											x				Verbena sp	Vervain Species				
											x				Verbena hastata	Blue Vervain	S5			
		x			x				x						Verbascum thapsus	Common Mullein	SE5			
									x						Viburnum acerifolium	Maple-leaf Viburnum	S5			
		x		x	x				x						Vicia cracca	Tufted Vetch	SE5			
		x							x						Vitis riparia	Riverbank Grape	S5			
									x						Waldsteinia fragarioides	Barren Strawberry	S5			
										x					Zea mays	Indian Corn	SE2			

Hillsburgh	Erin	Erin	Erin	Erin	Erin	Erin	Erin	Erin		WWTP	WWTP	WWTP	WWTP						
SPS-2	SPS-1	SPS-2	SPS-3	SPS-4	SPS-5	SPS-6	SPS-7	SPS-8	Route Alternative 1	Location 1	Location 1	Location 2B	Location 2A	ScientificName	CommonName	SRANK	Peel (Varga 2000)	CVC (Kaiser 2000)	CVC/PEEL STATUS (CVC 2002)
Anth	CUW1	CUM1-1	FOD5-8	CUM1-1	CUM1-1	CUM1-1	Anth	CUW1	All	CUM1-1	SWC3-2	CUM1-1	CUM1-1						
									x					Brasenia schreberi	Watershield	S5	R1	R/L	rare
									x					Calla palustris	Wild Calla	S5	U		
											x			Carex flava	Yellow Sedge	S5	R8	L	rare
									x		x			Chelone glabra	Turtlehead	S5	U		
									x					Cypripedium pubescens var. pubescens	Large Yellow Lady's-slipper	S5	R5	L	rare
									x	x				Geranium maculatum	Wild Geranium	S5	U		
									x		x			Picea glauca	White Spruce	S5	R3	L	
											x			Ranunculus hispidus var. hispidus	Bristly Buttercup	S3	R2	P/R/L	rare

Appendix C. Summary of Erin Breeding Amphibian Surveys, April, May and June 2017

Summary of Breeding Amphibians Surveys, April, May, and June 2017

Date Surveyed
26-Apr-17

Station Surveyed	**1**			**2**			**3**			**4**			**5**			**6**			**7**			**8**			**9**			**10**			**11**			**12**			**13**			**14**			**15**			**16**			**17**			**18**		
Station Start Time (24 hr)	20:15			21:45			22:30			22:15			22:40			22:45			22:59			23:05			23:10			9:30			N/A			N/A			N/A			N/A			22:03			23:47			23:58			23:54		
Background Noise	1			1			2			1			2			2			1			3			1			3															1			1			1			1		
No Calls Heard	0			0															0																																0		
Species Name	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In
American Toad							1	1	0	1	2	1	1	2	0																													1	4	4	1	2	2						
Fowler's Toad																																																					
Gray (Tetraploid) Treefrog																																																					
Cope's (Diploid) Gray Treefrog																																																				
Spring Peeper							1	3	0	2	6	6	1	3	3	2	6	6				1	3	0	1	3	0	1	2	0													2	7	7	1	4	4	2	4	4			
Chorus Frog																												1	1	1																								
Blanchard's Cricket Frog																																																				
Wood Frog																																																				
Northern Leopard Frog										1	3	0				1	2	2							1	1	0																		1	1	0						
Pickeel Frog																																																				
Green Frog																1	1	1																																				
Mink Frog																																																				
Bullfrog																																																				

Weather Conditions: Cloud Cover 1, Beauford Wind Scale 0, Temperature 9ºC, Precipition none.

Date Surveyed
30-May-17

20 and 21 on May 31/2017

Station Surveyed	**1**			**2**			**3**			**4**			**5**			**6**			**7**			**8**			**9**			**10**			**11**			**12**			**13**			**14**			**15**			**16**			**17**			**18**		
Station Start Time (24 hr)	22:35			21:55			21:45			21:30			22:05			23:20			23:35			23:25			23:30			23:35			22:10			22:20			21:35			22:00			23:05			23:10			23:15			0:00		
Background Noise	1			3			0			2			2			1			1			1			1			1			2			2			1			1			1			1			1			2		
No Calls Heard	0																					0									0																		0			0		
Species Name	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In
American Toad				1	2	2				1	3	0																						1	4	1																	
Fowler's Toad																																																					
Gray (Tetraploid) Treefrog													1	2	2				1	1	0													2	9	0	1	6	0	1	5	0	1	6	0	1	1	0						
Cope's (Diploid) Gray Treefrog																																																				
Spring Peeper																												1	2	0				1	2	2	1	2	0	1	4	0				1	4	0						
Chorus Frog										1	3	1																																								
Blanchard's Cricket Frog																																																			
Wood Frog																																																			
Northern Leopard Frog																									1	1	1																										
Pickeel Frog																																																			
Green Frog										1	2	1				1	9	6																1	1	1															
Mink Frog																																																			
Bullfrog																																																			

Weather Conditions: Cloud Cover 6, Beauford Wind Scale 1, Temperature 17ºC, Precipition non/drizzle.

Date Surveyed
27-Jun-17

Station Surveyed	**1**			**2**			**3**			**4**			**5**			**6**			**7**			**8**			**9**			**10**			**11**			**12**			**13**			**14**			**15**			**16**			**17**			**18**		
Station Start Time (24 hr)	23:11			22:02			21:50			21:30			23:31			23:45			23:51			23:55			23:58			23:25			22:50			23:05			22:17			22:28			0:08			0:02			0:02			N/A		
Background Noise	1			1			1			1			1			1			1			1			1			1			0			0			1			1			1			1			1					
No Calls Heard	0			0			0			0			0						0			0			0						0						0						0			0			0					
Species Name	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In	CC	Count	In
American Toad																																																				
Fowler's Toad																																																				
Gray (Tetraploid) Treefrog																																																				
Cope's (Diploid) Gray Treefrog																																																			
Spring Peeper																																																			
Chorus Frog																																																			
Blanchard's Cricket Frog																																																		
Wood Frog																																																			
Northern Leopard Frog																																																			
Pickeel Frog																																																			
Green Frog																1	9	4																							1	3	1										
Mink Frog																																																			
Bullfrog																																																			

Weather Conditions: Cloud Cover 1, Beauford Wind Scale 1, Temperature 17ºC, Precipition: None.

Appendix D. Summary of Erin Breeding Bird Surveys, June 2017

Summary of Breeding Bird Surveys, June 2017

Common Name	Scientific Name	Status																			
		National Species at Risk COSEWIC designation[a]	National Species at Risk *Species at Risk Act* Designation[a]	Species at Risk in Ontario Listing[b]	Provincial breeding season SRANK[c]	Area-sensitive (OMNR)[d]	1B	2	3	4	5	6	8	9	A	B	C	D	E	F	G
Canada Goose	*Branta canadensis*				S5															1	
Killdeer	*Charadrius vociferus*				S5													1			
Mourning Dove	*Zenaida macroura*				S5					1				1				1			
Belted Kingfisher	*Ceryle alcyon*				S4														1	1	
Yellow-bellied Sapsucker	*Sphyrapicus varius*				S5	A															1
Hairy Woodpecker	*Picoides villosus*				S5	A			1									1			
Northern Flicker	*Colaptes auratus*				S4													2			
Eastern Wood-Pewee	*Contopus virens*	SC		SC	S4													1			
Willow Flycatcher	*Empidonax traillii*				S5														1		
Great Crested Flycatcher	*Myiarchus crinitus*				S4													2			
Eastern Kingbird	*Tyrannus tyrannus*				S4										1						
Tree Swallow	*Tachycineta bicolor*				S4					2							1				
Barn Swallow	*Hirundo rustica*	THR		THR	S4					3								1			
Blue Jay	*Cyanocitta cristata*				S5							1	1					2			1
American Crow	*Corvus brachyrhynchos*				S5			1					1					5			
Black-capped Chickadee	*Poecile atricapillus*				S5										1			7			1
White-breasted Nuthatch	*Sitta carolinensis*				S5	A												2			1
Brown Creeper	*Certhia americana*				S5	A												1			
House Wren	*Troglodytes aedon*				S5										1		1	3			
Winter Wren	*Troglodytes hiemalis*				S5	A												1			
Veery	*Catharus fuscescens*				S4	A												1			
American Robin	*Turdus migratorius*				S5		1			2	1	1	1	1	1		1	10		1	2
Gray Catbird	*Dumetella carolinensis*				S4													2			1
Cedar Waxwing	*Bombycilla cedrorum*				S5			1		1								3			2
European Starling	*Sturnus vulgaris*				SE					1				1	1		1	7		1	2
Warbling Vireo	*Vireo gilvus*				S5													1			
Red-eyed Vireo	*Vireo olivaceus*				S5		1											4	1		1
Golden-winged Warbler	*Vermivora chrysoptera*	THR	THR	SC	S4													1			
Nashville Warbler	*Oreothlypis ruficapilla*				S5													3			
Yellow Warbler	*Setophaga petechia*				S5					1								2			
Chestnut-sided Warbler	*Setophaga pensylvanica*				S5													1			
Yellow-rumped Warbler	*Setophaga coronata*				S5													2			
Black-throated Green Warbler	*Setophaga virens*				S5	A												1			
Black-and-white Warbler	*Mniotilta varia*				S5	A												4			
American Redstart	*Setophaga ruticilla*				S5	A								1				3			1
Ovenbird	*Seiurus aurocapillus*				S4	A			1												1
Northern Waterthrush	*Parkesia noveboracensis*				S5								1					7			
Mourning Warbler	*Geothlypis philadelphia*				S4													1			
Common Yellowthroat	*Geothlyphis trichas*				S5										1			5	1		1
Northern Cardinal	*Cardinalis cardinalis*				S5													3			1
Indigo Bunting	*Passerina cyanea*				S4													4			
Chipping Sparrow	*Spizella passerina*				S5		1				1	1			1		1	7			
Field Sparrow	*Spizella pusilla*				S4													1			
Savannah Sparrow	*Passerculus sandwichensis*				S4	A									2		1	1			
Song Sparrow	*Melospiza melodia*				S5			1		2	1		1		1			18	1	1	

Summary of Breeding Bird Surveys, June 2017

Common Name	Scientific Name	Status																			
		National Species at Risk COSEWIC designation[a]	National Species at Risk *Species at Risk Act* Designation[a]	Species at Risk in Ontario Listing[b]	Provincial breeding season SRANK[c]	Area-sensitive (OMNR)[d]	1B	2	3	4	5	6	8	9	A	B	C	D	E	F	G
Swamp Sparrow	*Melospiza georgiana*				S5														1		
Bobolink	*Dolichonyx oryzivorus*	THR		THR	S4	A										1					
Red-winged Blackbird	*Agelaius phoeniceus*				S4			1		1	1				1	2	2	5	6	1	2
Eastern Meadowlark	*Sturnella magna*	THR		THR	S4	A									1	1	1				
Common Grackle	*Quiscalus quiscula*				S5			1		1	1	2	1	1				4			1
Baltimore Oriole	*Icterus galbula*				S4									1				3			
House Finch	*Haemorhous mexicanus*				SNA													3			
American Goldfinch	*Spinus tristis*				S5			1				1	1	1	1			9	1	1	

Field Work Conducted On: June 1 and June 21 2017 between 5:45-11:45 h

Weather Conditions: 0-50% cloud, 0-6 Beaufort wind scale, 0% precipitation, 6-19º C

Location 1B - SPS #1B
Location 2 - SPS #2
Location 3 - SPS #3
Location 4 - SPS #4
Location 5 - SPS #5
Location 6 - SPS #6
Location 8 - SPS #8
Location 9 - Hillsburgh SPS #2
Location A - Potential WWTP on west side of Wellington Rd 52
Location B - Potential WWTP on southeast side of Wellington Rd 52
Location C - Potential WWTP on northeast side of Wellington Rd 52
Location D - Forcemain Option 1
Location E - Credit River marsh
Location F - Riverside Park
Location G - Forcemain from SPS #3 to Dundas St W

Number of Species: 53
Number of (provincial and national) Species at Risk: 5
Number of S1 to S3 Species: 0
Number of Area-sensitive Species: 13

Location D - Forcemain Option 1
Number of Species: 43
Number of (provincial and national) Species at Risk: 3
Number of Area-sensitive Species: 9

KEY
a COSEWIC = Committee on the Status of Endangered Wildlife in Canada
b Species at Risk in Ontario List (as applies to ESA) as designated by COSSARO (Committee on the Status of Species at Risk in Ontario)
END = Endangered, THR = Threatened, SC = Special Concern

[c] SRANK for breeding status if:
S1 (Critically Imperiled), S2 (Imperiled),S3 (Vulnerable), S4 (Apparently Secure), S5 (Secure)
SH (historical, possibly extirpated)

Summary of Breeding Bird Surveys, June 2017

Common Name	Scientific Name	Status																		
		National Species at Risk COSEWIC designation[a]	National Species at Risk *Species at Risk Act* Designation[a]	Species at Risk in Ontario Listing[b]	Provincial breeding season SRANK[c]	Area-sensitive (OMNR)[d]	1B	2	3	4	5	6	8	9	A	B	C	D	E	F	G

SNA (Not applicable…'because the species is not a suitable target for conservation activities'; includes non-native species),
NatureServe. 2015. NatureServe Explorer: An online encyclopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. Available at: http://explorer.natureserve.org

d Ontario Ministry of Natural Resources (OMNR). 2000. Significant Wildlife Habitat Technical Guide (Appendix G). 151 p plus appendices.