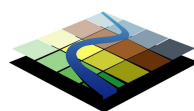


ENVIRONMENTAL IMPACT STATEMENT

Plan of Subdivision Application
475/555/635 Canal Bank Street (“Dain West”), City of Welland
September 2020



TERRASTORY
environmental consulting inc.

ENVIRONMENTAL IMPACT STATEMENT


Plan of Subdivision Application
475/555/635 Canal Bank Street (“Dain West”), City of Welland

Prepared for:

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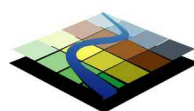
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2 September 2020

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EXECUTIVE SUMMARY

Terrastory Environmental Consulting Inc. (hereinafter “Terrastory”) was retained by 555 Canal Bank Developments GP Inc. (hereinafter “the Applicant”) to prepare this Environmental Impact Statement (EIS) in reference to a Draft Plan of Subdivision and related applications in Dain City (City of Welland). The Study Area consists of three (3) separate contiguous parcels (475/555/635 Canal Bank Street) which collectively amount to 74.7 hectares (184.6 acres) in area.

The purpose of this EIS is to present a biophysical characterization of the Study Area and Adjacent Lands as a means to identify the potential for adverse effects on the natural environment and natural heritage features stemming from the proposed redesignation of the former John Deere lands to residential and mixed uses. Since project commencement in April 2019 Terrastory has provided extensive feedback to and worked iteratively with the project team during formulation of the proposed lotting plan and associated technical reports. These discussions have centred on the need to avoid/minimize impacts to and maintain ecologically/policy appropriate setbacks from the significant natural features identified herein. Overall, this EIS has been prepared in support of the City OPA, Regional OPA, ZBA, and subdivision applications submitted to redesignate the lands to residential and mixed uses, and to support NPCA’s regulatory review under O. Reg. 155/06 pursuant to the *Conservation Authorities Act*.

This results of the site and significance assessments revealed the presence of the following significant natural heritage features within the Study Area:

- **Identified wetlands** greater than 2 hectares (primarily oak- and ash-dominated swamps) occurring in a mosaic of remnant Slough Forests.
- **Other identified wetlands** less than 2 hectares (deciduous swamp, thicket swamp, marshes) located in the Slough Forests and in more disturbed portions of the Study Area.
- **Significant Woodlands** occupying the entirety of the Slough Forests and contiguous second-growth forests/woodlands.
- **Candidate and confirmed Significant Wildlife Habitat** including bat maternity colonies, deer winter congregation areas (identified by MNRF), old-growth forest, provincially rare vegetation communities, terrestrial crayfish, and amphibian breeding and movement habitats.
- **Potential and confirmed habitat of Provincial and Regional Species of Concern**, including Eastern Wood-pewee, Grasshopper Sparrow, Monarch, Yellow-banded Bumble Bee, Yellow-fruited Sedge, and Tapered Rush.
- **Potential and confirmed habitat of Endangered species** (Myotis bats and Spoon-leaved Moss) and the presence of **Threatened species** in the local landscape (Barn Swallow and Chimney Swift).
- **Watercourses** regulated by NPCA, all of which represent drainage features that appear to have been historically constructed to drain the slough wetlands.
- **Potential fish habitat** pursuant to the *Fisheries Act* (subject to DFO confirmation).

Based on the presence of the above-mentioned significant natural heritage features, a comprehensive set of recommendations and mitigation measures are offered in **Sections 5.3** and **5.4** to achieve “no negative impact” and address applicable municipal, provincial, and federal policies outlined in **Section 6**. This includes the formulation of a conceptual Restoration and Enhancement Plan to address the proposed removal of 0.312 hectares of identified wetland (outside the Slough Forests)

and 2.707 hectares of Significant Woodland (outside the Slough Forests). A permit from NPCA pursuant to O. Reg. 155/06 is required to interfere with and/or alter the on-site wetlands and regulated watercourses.

Terrastory has determined that no negative impacts to the above-noted features will occur and that the application appropriately addresses applicable natural heritage policies provided that all technical mitigation measures recommended herein are implemented in full. It is advised that such technical recommendations be incorporated into any necessary development approvals that permit the applications.

1 INTRODUCTION

1.1 Study Background

Terrastory Environmental Consulting Inc. (hereinafter “Terrastory”) was retained by 555 Canal Bank Developments GP Inc. (hereinafter “the Applicant”) to prepare this Environmental Impact Statement (EIS) in reference to a Draft Plan of Subdivision and related applications in Dain City (City of Welland). The Study Area consists of three (3) separate contiguous parcels (475/555/635 Canal Bank Street) which collectively amount to 74.7 hectares (184.6 acres) in area. The Study Area is bounded by Canal Bank Street (west), an easement owned by the Applicant (north), railway lands (east), a biodiesel facility (southeast), and St. Clair Drive (south). The lands formerly contained manufacturing facilities owned and operated by John Deere for nearly 100 years, which were demolished in spring/summer 2019. The location of the Study Area within its broader landscape setting is shown in **Figure 1**.

The Study Area is zoned General Industrial (G1) on Schedule A of Zoning By-law 2017-117 and designated General Industrial on Schedule B (Land Use Plan) of the City’s Official Plan (OP). Two Environmental Conservation overlays situated within the northern and southeastern portion of the Study Area reflect the presence of Significant Woodlands that form part of a Core Natural Heritage System (NHS) reflected on Schedule C1 of the City’s OP and Schedule C of the Regional OP. A Potential Natural Heritage Corridor overlay designation captures the eastern portion of the Study Area, extending southward through Dain City and northward to Highway 58A. Several surface water drainage features are identified on Niagara Peninsula Conservation Authority (NPCA) screening maps, one of which is also illustrated on Schedule C1 of the City’s OP. An evaluated (non-significant) wetland (Seaway Wetland Complex) occurs on Adjacent Lands to the southeast.

Several applications are proposed to facilitate redesignation of the lands from employment to residential and mixed uses and expand the community of Dain City northward. This includes a City Official Plan Amendment (OPA), Regional OPA, Zoning By-law Amendment (ZBA), and Draft Plan of Subdivision applications. The residential component of the Draft Plan will consist of singles, semis, and townhomes. A mixed-use block, stormwater management pond, school, and park space are also proposed along with a realignment of Canal Bank Street.

A Terms of Reference (TOR) which provides scope to the conduct and content of this study was originally prepared by Terrastory for comment and approval by Regional environmental planning staff on 25 March 2019. A response memo was received on 15 April 2019 clarifying Regional expectations for the study. The TOR and Regional response memo can be reviewed in **Appendix 1**. A preliminary meeting with Regional and NPCA staff to discuss the results of the 2019 natural heritage investigations (revealed herein) in the context of the related applications occurred on 5 February 2020.

For clarity and consistency, the following terminology is employed throughout this EIS to describe certain noteworthy areas and features which are shown spatially on **Figure 2**.

- **Study Area** – 475/555/635 Canal Bank Street collectively, also referred to as “Dain West”.
- **Adjacent Lands** – areas within 120 meters of the Study Area.
- **Developed Area** – footprint of the manufacturing facilities demolished in spring/summer 2019 and adjacent parking lots and infrastructure.

- **Northern Slough Forest** – complex of mature deciduous woodland and deciduous swamp communities along the northern boundary of the Study Area where the pre-settlement landform character and vegetation composition has largely persisted.
- **Southern Slough Forest** – complex of mature woodland and deciduous swamp communities occupying the southeastern portion of the Study Area where the pre-settlement landform character and vegetation composition has largely persisted.
- **Eastern Disturbed Area** – complex of disturbed vegetation communities and stands of Common Reed (*Phragmites australis* ssp. *australis*) which have emerged relatively recently and (in part) on fill materials.
- **Stormwater Pond** – small pond east of the Developed Area, which is understood to be subject to an existing Environmental Compliance Approval (ECA).
- **Southern Pond** – small pond in the southwest corner of the Study Area not known to be subject to an existing ECA.
- **Designated Watercourse** – constructed drainage feature identified (in part) as a watercourse pursuant to the City’s OP (Schedule C1) (not shown on **Figure 2**, see **Figure 4**).

1.2 Study Purpose

The purpose of this EIS is to present a biophysical characterization of the Study Area and Adjacent Lands as a means to identify the potential for adverse effects on the natural environment and natural heritage features stemming from the proposed redesignation of the former John Deere lands to residential and mixed uses. The scope and approach of this study is informed by the TOR (see **Appendix 1**), Regional EIS Guidelines, and applicable policy requirements. It is understood that this report will form part of the subdivision application package to be submitted for consideration by the City, Region, and NPCA.

1.3 Other Technical Plans and Reports Reviewed

The following technical reports/plans which also form part of the application submission were reviewed, with their findings incorporated into this EIS as appropriate:

- Draft Plan of Subdivision (Armstrong, 9 July 2020);
- Hydrogeological Investigation (EXP Services Inc., 28 August 2020);
- Geotechnical Investigation Report (EXP Services Inc., 28 August 2020);
- Pre- and Post-Development Site Specific Water Balance Assessment (EXP Services Inc., 10 July 2020);
- Preliminary Functional Servicing Report and associated plans (Upper Canada Consultants, August 2020); and
- Preliminary Stormwater Management Plan (Upper Canada Consultants, August 2020).

2 APPROACH AND METHODS

This study is composed of five discrete components which are bulleted below and further described in the following sections.

- **Acquire background biophysical information and mapping** available for the Study Area and local landscape (see **Section 2.1**).

- **Conduct site assessments and ecological surveys** to field-verify the accuracy of the acquired background biophysical information and collect additional biophysical information as necessary (see **Section 2.2**).
- **Assess the significance** of the biophysical information collected and natural features identified within the context of applicable natural heritage and environmental policies (see **Section 2.3**).
- **Predict the effects** of the application on the identified significant natural features and natural environment, particularly the net effects once mitigation measures and technical recommendations are implemented (see **Section 2.4**).
- **Determine whether the proposed application addresses applicable natural heritage and environmental policies** at municipal, provincial, and federal levels (see **Section 2.4**).

All items associated with the preparation of this EIS – including background information gathering, site assessments and surveys, graphics, and reporting – were undertaken by Terrastory’s Senior Ecologist/President (T. Knight).

2.1 Background Biophysical Information Assessment

This study is supported by background biophysical information and mapping acquired and reviewed from a variety of sources, which are listed below in **Table 1**.

Table 1. Background Biophysical Information Acquired and Reviewed.

Type of Information Acquired	Description
Ortho-rectified Aerial Photographs	<ul style="list-style-type: none"> • 1934, 1948, 1954, 1965, 1968, 2000, 2002-2003, 2006, 2009, 2013, 2015-2018.
Natural Feature Mapping	<ul style="list-style-type: none"> • City of Welland Official Plan (Revised 20 June 2017) Schedules C, C1, and C2. • Regional Municipality of Niagara Official Plan (2014 consolidation) Schedule C. • Land Information Ontario (LIO) accessed via MNRF’s “Make a Map” web-based platform (accessed 10 July 2020). • Niagara Peninsula Conservation Authority (NPCA) regulation mapping (accessed 10 July 2020).
Physiographic Resource Mapping and Datasets	<ul style="list-style-type: none"> • Topographic Survey of the Study Area. • Ontario Base Maps (1:10,000). • Well Records (publicly-available). • The Soils of the Regional Municipality of Niagara (Kingston and Presant 1989). • Agricultural Information Atlas (accessed 25 March 2019). • Paleozoic Geology of Southern Ontario (Armstrong and Dodge 2007). • Surficial Geology of Southern Ontario (Ontario Geological Survey 2010). • Physiography of Southern Ontario (Chapman and Putnam 1984).
Ecological Resource Mapping and Datasets	<ul style="list-style-type: none"> • Natural Heritage Information Centre (NHIC) database accessed via MNRF’s “Make a Map” web-based platform (squares: 17PH4158, 17PH4258, 17PH4157, 17PH4257, 17PH4156, 17PH4256, 17PH4356; accessed 19 December 2019). • iNaturalist “(NHIC) Rare species of Ontario” project (accessed 19 December 2019). • Ministry of Environment, Conservation, and Parks (MECP) Information Request (received from M. Karam on 4 April 2019, see Appendix 2).

Type of Information Acquired	Description
	<ul style="list-style-type: none"> • Ministry of Natural Resources and Forestry (MNRF) Information Request (received from D. Denyes on 15 April 2019, see Appendix 2). • Ontario Breeding Bird Atlas (OBBA) database and the Atlas of the Breeding Birds of Ontario, 2001–2005 (Cadman et al. 2007) (square: 17PH45). • Ontario Reptile and Amphibian Atlas database (square: 17PH45; accessed 25 March 2019). • Ontario Butterfly Atlas database (square: 17PH45; accessed 25 March 2019). • Aquatic Species at Risk Maps by Fisheries and Oceans Canada (accessed 19 December 2019). • Atlas of the Mammals of Ontario (Dobbyn 2005).
Natural Heritage Objectives and Strategies	<ul style="list-style-type: none"> • NPCA Natural Areas Inventory Volumes 1 and 2, particularly Study Site WE-07 (Canal Lands). • Great Lakes Conservation Blueprint for Terrestrial Biodiversity, Volume 2 (Henson and Brodribb 2005). • Great Lakes Conservation Blueprint for Aquatic Biodiversity, Volume 2 (Phair et al. 2005).
Other Ecological Information Reviewed	<ul style="list-style-type: none"> • Environmental Impact Study prepared for the “Dain East” subdivision (L. Campbell & Associates 2007).

2.2 Site Assessments and Surveys

The acquired background information per **Table 1** helped direct several site assessments and surveys carried out by Terrastory staff (T. Knight) from spring to early fall 2019. **Table 2** below indicates the primary assessments/surveys performed during each site visit, weather conditions, and time on-site.

Table 2. Site Assessments and Surveys performed within the Study Area.

Date of Site Assessment	Assessments/Surveys Performed	Staff	Weather Conditions	Time On-site
7 April 2019	Site reconnaissance, snake survey (emergence) #1, turtle visual encounter survey #1, anuran calling survey #1, incidental observations.	T. Knight	Air Temperature 12-17°C; Beaufort Wind 2-3; Cloud Cover 40-70% (mostly thin); No Precipitation.	12:30-21:45
18 April 2019	Vernal pool characterization and egg mass survey, drainage channel morphology assessment, snake survey (emergence) #2, turtle visual encounter survey #2, incidental observations.	T. Knight	Air Temperature 16-21°C; Water Temperature 11-13°C; Beaufort Wind 2-3; Cloud Cover 40-100%; Precipitation for approximately 5 minutes (<1 mm) at 13:00.	9:15-16:00
30 April 2019	Vernal pool characterization and egg mass survey, drainage channel morphology assessment, snake survey (emergence) #3, turtle visual	T. Knight	Air Temperature 8-12°C; Water Temperature 4-10°C; Beaufort Wind 1; Cloud Cover 50-100%; No Precipitation.	10:15-15:45

Date of Site Assessment	Assessments/Surveys Performed	Staff	Weather Conditions	Time On-site
	encounter survey #3, incidental observations.			
9 May 2019	Anuran calling survey #2, incidental observations.	T. Knight	Air Temperature 16-17°C; Beaufort Wind 0-2; Cloud Cover 90-100%; Damp with brief periods of light precipitation.	21:00-22:30
16 May 2019	Snake survey #4, turtle visual encounter survey #4, spring vascular plant survey, incidental observations.	T. Knight	Air Temperature 14-17°C; Beaufort Wind 1-2; Cloud Cover 50-100% but generally sunny and clouds light, brief period of light precipitation at 15:20.	10:20-16:50
3 June 2019	Breeding bird survey #1, snake survey #5, turtle visual encounter survey #5, vascular plant survey, deploy bat acoustic monitors, incidental observations.	T. Knight	Air Temperature 7-16°C; Beaufort Wind 2-3; Cloud Cover 0-80%; No Precipitation.	5:45-14:15
12 June 2019	Relocate bat acoustic monitors, vascular plant survey, ELC, anuran calling survey #3, incidental observations.	T. Knight	Air Temperature 18-24°C; Beaufort Wind 0-3; Cloud Cover 0-20%; No Precipitation.	14:00-22:50
21 June 2019	Breeding bird survey #2, retrieve bat acoustic monitors, incidental observations.	T. Knight	Air Temperature 16-22°C; Beaufort Wind 0-1; Cloud Cover 0-90%; No Precipitation.	5:50-11:15
15 July 2019	ELC, summer vascular plant survey, incidental observations.	T. Knight	Fair, warm.	8:45-14:30
18 July 2019	ELC, summer vascular plant survey, incidental observations.	T. Knight	Fair, warm.	8:45-16:00
24 July 2019	ELC, summer vascular plant survey, incidental observations.	T. Knight	Fair, warm.	8:30-16:15
25 July 2019	ELC, summer vascular plant survey, incidental observations.	T. Knight	Fair, warm.	9:00-16:00
31 July 2019	ELC, summer vascular plant survey, incidental observations.	T. Knight	Fair, warm.	10:15-16:00
17 September 2019	Fall vascular plant survey, incidental observations.	T. Knight	Fair, warm.	11:30-16:00
30 September 2019	Staking with NPCA and Regional staff.	T. Knight	Fair, warm.	9:30-12:00; 1:00-3:00

The site assessments and surveys centred on characterizing the land use (e.g., historical development patterns, existing built structures, land maintenance, etc.), physiographic (e.g., topography, drainage, surface water features, etc.), and ecological (e.g., vegetation, wildlife, habitats, etc.) conditions and features of the Study Area and (to the extent possible/necessary) Adjacent Lands. All land-use,

physiographic, and ecological information described for Adjacent Lands was collected from either current aerial photographs or from inside the Study Area and/or publicly-accessible areas (e.g., rights-of-way, etc.). The locations and boundaries of significant natural features and/or habitats were recorded on-site with a high-accuracy GPS (Mesa II) supported by representative photographs.

In addition to collecting general biophysical information, the following targeted assessments (i.e., feature- or species-specific surveys) were undertaken:

- **Vegetation Mapping according to Ecological Land Classification (ELC):** Vegetation communities within the Study Area were characterized and mapped according to Ecological Land Classification (Lee et al. 1998) and the 2008 update to the Vegetation Type List (Lee 2008). Vegetation communities were initially identified based on current aerial photographs and then verified and refined on-site. The ecological units most useful for site-specific evaluations are ecosites and vegetation types (also known as eco-elements). Vegetation types are the finest level of resolution in the ELC system and are recurring patterns found in the plant species assemblages that are associated with a particular ecosite (Lee et al. 1998). ELC mapping was scaled to the finest level of resolution deemed appropriate (i.e., either Ecosite or Vegetation Type).
- **Wetland Boundaries:** Where wetlands were identified via ELC, their boundaries were delineated consistent with the “50% wetland vegetation rule” and presence of hydric soils per the procedures of the Ontario Wetland Evaluation System (OWES) (OMNRF 2014).
- **Ontario Stream Assessment Protocol (OSAP):** Fish and aquatic habitat conditions within all on-site drainage features were assessed in accordance with the Ontario Stream Assessment Protocol (OSAP) (Stanfield 2010). A modified-version of the OSAP Section 4, Module 1 (Rapid Assessment Methodology for Channel Structure) was employed to collect the aquatic data. OSAP provides a standard assessment technique for characterizing watercourses and their attendant fish and aquatic habitat conditions at specific locations (stations). Information to collect includes bankfull and wetted widths, channel structure, evidence of erosion, instream cover, substrate type, stability, and aquatic and riparian vegetation, and other relevant characteristics.
- **Vascular Plant Survey:** Vascular plants were recorded based on a comprehensive area search (“wandering transects”) within naturally-occurring (i.e., non-planted) or naturalizing areas of vegetation. Particular effort was paid to areas with the greatest potential to support significant vascular plants (i.e., designated Species at Risk, provincially rare, etc.) and areas with the greatest potential for impact based on the proposed development plan. Nomenclature and common names for the recorded vascular plant species are generally consistent with the Southern Ontario Vascular Plant Species List (Bradley 2013) except where a name change has more recently been adopted by NHIC.
- **Anuran Calling Surveys according to the Marsh Monitoring Protocol:** Three rounds of Anuran calling surveys were conducted in accordance with the Marsh Monitoring Protocol (Bird Studies Canada et al. 2008). Surveys occurred within the appropriate season (April to June), time of day (between 30 minutes after sunset and 12:00am), and weather conditions (minimal to no rain, wind speed ≤ 3 on the Beaufort Wind Scale).
- **Breeding Bird Surveys according to the Ontario Breeding Bird Atlas Protocol:** Two rounds of breeding bird surveys were conducted in accordance with the Ontario Breeding Bird Atlas (OBBA) protocol (Bird Studies Canada et al. 2001). Surveys occurred within the appropriate season (May 24–July 10), time of day (between dawn and approximately 5 hours after dawn), and weather conditions (no rain, wind speed ≤ 3 on the Beaufort Wind Scale). While the OBBA protocol recommends that stations

be situated at least 300 m apart (to avoid double counting), the stations established herein were often situated closer together to ensure more comprehensive survey coverage. Surveys occurred for a minimum duration of 10 minutes at each station.

- **Turtles Visual Encounter Surveys according to the MNRF Blanding’s Turtle Protocol:** Five visual encounter surveys were undertaken in accordance with the Occurrence Protocol for Blanding’s Turtle (*Emydoidea blandingii*) in Ontario (MNR 2013b). The surveys were spread out over a minimum three week period between ice-out (April) and June 15 under appropriate weather conditions (e.g., air temperatures $\geq 5^{\circ}\text{C}$ when sunny or $\geq 15^{\circ}\text{C}$ when overcast, no rain). Where possible, surveys were timed to target warm days following cool or inclement weather (conditions which promote turtle basking). Vegetation communities and surface water features with a potential to function as turtle habitat (particularly for overwintering, basking, and feeding) were surveyed.
- **Snake Visual Encounter and Active Hand Surveys according to the MNRF Guelph District Milksnake Protocol:** Five visual encounter and active hand searches for Milksnakes (and other snake species) occurred in accordance with the *Milksnake Survey Protocol – MNR Guelph District* (MNR 2013a). Surveys occurred within the appropriate season (April 1-October 15), time of day (between dawn and 5 hours after dawn), and weather conditions (air temperature between 8°C and 25°C when sunny, $>15^{\circ}\text{C}$ when overcast, no rain, wind speed ≤ 3 on the Beaufort Wind Scale). Three surveys were scheduled early in the season (i.e., April) with the intent of detecting recent snake emergence from hibernacula. Where present, cover objects (e.g., rocks, debris, etc.) were overturned to detect individuals beneath.
- **Bat Roosting Habitat Assessment and Acoustic Monitoring according to the MNRF Guelph District Protocol:** Surveys focused on identifying maternity roost sites (e.g., snags, cavity trees, etc.) for Endangered bats consistent with protocols outlined in the *Survey protocol for Species at Risk Bats within treed habitats: Little Brown Myotis, Northern Myotis and Tri-colored Bat* (MNRF 2017). A general snag/cavity tree reconnaissance survey was conducted in early April to confirm potential roosting sites for bats. Ultrasonic acoustic monitors were deployed in areas with the greatest potential to support roosting bats in general proximity to proposed areas of development and site alteration. Acoustic monitoring was completed between sunset and sunrise each day using a SM4BAT full spectrum digital recorder (Wildlife Acoustics) and ultrasonic microphone (SMM-U1 and SMM-U2).

2.3 Significance Assessment

2.3.1 Definitions and Criteria

“Significant natural features” as described herein represent natural features and habitats that have recognized status (and therefore policy significance) within the planning jurisdiction in which an application is proposed. Herein, “significant natural features” are defined to include those referenced in section 2.1 of the 2020 Provincial Policy Statement (PPS), namely:

- Significant Wetlands;
- Significant Woodlands;
- Significant Valleylands;
- Significant Wildlife Habitat (SWH);
- Significant Areas of Natural and Scientific Interest (ANSIs);
- Habitat of Endangered and Threatened Species; and
- Fish Habitat.

Defining “significant natural features” pursuant to the PPS is considered warranted as such features form part of the City’s Core NHS and are shown on Schedule C of the City and Regional OPs. It is noted that the Regional OP provides provisions that consider and/or protect additional natural features beyond the requirements of the PPS. These features are also considered “significant” herein and include:

- Other Evaluated Wetlands; and
- Regionally Significant Woodlands.

Criteria used to determine the presence or absence of the above significant natural features within the Study Area were considered from a variety of sources including the Natural Heritage Reference Manual (MNR 2010a) and (for Significant Wildlife Habitat) the Ecoregion 7E Criteria Schedule (MNRF 2015).

Apart from PPS- and OP-derived significant natural features, this study also seeks to determine whether any natural features or hazards regulated by NPCA pursuant to O. Reg. 155/06 occur within the Study Area and/or Adjacent Lands. NPCA regulated features and hazard lands include:

- Wetlands (significant, evaluated, or identified);
- Watercourses and their associated meanderbelts and floodplains;
- Valleylands;
- Steep slopes; and
- Shorelines.

Like significant natural features, “significant species” represent individuals of wild species which have recognized status (and therefore policy significance) within the planning jurisdiction in which an application is proposed. Significant species are defined herein to include:

- Species designated Endangered, Threatened, or Special Concern under O. Reg. 230/08 pursuant to the provincial *Endangered Species Act, 2007*.
- Species designated Provincially Rare (i.e., S1, S2, or S3) by NHIC.
- Species designated locally rare per the List of Vascular Plant’s of Ontario’s Carolinian Zone (Oldham 2017).

2.3.2 Determination

After collecting the background biophysical information and conducting the site assessment the data was interpreted to determine whether any significant natural features (as defined above), natural features/hazards regulated by NPCA, and/or significant species occur within the Study Area and/or Adjacent Lands. If a natural feature or species met the significance criteria, it is considered “confirmed”. If a natural feature or species may be present on the Study Area and/or Adjacent Lands given biophysical or habitat conditions but was not confirmed based on either background or site-specific biophysical data, it is considered “potential” or “candidate”. Potential/candidate significant natural features and species are treated as confirmed where no additional information is available.

2.4 Effects Assessment and Mitigation

The potential ecological effects of an application can be understood spatially as zones that radiate outward from the direct project footprint (e.g., building envelopes, etc.) and associated areas of site alteration (e.g., grading, etc.). While the greatest potential for effects typically occurs within areas directly subject to development or disturbance, surrounding areas may also be affected indirectly. Such indirect effects can include light or noise pollution that affects wildlife communities on Adjacent Lands, or degradation of water quality within a downstream receptor resulting from sediment runoff during construction.

The following five-pronged approach is employed herein to assess the effects of an application on significant natural features and species and (where warranted) the natural environment in general:

1. **Scope** the effects assessment to environmental components that warrant consideration. The effects assessment herein centres principally on significant natural features and species (i.e., those that have policy significance within the planning jurisdiction, as defined in **Section 2.3.1**) but may also consider general environmental effects where warranted.
2. **Identify the predicted direct and indirect effects** of the application on each significant natural feature or species during all project stages (i.e., pre- to -post-development) in the absence of mitigation. Direct effects are those where there is a cause-effect relationship between a proposed activity and an effect on a natural feature or species (e.g., tree clearance within a building footprint, etc.). Indirect effects result when an activity is linked to a direct effect through a chain of foreseeable interactions or steps.
3. **Evaluate the significance** of the predicted effects for each environmental component based on their attributes (i.e., spatial extent, magnitude, timing, frequency, and duration) and likelihood (i.e., high, medium, low).
4. Where the potential for negative effects are anticipated, **recommend ecologically-meaningful mitigation measures** to avoid such impacts first (where possible), and where impacts cannot be avoided to minimize, compensate, and/or enhance as appropriate.
5. **Identify the predicted residual or net effects** of the application assuming implementation of all recommended mitigation measures.

Per step 4, mitigation measures are offered where the potential for negative effects are anticipated to a degree that cannot be supported given the prevailing policy context. Whenever possible, Terrastory works iteratively with the project team as a means to identify development plan options that avoid negative effects first; options that would minimize or mitigate such negative effects are less preferred and considered secondarily. In general, avoidance measures that have already been incorporated into the application or project design are not duplicated as technical recommendations herein. The effects assessment and any recommended mitigation measures are provided in **Section 5**.

2.5 Natural Heritage Policy Context

There is an overlapping municipal, provincial, and federal policy framework respecting the identification and protection of natural heritage features and areas in southern Ontario. These requirements include objectives, policies, and directives which are principally contained in federal and provincial statutes, regulations, policy statements, Official Plans, and guidance documents. The overarching natural heritage policy framework directing development activities within the Study

Area is outlined below in **Table 3**. A determination of whether the application considered herein addresses such policies is provided in **Section 6**.

Table 3. Applicable Natural Heritage Policies.

Level of Government	Natural Heritage or Environmental Policy Requirements
Municipal	<p>City of Welland Official Plan (Revised 20 June 2017).</p> <p>Regional Municipality of Niagara Official Plan (2014 consolidation).</p>
Provincial	<p>Provincial Policy Statement 2020, pursuant to the <i>Planning Act</i>, R.S.O. 1990, c. P.13, including:</p> <ul style="list-style-type: none"> • Natural Heritage Reference Manual for Natural Heritage Policies of the Provincial Policy Statement, 2005 (MNR 2010a). • Significant Wildlife Habitat Technical Guide (MNR 2010b). • Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E (MNRF 2015). • Significant Wildlife Habitat Mitigation Support Tool (MNRF 2014). <p>Growth Plan for the Greater Golden Horseshoe 2019, pursuant to the <i>Places to Grow Act</i>, S.O. 2005, c. 13.</p> <p><i>Conservation Authorities Act</i>, R.S.O. 1990, c. C.27, including:</p> <ul style="list-style-type: none"> • Ontario Regulation 155/06 – Niagara Peninsula Conservation Authority Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation. • NPCA Policy Document: Policies for the Administration of Ontario Regulation 155/06 and the Planning Act. Policies for the Administration of the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation. (September 2018). <p><i>Endangered Species Act</i> (ESA), S.O. 2007, c. 6, including:</p> <ul style="list-style-type: none"> • Ontario Regulation 230/08 – Species at Risk in Ontario List. • Ontario Regulation 242/08 – General. <p><i>Fish and Wildlife Conservation Act</i>, S.O. 1997, c. 41.</p>
Federal	<p><i>Fisheries Act</i>, R.S.C. 1985, c. F-14, including:</p> <ul style="list-style-type: none"> • Fish and Fish Habitat Protection Policy Statement (DFO 2019). <p><i>Migratory Birds Convention Act</i>, S.C. 1994, c. 22, including:</p> <ul style="list-style-type: none"> • Migratory Birds Regulations, C.R.C., c. 1035.

3 EXISTING BIOPHYSICAL CONDITIONS

The following is a description of the biophysical features and conditions of the Study Area. Certain targeted surveys were undertaken at discrete stations (e.g., channel morphology per OSAP, calling Anurans, bats, breeding birds, and turtles), the locations of which are shown on **Figure 3**. Other targeted surveys were undertaken based on area searches using “wandering transects” within suitable areas/habitats (e.g., snakes, vascular plants). Natural features and conditions associated with the physiographic setting of the Study Area (e.g., surface water features, topographic elements, etc.) are shown on **Figure 4**, while natural features and conditions associated with the ecological setting of the Study Area (e.g., vegetation communities, certain wildlife, etc.) are shown on **Figure 5**. Representative photographs of the Study Area are provided in **Appendix 3**.

3.1 Land-use and Landscape Setting

Lands that comprise the Study Area were originally purchased in 1908 by Joseph Dain of the Dain Manufacturing Company (Welland Public Library, n.d.). A manufacturing plant opened in 1910 and produced various agricultural implements while a new community (Dain City) was constructed for plant employees south of St. Clair Drive. The Dain Manufacturing Company was acquired by Deere and Company (to become John Deere) which operated the facilities until closure in 2008. Since then the Study Area has been vacant and allowed to naturalize. The manufacturing facilities were demolished by the Applicant in spring/summer 2019.

The landscape surrounding the Study Area consists of a variety of land-uses. The old Welland Canal (now Welland Recreational Waterway) is situated less than 50 m west of the Study Area. South of the Study Area is the community of Dain City which primarily consists of detached single-family dwellings. A biodiesel plant (Verbio Diesel Canada) and railway land borders the southeast and eastern portions of the Study Area, respectively. Natural areas in the wider local landscape include open fields and thickets, slough forest/swamps, and active agricultural lands.

3.2 Physiographic Setting

3.2.1 Bedrock Geology

The bedrock underlying the Study Area is characterized as Silurian-aged (i.e., 419 to 444 million-year-old) dolostones, shales, and evaporites (i.e., gypsum) of the Salina Formation. In Ontario the Salina Formation can be traced from Southampton on the shores of Lake Huron to the Niagara River north of Fort Erie (Armstrong and Dodge 2007). The Salina Formation rarely outcrops at the surface (due to the high erodibility of shale and solubility of evaporite minerals) and is mostly hidden beneath surficial deposits. Based on publicly-available well records the depth to bedrock in the local landscape is approximately 35 m.

3.2.2 Surficial Geology and Soils

Surficial deposits within the Study Area are predominantly of glaciolacustrine origin and consist of clays and silts laid down in a deepwater environment associated with Lake Warren (precursor to Lake Erie). Such deposits form part of a broad region known as the Haldimand Clay Plain (Chapman and Putnam 1984). Soils assessed during ELC vegetation mapping confirm the preponderance of silty clay and clay soil types throughout the Study Area. Portions of the Eastern Disturbed Area appear to contain fill materials to a maximum depth of several metres in places (see **Figure 4**).

3.2.3 Topography, Drainage, and Surface Water Features

The Study Area exhibits generally flat topography and is situated between approximately 178 and 181 metres above sea level (masl). The minimal gradient, clay-rich soils, and shallow surface depressions (i.e., sloughs) promote seasonal ponding and wetland conditions in certain areas. Such physiographic conditions are often referred to as “Slough Forests”, where a mosaic of vernal pools or shallow depressions (“sloughs”) are surrounded by slightly elevated bottomlands dominated by a mixture of hydrophytic and upland vegetation. Slough Forests reflect the pre-settlement vegetation and topographic conditions in much of the local landscape and southern Niagara Region generally.

Notwithstanding the overall flat topography, an effort to drain the Slough Forests appears to have occurred historically as evidenced by numerous constructed drainage features conveying surface water off-site (**Figure 4**). The drainage features are considered constructed as they exhibit a nearly straight alignment and are absent from historical aerial photographs (1934, 1954). The most extensive drainage efforts appear to have occurred between 2000 and 2002 (based on historical aerial photographs); however, certain constructed drainage features (particularly those in the Eastern Disturbed Area) appear to predate such efforts. Visual observations in April 2019 confirm that several drainage features are actively reducing standing water levels in both Slough Forests and therefore have a measurable effect on their hydroperiod. Once the maximum standing water level recedes below the thalweg (i.e., lowest point) of the constructed drainage features, which was observed to occur in late spring or early summer in 2019 (depending on location), drainage is no longer conveyed away from the Slough Forests or wetlands therein.

A total of 23 OSAP stations were established to assess channel morphological and aquatic attributes of the constructed drainage features. The results of these surveys are provided in **Appendix 4**. Overall, the constructed drainage features exhibit minimal gradient and many lack perceptible flow, drying completely by mid-summer or so (depending on location). Stations situated along the Designated Watercourse revealed larger channel dimensions than the remainder of the constructed drainage features. Most are clay- and detritus-bottomed and contained around 8-10 cm of standing or minimally flowing water (maximum) in April 2019.

Fish were observed in the Designated Watercourse (just upstream of the railway culvert) and in the Stormwater Pond. Additional information pertaining to the expected fish community of the Study Area is provided in **Section 4.7**.

3.3 Ecological Setting

3.3.1 Vegetation Communities

Vegetation communities within the Study Area are mapped on **Figure 5** and characterized in detail (e.g., dominant layers and flora, soils, topographic position, etc.) in **Appendix 5**. Several “vernal pools” are shown on **Figure 5** which indicate areas of seasonal water ponding which lack sufficient vegetation density (and/or are too small) to be appropriately considered “wetlands”. Vernal pools and other areas of water ponding within the wetlands mapped on **Figure 5** are not delineated; however, note that the area of ponding is generally extensive in the Slough Forest wetlands (e.g., SWDM2). The following is a general summary of the prevailing vegetation communities within the Study Area.

The Northern and Southern Slough Forests are likely relicts of the pre-settlement landscape. While the Northern Slough Forest appears to have been partially cleared of treed vegetation (per the 1934 aerial photograph), its overall topography and vegetation characteristics suggest it was not fully cleared nor used to grow row crops. The Southern Slough Forest appears more extensively treed in the 1934 aerial photograph though its eastern section (e.g., FODM7-2-c) appears to lack trees and be actively maintained for agricultural purposes at that time. A curved ridge through the Southern Slough Forest (see **Figure 4**) is interpreted (per the 1934 aerial photograph) to be an abandoned railway spur. Both Slough Forests are generally oak-dominated with an overstory of Pin Oak (*Quercus palustris*) intermixed with Bur Oak (*Quercus macrocarpa*) and to a lesser extent Swamp White Oak (*Quercus bicolor*) and Green Ash (*Fraxinus pennsylvanica*). The many sloughs contain standing water for several months in the spring and early summer but eventually dry out, permitting growth of a diverse

hydrophytic grass and sedge flora. Slight rises in elevation above the sloughs are occupied by moist upland vegetation including Shagbark Hickory (*Carya ovata*), Red Oak (*Quercus rubra*), and Musclewood (*Carpinus caroliniana*). The oak-dominated wetland portions of the Slough Forests represent a provincially rare vegetation community (see **Section 4.3**). Fairy Shrimp (*Branchinecta lynchi*) (a vernal pool indicator) were identified in the Southern Slough Forest and may occur in the Northern Slough Forest.

The southeast portion of the Northern Slough Forest is Green Ash dominated and undergoing heavy canopy loss primarily due to dieback and mortality associated with larval feeding by Emerald Ash Borer (*Agrilus planipennis*), which may in turn be affecting the local hydroperiod through decreased rates of evapotranspiration. Mortality of Green Ash canopy trees approaches 100% in portions of this community, though some individuals continue to persist as basal sprouts and the canopy is succeeding in places to Pin Oak. Overall, the southeast portion of the Northern Slough Forest is the most open (generally 25-50% canopy coverage) and wettest (i.e., depth and duration of standing water) section of the Slough Forests. As described in **Section 3.2.3**, the Slough Forests are being actively drained by several constructed drainage features depicted on **Figure 4**.

A former hedgerow extends southward through the central portion of the Study Area from the Northern Slough Forest. This hedgerow is visible in both the 1934 and 1954 aerial photographs, appearing to extend about 30-40 m in width by 2003. Since then this area has further naturalized and expanded to become woodland. The treed communities here are dominated by mature oak and Shagbark Hickory (FODM9-6) where the hedgerow has persisted, transitioning into second-growth Eastern Cottonwood (*Populus deltoides*) and Green Ash dominated (FODM7-2-b) sections. The eastern portion of the FODM7-2-b community contains greater coverage by non-native and invasive vascular plants where it abuts the Eastern Disturbed Area.

The Eastern Disturbed Area contains a complex of young and (often) invasive dominated vegetation communities intermixed with stands of *Phragmites*. This area includes Grey Dogwood thickets (THDM2-4, THDM5-1), cottonwood- and ash-dominated open woodlands (WODM5-a, WODM5-b), pear- and hawthorn-dominated woodlands (WODM5-c), Grey Willow (*Salix atrocinerea*) thicket swamps (SWTM5-7), and *Phragmites*-dominated meadows (MEMM4-b). Green Ash dominated woodlands in this area have suffered heavy canopy loss and are expected to succeed (in part or in whole) to thicket communities. Portions of this area were historically filled.

3.3.2 Vascular Plants

A total of 289 vascular plant species were recorded during the 2019 field activities. A list of all vascular plant species recorded is provided in **Appendix 6**.

No species at risk vascular plants were documented. One provincially Endangered non-vascular plant species was documented in a second-growth woodland east of the Southern Slough Forest (WODM5-c): Spoon-leaved Moss (*Bryoandersonia illecebra*). All documented locations of this species within the Study Area along with its habitat requirements are described in **Section 4.2**.

Two provincially rare vascular plant species were documented in various locations: Yellow-fruited Sedge (*Carex annectens*; S2) and Tapered Rush (*Juncus acuminatus*; S3). Photographs of both species were reviewed and confirmed by M. Oldham (Provincial Botanist, NHIC) to ensure data accuracy. All documented locations of these species within the Study Area along with their habitat requirements are described in **Section 4.4**.

A total of 21 vascular plants considered locally rare in Niagara Region (Oldham 2017) were documented in various locations. This includes:

- Slender-leaved False Foxglove (*Agalinus tenuifolia*);
- Yellow-fruited Sedge (*Carex annectens*);
- Necklace Sedge (*Carex projecta*);
- American Hazelnut (*Corylus americana*);
- Pringle's Hawthorn (*Crataegus coccinea* var. *pringlei*);
- Western Barnyard Grass (*Echinochloa muricata* var. *microstachya*);
- Rough Fleabane (*Erigeron strigosus*);
- Nodding Spurge (*Euphorbia nutans*);
- False Mermaidweed (*Floerkea proserpinacoides*);
- Blunt-leaved Bedstraw (*Galium obtusum*);
- Thin-leaved Sunflower (*Helianthus decapetalus*);
- Sharp-fruited Rush (*Juncus acuminatus*);
- Alpine Rush (*Juncus alpinoarticulatus*);
- Knotted Rush (*Juncus nodosus*);
- False Waterpepper (*Persicaria hydropiperoides*);
- Leafy Pondweed (*Potamogeton foliosus*);
- Swamp Red Currant (*Ribes triste*);
- Swamp Dock (*Rumex verticillatus*);
- Smooth Ontario Aster (*Symphyotrichum ontarionis* var. *glabratum*);
- Canada Germander (*Teucrium canadense*); and
- Le Conte's Violet (*Viola affinis*).

3.3.3 Wildlife

A list of all wildlife species documented by Terrastory within the Study Area during either targeted surveys or incidentally in 2019 is provided in **Appendix 7**. A total of seven (7) amphibian species, 74 bird species (including migrants), 12 mammal species, and two (2) reptile species were recorded, along with 11 incidentally recorded odonates (dragonflies/damselflies) and seven (7) incidentally recorded butterflies. The results of Terrastory's targeted wildlife surveys are provided below.

3.3.3.1 Bats

Ultrasonic acoustic monitoring to characterize the assemblage of bat species that may be occupying the Study Area was undertaken at four (4) stations between 2 June and 21 June 2019. BA-1 and BA-2 surveyed portions of the Southern Slough Forest from 2 June (pm) to 13 June (am) 2019 while BA-3 and BA-4 surveyed portions of the Northern Slough Forest and adjacent deciduous forest (FODM9-6) from 13 June (pm) to 21 June (am) 2019. The monitoring stations were situated in areas containing potential maternity roosting sites and suitable foraging habitat to increase the likelihood of bat detections. The acoustic monitoring results are provided below in **Table 4**. A small number of recordings were poor quality and/or exhibit amplitudes and frequencies which overlap among more than one species.

Acoustic detections of bats via recorded ultrasonic calls (including echolocation or “search” calls, social calls, and feeding “buzzes”) can be used to ascertain species presence and relative abundance

of bats at a specific locality. Notwithstanding this, the number of detections (or “passes”) generally does not necessarily equate with the total number of individuals present at a particular station since the same individual may trigger the device several times while flying/foraging in the local area. Further, it is often not possible to infer whether a recorded bat was interacting with the immediate habitat (i.e., foraging, roosting nearby, etc.) or simply making a short- or long-distance foray through the local landscape.

The greatest number of bat recordings were generated at station BA-1 (1,459). Big Brown Bat (*Eptesicus fuscus*) and “Big Brown Bat or Silver-haired Bat” generated the greatest number species-specific recordings (1,259, or 86.3% of the recordings at BA-1). There is overlap in the amplitude and peak frequencies of Big Brown Bat and Silver-haired Bat calls such that many recordings cannot be reliably attributed to one species or the other. Only recordings with an amplitude ≥ 65 kHz can be attributed to Big Brown Bat, while mostly flat recordings with a peak frequency between 26-30 kHz are diagnostic for Silver-haired Bat (*Lasiomycteris noctivagans*) (Humboldt State University Bat Lab 2011; Thorne 2017). Many of the Big Brown Bat recordings at this station were high quality (i.e., clear high frequency element, ≥ 65 kHz high amplitude, presence of harmonics) which likely indicates such individuals were calling in close proximity to the device microphone. Big Brown Bat and/or Silver-haired Bat were also the most abundant bat(s) recorded at nearby BA-2; these two species may therefore be relatively abundant in the Southern Slough Forest though this cannot be known with certainty based on passive monitoring alone. Eastern Red Bat (*Lasiurus borealis*) and Hoary Bat (*Lasiurus cinereus*) were also recorded at BA-1 and BA-2.

Fewer bat recordings were generated at BA-3 and BA-4. Upon arrival to retrieve BA-3 on 21 June 2019, the microphone pole had been bent over (due to either human tampering, deer movements, or some other factor) which left the microphone in contact with the ground surface. The low number of recordings at BA-3 may reflect this. Eastern Red Bat was recorded most often at BA-4, with lesser numbers of Big Brown Bat, Silver-haired Bat, and Hoary Bat.

A *Myotis* species triggered the acoustic monitor at BA-1 (2 times), BA-2 (42 times), and BA-4 (16 times). Given considerable overlap in the call amplitudes and frequencies of *Myotis* species, it is often not possible to attribute such calls to a particular species; however, the recorded signatures and prevailing habitat suggest that the calls were likely made by either Little Brown Myotis (*Myotis lucifugus*) or Northern Myotis (*Myotis septentrionalis*). All documented locations of *Myotis* species within the Study Area along with their habitat requirements are described in **Section 4.6.3**.

Table 4. Bats documented via Ultrasonic Acoustic Monitoring within the Study Area.

Survey Station	Date and Time	Species Detection (No. of Passes)
BA-1	June 2 (pm) – 13 (am) 2019	Big Brown Bat (781) Silver-haired Bat (24) Big Brown Bat or Silver-haired Bat (478) Eastern Red Bat (156) Hoary Bat (7) Myotis species (2) Recording could not be confidently identified to species or genus (11) TOTAL PASSES (1,459)
BA-2	June 2 (pm) – 13 (am) 2019	Big Brown Bat (62) Silver-haired Bat (19) Big Brown Bat / Silver-haired Bat (196)

Survey Station	Date and Time	Species Detection (No. of Passes)
		Eastern Red Bat (100) Hoary Bat (113) Myotis species (42) Recording could not be confidently identified to species or genus (43) TOTAL PASSES (575)
BA-3	June 13 (pm) – 21 (am) 2019	Silver-haired Bat (5) Big Brown Bat / Silver-haired Bat (4) Hoary Bat (4) TOTAL PASSES (13)
BA-4	June 13 (pm) – 21 (am) 2019	Big Brown Bat (11) Silver-haired Bat (12) Big Brown Bat / Silver-haired Bat (11) Eastern Red Bat (129) Hoary Bat (35) Myotis species (16) Recording could not be confidently identified to species or genus (17) TOTAL PASSES (231)

3.3.3.2 Breeding Anurans

Anuran calling surveys were undertaken at 13 stations on 7 April, 9 May, and 12 June 2019. The locations of each survey station are shown on **Figure 5** while the full survey results are provided in **Appendix 8**. A total of seven (7) Anuran species were documented during the calling surveys. A general description of the Anuran communities present within the Study Area is provided below.

Stations AN-1, AN-2, AN-3, AN-12, and AN-13 surveyed the Northern Slough Forest while Stations AN-7, AN-9, and AN-10 surveyed the Southern Slough Forest. Western Chorus Frog (*Pseudacris triseriata*) was found to be breeding abundantly in vernal pools throughout the Slough Forests and egg masses were documented in several locations. Western Chorus Frog were heard vocalizing from nearly all of the smaller wetlands and areas of standing water outside the Slough Forests (e.g., AN-4) as well, but generally at a much lower density (with the exception of vernal pools north of AN-8). Some of the wetlands or areas of standing water where Western Chorus Frog vocalized are not expected to support successful breeding under average rainfall conditions given their short hydroperiod.

Other vocalizing Anuran species were documented in the Slough Forests including Northern Leopard Frog (*Lithobates pipiens*), Spring Peeper (*Pseudacris crucifer*), Gray Treefrog (*Hyla versicolor*), and American Toad (*Anaxyrus americanus*) but at considerably lower densities compared to Western Chorus Frog. Many of the Slough Forest vernal pools are not expected to retain standing water at a sufficient depth and duration to support successful egg, tadpole, and froglet development for mid- or late-season breeding Anurans. One exception is the southeast portion of the Northern Slough Forest which in some areas contains semi-permanent standing water and supports large numbers of Northern Leopard Frog based on incidental field observations (despite generally low calling frequency documented during the formal calling surveys). This is also the only area where Green Frog (*Lithobates clamitans*) vocalized within the Slough Forests.

The Stormwater Pond (AN-8) was found to support American Bullfrog (*Lithobates catesbeianus*; one calling individual) while the Southern Pond (AN-11) contains Green Frog and Northern Leopard Frog.

The presence of abundantly vocalizing Western Chorus Frogs (call code 3) and greater than 20 individuals of Northern Leopard Frogs suggests that the southeastern portion of the Northern Slough Forest contains significant Anuran breeding habitat (see **Section 4.4.6**). While American Bullfrog was documented vocalizing in the Stormwater Pond this feature is subject to an existing ECA and is therefore not appropriately considered Significant Wildlife Habitat (SWH).

3.3.3.3 Breeding Birds

Breeding bird surveys were undertaken at 16 stations on 3 June and 21 June 2019. A total of 49 bird species were recorded during the breeding bird surveys (with 25 additional bird species recorded incidentally during the course of other field activities). The assemblage and abundance of birds recorded generally reflects the prevailing structure and composition of on-site vegetation communities and variable habitats of the Study Area (e.g., forest, woodland, treed swamp, thicket, thicket swamp, meadows, disturbed open areas). The locations of each survey station are shown on **Figure 3** while the full survey results indicating each species' breeding status by survey station can be found in **Appendix 9**. The locations of significant bird species recorded are shown on **Figure 5**. A general summary of the breeding bird communities present within the Study Area is provided below.

Survey stations situated within or adjacent to the Slough Forests include BB-2, BB-3, BB-4, BB-8, BB-9, BB-10, BB-13, and BB-15. Bird species frequently recorded within the Slough Forests included American Goldfinch (*Spinus tristis*), American Robin (*Turdus migratorius*), Black-capped Chickadee (*Parus atricapillus*), Blue Jay (*Cyanocitta cristata*), Common Yellowthroat (*Geothlypis trichas*), Eastern Wood-pewee (*Contopus virens*), Gray Catbird (*Dumetella carolinensis*), Indigo Bunting (*Passerina cyanea*), Red-winged Blackbird (*Agelaius phoeniceus*), Song Sparrow (*Melospiza melodia*), and Yellow Warbler (*Setophaga petechia*). Other species considered possible or probable breeders and recorded at more than one station in the Slough Forests include Blue-winged Warbler (*Vermivora cyanoptera*), Red-bellied Woodpecker (*Melanerpes carolinus*), and Great Crested Flycatcher (*Myrarchus crinitus*). Red-tailed Hawk (*Buteo jamaicensis*) and Great Horned Owl (*Bubo virginianus*) both successfully bred (based on the presence of fledged young) in the Northern Slough Forest in 2019 (see **Figure 6**). American Woodcock (*Scolopax minor*) were observed displaying in meadows adjacent to the Slough Forests (based on incidental observations during the Anuran calling surveys) and many individuals were incidentally flushed from the Northern Slough Forest during the course of 2019 fieldwork. Wild Turkey (*Meleagris gallopavo*) routinely roosted in the Southern Slough Forest and successfully nested within the Study Area in 2019 (exact location unknown) based on the presence of young.

Edge habitats adjacent to the Slough Forests were surveyed at stations BB-11, BB-12, and BB-16. Species commonly recorded in these habitats included American Goldfinch, Baltimore Oriole (*Icterus galbula*), Red-winged Blackbird, Song Sparrow, and Willow Flycatcher (*Empidonax traillii*). A Grasshopper Sparrow (*Ammodramus savannarum*) was recorded as a possible breeder at BB-16 and on Adjacent Lands to the north (heard from BB-9). Barn Swallow (*Hirundo rustica*) flyovers were common in these and other open areas.

The Eastern Disturbed Area was surveyed at stations BB-5, BB-6, and BB-7. Common bird species documented here are generally associated with scrubby, early-successional habitats and include Alder Flycatcher (*Empidonax alnorum*), Willow Flycatcher, Brown-headed Cowbird (*Molothrus ater*), American Robin (*Turdus migratorius*), Song Sparrow, Red-winged Blackbird, and Northern Flicker (*Colaptes auratus*).

Four (4) significant bird species were recorded during the targeted breeding bird surveys: Barn Swallow, Chimney Swift, Eastern Wood-pewee, and Grasshopper Sparrow. All documented locations of these species within the Study Area along with their habitat requirements are described in **Section 4.4**.

3.3.3.4 Snakes

Snake visual encounter and active hand surveys were undertaken on 7, 18, and 30 April, 16 May, and 3 June 2019. The surveys were concentrated in areas with the greatest potential to support snakes (i.e., semi-open areas with ample thermoregulating sites, cover objects, and/or small mammal prey). The April surveys were intended to identify individuals that may have recently emerged from potential hibernation sites. Incidental efforts to locate snakes (i.e., carefully flipping cover objects, etc.) were made during most site investigations throughout 2019.

Two (2) snake species were documented: Eastern Garter Snake (*Thamnophis sirtalis* spp. *sirtalis*) and Eastern Milksnake (*Lampropeltis triangulum*). All snake observations were made in open/scrubby habitats outside of (or adjacent to) the Slough Forests, with the exception of one (1) Eastern Garter Snake observation in the Northern Slough Forest on 17 September 2019. All observations of snakes are shown on **Figure 5**; note that at many of the observation locations (i.e., points) multiple individuals were documented on the same date and/or on multiple dates.

No snakes were observed during the 7 April 2019 survey, one Eastern Garter Snake was observed during the 18 April 2019 survey, and three (3) Eastern Garter Snakes (two separate locations) were observed during the 30 April 2019 survey. None of the April snake observations were made in the general vicinity of a discrete feature that would be expected to provide snakes with access below the frost line. Overall, the Study Area contains a wide array of discrete (i.e., rock/fill piles, etc.) and less conspicuous (e.g., small mammal burrows, fence posts, etc.) features that could support snake overwintering. For the purposes of the SWH assessment in **Section 4.3**, the results of the snake visual encounter and active hand surveys did not reveal specific locations of snake overwintering within the Study Area. Notwithstanding this, snake overwintering somewhere within the Study Area is anticipated.

Three (3) individual Milksnakes were documented within the Study Area at two (2) separate locations. The more easterly observation (in THDM5-b) involved a small and recently deceased individual. On 3 June 2019 two Milksnakes were documented beneath a cover board (with one Eastern Garter Snake) just west of the Southern Slough Forest.

3.3.3.5 Turtles

Turtle visual encounter surveys were undertaken on 7, 18, and 30 April, 16 May, and 3 June 2019. The earliest surveys were intended to identify individuals that would have recently emerged from a potential overwintering site (i.e., water bodies that do not freeze to the bottom). Surveys focused predominantly on open-water and open-canopy features including the Stormwater Pond and Southern Pond. Incidental efforts to locate basking turtles within the Stormwater Pond, Southern Pond, and vernal pools were made during most site investigations in 2019.

No turtles were recorded anywhere within the Study Area during targeted surveys or incidentally in 2019.

3.3.3.6 Incidental Wildlife Recorded

Efforts to incidentally document wildlife were made during all site visits. Many mammal species were recorded in this manner (see **Appendix 7**), while several bird species such as Rusty Blackbird (*Euphagus carolinus*), Magnolia Warbler (*Setophaga magnolia*), and Northern Parula (*Setophaga americana*) were recorded on migration through the Study Area in advance of the formal breeding bird survey period. A list of some odonates and butterflies recorded incidentally is also included in **Appendix 7**.

Fish were documented at two locations within the Study Area. Greater details about fish and fish habitat are provided in **Section 4.7**.

4 SIGNIFICANCE ASSESSMENT

Based on the biophysical information collected during background information gathering (per **Table 1**) and the results of Terrastory’s site assessments and surveys (per **Section 2.2**), **Table 5** below provides a determination of whether or not a specific significant natural feature occurs within the Study Area. The shaded rows highlight features which may be present or are confirmed within the Study Area or Adjacent Lands and are considered further as part of the effects assessment in **Section 5**. Significant natural feature mapping is provided on **Figure 6**.

Table 5. Summary of the Assessment of Significant Natural Features within the Study Area.

Significant Natural Feature	Status within the Study Area	Status on Adjacent Lands (i.e., < 120 m from Study Area)
PPS Significant Natural Features		
Significant Wetlands	<i>Absent.</i> See Section 4.1 .	<i>Absent.</i> See Section 4.1 .
Significant Woodlands	<i>Confirmed.</i> See Section 4.2 .	<i>Confirmed.</i> See Section 4.2 .
Significant Valleylands	<i>Absent.</i> See Section 4.3 .	<i>Absent.</i> See Section 4.3 .
Significant Wildlife Habitat	<i>Candidate and Confirmed.</i> See Section 4.4 .	<i>Candidate.</i> See Section 4.4 .
Significant Areas of Natural and Scientific Interest	<i>Absent.</i> See Section 4.5 .	<i>Absent.</i> See Section 4.5 .
Habitat of Endangered and Threatened Species (per ESA)	<i>Potential and Confirmed.</i> See Section 4.6 .	<i>Potential.</i> See Section 4.6 .
Fish Habitat (per <i>Fisheries Act</i>)	<i>Potential.</i> See Section 4.7 .	<i>Potential.</i> Section 4.7 .
Regionally Significant Natural Features (i.e., not considered by the PPS)		
Evaluated Wetlands	<i>Absent.</i> See Section 4.1 .	<i>Confirmed.</i> See Section 4.1 .
Regionally Significant Woodland	<i>Confirmed.</i> See Section 4.2 .	<i>Confirmed.</i> See Section 4.2 .
NPCA Regulated Features and Hazard Lands		
Wetlands, watercourses, valleylands, meanderbelts, floodplains, steep slopes, and shorelines.	<i>Confirmed</i> (wetlands and watercourses). See below.	<i>Confirmed</i> (wetlands and watercourses). See below.

4.1 Wetlands

Per the vegetation community mapping provided in **Section 3.3.1** and shown on **Figure 5** and **Figure 6**, several identified wetlands were documented within the Study Area. None of these

wetlands had heretofore been identified on local or provincial natural feature maps (i.e., NPCA regulated areas, LIO) nor evaluated per OWES; as such, none of the wetlands are currently designated provincially significant (PSW).

Approximately half of the Northern Slough Forest is wetland (oak- and ash-dominated deciduous swamp) while the western half of the Southern Slough Forest is wetland (oak-dominated deciduous swamp). To assist with mapping interpretation, note that the treed swamp communities in the Northern Slough Forest are relatively discrete and can be reliably delineated based on OWES protocols (i.e., presence of 50% relative coverage by hydrophytic plants and redoximorphic soil indicators). Other wetland types including thicket swamp and marsh occur southeast of the Northern Slough Forest. The Southern Slough Forest contains a spatially variable arrangement of wetland and upland areas (typical of Slough Forests across southern Niagara); as such, wetland and upland communities within this broader feature are primarily “lumped” based on dominant vegetation type. Small, discrete areas of standing water occurring outside the mapped wetland communities are identified as “vernal pools” on **Figure 5**.

Smaller wetland communities also occur outside the Slough Forests. Some of these smaller wetlands may be hydrologically isolated (i.e., receive inflows but no outflows of surface water) while others (particularly near the eastern Study Area boundary at the railway line) are maintained by flows within the constructed drainage features. In general, the smaller wetlands are younger (i.e., have emerged recently following cessation of regular maintenance), dominated by invasive species (e.g., *Salix atrocinerea*, *Phragmites*, etc.), and (in some cases) may act as sinks for breeding Western Chorus Frog.

A natural feature staking was undertaken with Regional (A. Boudens) and NPCA (C. Lampman) staff on 30 September 2019 and was also attended by the Applicant (T. Lefas), project Planner (M. Jones, Armstrong), and surveyor (Upper Canada Consultants). At that time, the parties present decided it was appropriate to stake the greatest limit of the natural feature setback (rather than the Significant Woodland and wetlands separately). With respect to the Slough Forests, the greatest natural feature limit is generally represented by the dripline rather than the wetland boundary except where marshes extend beyond the dripline (e.g., southeast portion of the Northern Slough Forest and northeast portion of the Southern Slough Forest). With respect to the smaller wetland communities outside the Slough Forest, NPCA staff accepted the limit of these features as determined by Terrastory during 2019 fieldwork. The approved greatest natural feature limit is shown on **Figure 6**.

4.2 Significant Woodlands

The determination of woodland significance within the Study Area herein relies primarily on guidance from the Regional OP and related policies. The Regional OP defines “woodland” as:

A treed area that provides environmental and economic benefits to both the private landowner and the general public such as erosion prevention, hydrologic and nutrient cycling, provision of clean air and long term storage of carbon, provision of wildlife habitat, outdoor recreational opportunities and the sustainable harvest of woodland products. It does not include a cultivated fruit or nut orchard or a plantation used for the purpose of producing Christmas trees.

The Region considers all vegetation communities with at least 35% canopy cover by trees to be “woodlands”, thereby including all “forest” and “woodland” communities as defined by ELC (Lee

et al. 1998; Lee 2008). To be considered “significant”, Policy 7.B.1.5 of the Regional OP requires that a woodland must meet “one or more” of the following criteria:

- a) *Contain threatened or endangered species or species of concern;*
- b) *In size, be equal to or greater than:*
 - a. *2 hectares;*
 - b. *4 hectares, if located outside Urban Areas and north of the Niagara Escarpment;*
 - c. *10 hectares, if located outside Urban Areas and south of the Niagara Escarpment;*
- c) *Contain interior woodland habitat at least 100 metres in from the woodland boundaries;*
- d) *Contain older growth forest and be 2 hectares or greater in area;*
- e) *Overlap or contain one or more of the other significant natural heritage features listed in Policies 7.B.1.3 or 7.B.1.4; or*
- f) *Abut or be crossed by a watercourse or water body and be 2 or more hectares in area.*

Per Policy 7.B.1.4 of the Regional OP, and the requirements of the City’s OP, Significant Woodlands are to be considered Environmental Conservation Areas.

Based on the above Regional criteria, the entirety of the Slough Forests and contiguously treed communities (forest and woodland) are considered significant. Both the Northern and Southern Slough Forests (and contiguous treed communities) exceed the minimum size requirement (2 hectares), exhibit “older growth forest” characteristics, and overlap with SWH features. The woodland community east of the Southern Slough Forest (WODM5-c) also contains the Endangered Spoon-leaved Moss. It is also appropriate to consider all Regionally Significant Woodlands mapped herein as significant in the context of the PPS given the above-mentioned characteristics and relevant criteria outlined in the NHRM.

The largely second-growth and successional (i.e., mostly dominated by Common Pear and declining Green Ash) woodland communities in the Eastern Disturbed Area are not considered significant as they do not meet the Regional criteria outlined above.

As noted in **Section 4.2**, the dripline of the Significant Woodlands was staked on 30 September 2019 with Regional and NPCA staff. Sections of the Significant Woodland dripline as it extends through the eastern portion of the FODM7-2-b and WODM5-c communities are difficult to traverse and were delineated based on data collected by Terrastory in summer 2019 (in the absence of being formally staked), as approved by NPCA and the Region.

4.3 Significant Valleylands

According to the 2020 PPS, a valleyland consists of a “*natural area that occurs in a valley or other landform depression that has water flowing through or standing for some period of the year*”. No natural landform features that exhibit valleyland morphology are present within the Study Area.

4.4 Significant Wildlife Habitat

An assessment of the likelihood that any candidate or confirmed SWH features or areas occur within the Study Area is provided in **Appendix 10**. Based on the results of this assessment, eight (8) confirmed SWH features (or candidate SWH features where no detailed information is available) are considered further:

- Seasonal Concentration Areas of Animals
 1. Bat Maternity Colonies
 2. Deer Winter Congregation Areas
- Rare Vegetation Communities or Specialized Habitats for Wildlife
 3. Old Growth Forest
 4. Other Rare Vegetation Communities
 5. Amphibian Breeding Habitat (Woodlands)
- Habitat of Species of Conservation Concern
 6. Special Concern and Rare Wildlife Species
 7. Terrestrial Crayfish
- Animal Movement Corridors
 8. Amphibian Movement Corridors

Also based on this assessment, a total of six (6) Special Concern or provincially rare species were confirmed from the Study Area (or are considered to have a possible likelihood of occurrence):

- 1) Eastern Wood-pewee (*Contopus virens*)
- 2) Grasshopper Sparrow (*Ammodramus savannarum*)
- 3) Monarch (*Danaus plexippus*)
- 4) Yellow-banded Bumblebee (*Bombus terricola*)
- 5) Tapered Rush (*Juncus acuminatus*)
- 6) Yellow-fruited Sedge (*Carex annectens*)

A general description of each SWH feature and Special Concern/provincially rare species and their habitat in the Study Area is offered below.

4.4.1 Bat Maternity Colonies

Big Brown Bat and Silver-haired Bat form maternity colonies that roost with pups in various features, particularly the cavities of large-diameter trees and buildings. Snags/cavity trees in earlier stages of decay (i.e., decay classes 1-3) may be preferred.

Based on the results of passive acoustic monitoring undertaken between 3 and 21 June 2019, the Southern Slough Forest may contain a relatively abundant population of Big Brown Bat and/or Silver-haired Bat while the Northern Slough Forest appeared to contain fewer individuals (see **Section 3.3.3.1**). While the time stamps of the Big Brown Bat and Silver-haired Bat recordings do not suggest that a maternity roost was present nearby (given that an overwhelming majority of the recordings occurred hours after sunset or before sunrise), note that the Slough Forests contain an abundance of potential roosting sites for both individuals and maternity colonies (e.g., mature trees with cavities/loose bark, snags) and only a small portion of the Slough Forests were surveyed using acoustic monitoring.

Based on the results of the ultrasonic acoustic monitoring, and in the absence of exit surveys and/or more extensive passive acoustic surveys, the Slough Forests are assumed to contain candidate significant habitat for bat maternity colonies.

4.4.2 Deer Winter Congregation Areas

Unlike other parts of southern and central Ontario, deer movement in winter is not typically constrained by snow depths in Ecoregion 7; however, deer will annually congregate in certain woodlots where suitable browse (e.g., twigs, buds) is readily available. MNRF has identified two (2) deer wintering areas within the Study Area (along with additional wintering areas in the local landscape), which are shown on **Figure 6**. The deer wintering area mapping appears to have been undertaken at a broad scale as it captures certain areas (i.e., built lands, etc.) that are not likely to contain browse or support wintering deer. It is not known when such areas were mapped by MNRF or what methodology was used to support their assessment.

On the basis of MNRF's mapping, in the absence more refined mapping and/or wintering surveys, all areas currently identified by MNRF are considered significant deer wintering habitat.

4.4.3 Old Growth Forest

Forests characterized by (among other attributes) an abundance of large/mature trees, dominance by late-successional species, canopy-gaps produced by mortality of overstory trees, limited disturbance, and abundant downed woody debris have the potential to be considered "old-growth".

Based on a review of historical aerial photographs dating back to 1934 the Southern Slough Forest appears to be at least 90 years old and may be much older. The composition of this forest is late-successional in certain areas and overall, the forest is floristically rich, contains abundant snags and woody debris, and exhibits limited evidence of recent human disturbance. Western portions of the Northern Slough Forest also exhibit old-growth attributes such as mature trees and abundant downed woody debris, but this area appears to have been partially cleared of trees (harvested?) at some point based on the 1934 aerial photograph. Both Slough Forests contain undulating topography (i.e., slough vernal pools separated by slight rises in topography) and are therefore unlikely to have been tilled.

The woodland communities in the Eastern Disturbed Area represent more recent growth and do not exhibit sufficient old-growth attributes. The narrow, linear wooded area (i.e., south of the Northern Slough Forest), while containing some old trees that formed part of a former hedgerow, also lacks sufficient characteristics to be considered old-growth.

Based on the above characteristics, the Slough Forests are considered a significant old-growth forest and may be representative of the pre-settlement forest community that once covered the local landscape and wider Haldimand Clay Plain.

4.4.4 Other Rare Vegetation Communities

Pin Oak and Swamp White Oak dominated deciduous swamps are individually considered provincially rare vegetation communities by NHIC (S2S3) while Bur Oak dominated swamps are also considered provincially rare (S3). SWDM1-a and portions of SWDM1-b are generally dominated by Pin Oak and to a lesser extent Bur Oak with occasional Swamp White Oak in the canopy. Pin Oak and Bur Oak dominated deciduous swamps are also considered globally rare (G2 and G2G3, respectively) per NHIC.

Given the above, the oak dominated deciduous swamps in the Slough Forests (SWDM1-a and portions of SWDM1-b) are considered significant rare vegetation communities.

4.4.5 Terrestrial Crayfish

Historically, terrestrial (or “burrowing”) crayfish in Ontario have been referred to two species: Digger Crayfish (*Creaserinus fodiens*) and Devil Crayfish (*Lacunicambarus diogenes*). These species are considered primary burrowers and spend most of their lives underground. A third species – Calico Crayfish (*Faxonius immunitis*) – is a secondary burrower which may only dig burrows to escape drying waterbodies. A fourth species – Paintedhand Mudbag (*Lacunicambarus polychromatus*) – was recently documented at three (3) sites in the Windsor area (Jones and Glon 2019).

Terrestrial crayfish excavate burrows in areas of moist/wet soil with a high water table such as marshes, wet meadows, and even manicured lawn. The burrows are flooded by groundwater and open to the ground surface by a “chimney” consisting of rounded soil pellets. Burrows produced from clay often exhibit the definitive chimney structure while those excavated from organic substrate (i.e., peat) may appear as a circular collapsed mound.

One (1) terrestrial crayfish chimney was documented along the Designated Watercourse (see **Figure 6**). The specific terrestrial crayfish species that excavated this chimney is unknown as no individuals were observed.

4.4.6 Amphibian Breeding Habitats (Woodland) and Movement Corridors

The full results of the Anuran calling surveys are provided in **Appendix 8**. The results indicate that the southeastern portion of the Northern Slough Forest contains significant breeding habitat for woodland Anurans based on the presence of sufficiently large congregations of Western Chorus Frog and Northern Leopard Frog. Many other wetlands and vernal pools within the Study Area contain abundantly breeding Western Chorus Frog but lack significant congregations of other Anuran species. No mole salamanders or their egg masses were documented during targeted surveys in April 2019; however, no minnow traps or other methods to capture individuals were employed as part of this study. If present, the most likely location for breeding mole salamanders within the Study Area overlaps with the confirmed significant Anuran breeding habitat (i.e., southeast portion of the Northern Slough Forest).

Adult and juvenile Anuran movements are generally unimpeded within the Slough Forests and eastern portion of the Study Area. Greater movements likely follow the many constructed drainage features scattered throughout the Study Area where desiccation can be avoided.

4.4.7 Eastern Wood-pewee

Eastern Wood-pewee is designated Special Concern in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). This species is most commonly associated with relatively open, deciduous and mixed forests of various sizes, as well as forest edges and other areas with relatively continuous (albeit open) canopy cover (e.g., parks, cemeteries, etc.). This species’ preference for open forests and forest edges may be attributed to its aerial foraging behaviour (COSEWIC 2012). Territory sizes were shown to average approximately 1.75 ha (representing a circle with a radius of 75 m) in a study in southern Ontario (as cited in COSEWIC 2012).

Eastern Wood-pewee was documented as a probable breeder at two stations (BB-3 and BB-9) in both Slough Forests and as a possible breeder at two additional stations (BB-2 and BB-8). Five (5)

separate documented vocalizing locations are shown on **Figure 6**; most (if not all) locations shown represent different singing males based on the 2019 surveys.

4.4.8 Grasshopper Sparrow

Grasshopper Sparrow is designated Special Concern in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Special Concern by COSEWIC. This species occupies meadows of various sizes and is not considered area-sensitive. Unlike most other grassland birds that breed in southern Ontario, Grasshopper Sparrow may also occupy meadows with sparse or uneven herbaceous vegetation coverage (COSEWIC 2013), as is the case at BB-16.

Grasshopper Sparrow was recorded as a possible breeder at BB-16 and on Adjacent Lands to the north (heard from BB-9). There is a relatively robust population of Grasshopper Sparrow in the local landscape (i.e., eastward in fields between the Welland Canal, Highway 140, and the railway lands).

4.4.9 Monarch

Monarch is designated Special Concern in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Endangered by COSEWIC. Monarch is well-known to be host-specific and oviposits exclusively on species of milkweed (*Asclepius* spp.). This species is a generalist forager and may nectar in any area with wildflowers.

Monarch adults were observed within the Study Area and one caterpillar was documented within the MEMM4-a community approximately 65 metres east of Canal Bank Road. Successful breeding may also be occurring at other locations within the Study Area.

4.4.10 Yellow-banded Bumble Bee

Yellow-banded Bumble Bee is designated Special Concern in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Special Concern by COSEWIC. This species occupies a range of open areas that contain nectaring sites, and it nests underground in abandoned rodent burrows or decomposing logs, typically in woodlands.

Current records of this species in southern Ontario suggest that it is associated with more densely forested landscapes north of the Carolinian zone. Notwithstanding this, given that the Study Area provides potentially suitable nectaring, nesting, and overwintering habitat, and bumble bee surveys were not undertaken as part of this study, the Study Area is assumed to contain suitable habitat for this species.

4.4.11 Tapered Rush

Tapered Rush is designated S3 by NHIC. Like other rushes, this species generally occupies open, moist fields and marshes.

This species was documented in five different locations within the Study Area (see **Figure 6**), all of which contain seasonal standing water. Distinguishing this species from other similar rushes often requires mature seed which is not produced until later in the growing season. The presence of this species within the Study Area was confirmed by M. Oldham (Provincial Botanist, NHIC) via a review of photographs.

4.4.12 Yellow-fruited Sedge

Yellow-fruited Sedge is designated S2 by NHIC. In Ontario, this species is known to occupy a range of meadows (dry to moist) including disturbed fields dominated by pasture grasses as well as higher quality habitats such as prairie remnants and alvars (M. Oldham, pers. comm., 16 July 2019). This species is known from less than ten locations in Ontario and from one other locality in Niagara (Dufferin Islands Nature Area; M. Oldham, pers. comm., 16 July 2019).

Yellow-fruited Sedge was documented in meadows at two general locations within the Study Area (see **Figure 6**) including the area south of the Northern Slough Forest and the northern portion of the Eastern Disturbed Area. The more westerly population south of the Northern Slough Forest contained several hundred (perhaps thousands) of fruiting culms across a relatively wide area, while the more easterly population is much smaller and contained only a handful of mostly scattered clumps.

4.5 Significant Areas of Natural and Scientific Interest

Based on available natural feature mapping, provincially (or regionally) significant ANSIs are absent from the Study Area.

4.6 Habitat of Endangered and Threatened Species

At project commencement Terrastory corresponded with MECP to gather available background Species at Risk (SAR) information for the Study Area. MECP's response is provided in **Appendix 2**; no background SAR information was provided.

An assessment of the likelihood that any Endangered and Threatened species or their habitats occur within the Study Area is provided in **Appendix 11**. A total of five (5) Endangered or Threatened species were confirmed from the Study Area based on the results of 2019 field activities:

- 1) Barn Swallow (*Hirundo rustica*)
- 2) Chimney Swift (*Chaetura pelagica*)
- 3) Little Brown Myotis (*Myotis lucifugus*)
- 4) Northern Myotis (*Myotis septentrionalis*)
- 5) Spoon-leaved Moss (*Bryoandersonia illecebra*)

A general description of each Endangered/Threatened species and their habitats in the Study Area is offered below.

4.6.1 Barn Swallow

Barn Swallow is designated Threatened in Ontario per O. Reg. 230/08 pursuant to the *Endangered Species Act* (ESA) and is federally designated Threatened by COSEWIC. Prior to European settlement Barn Swallow nested in or on natural features (e.g., caves, cliff faces, etc.); today most nesting is associated with built structures such as barns, bridge/culvert undersides, and awnings/overhangs on the sides of buildings (COSEWIC 2011). Foraging habitat includes a variety of open areas such as agricultural lands, old fields, and open water. Foraging distances from nest sites depend on habitat quality and social characteristics and have been found to extend greater than one kilometre (Brown and Brown 1999), though most forays may average only a few hundred metres from nests (Turner 1981).

Barn Swallow was documented at seven stations (BB-1, BB-5, BB-11, BB-12, BB-14, BB-15, BB-16), all of which were situated in relatively open areas. Notwithstanding this, the Study Area lacks suitable nesting sites for this species (e.g., barns, bridge/culvert undersides, awnings/overhangs inside or on sides of buildings, etc.). MNRF guidance for establishing the spatial extent of Barn Swallow habitat to assist the impact assessment process is as follows:

- **Category 1** (lowest tolerance to alteration): nest.
- **Category 2** (moderate tolerance to alteration): the area within 5 m of the nest
- **Category 3** (highest tolerance to alteration): the area within 5 m and 200 m of the nest.

Given that the Study Area lacks suitable nesting sites, Category 1 and 2 habitats are absent. Nests may be present on Adjacent Lands (e.g., in the vicinity of the Welland Recreational Canal, etc.); however, none are known at this time.

4.6.2 Chimney Swift

Chimney Swift is designated Threatened in Ontario per O. Reg. 230/08 pursuant to the ESA and is federally designated Threatened by COSEWIC. Prior to settlement this species nested and roosted in large hollow trees as well as along cave and rock walls given its requirement for vertical surfaces to grip during roosting and to attach nests. Today, nesting and roosting has mostly shifted from natural to artificial sites, particularly chimneys (COSEWIC 2007). Chimney Swifts are regularly encountered foraging above urban areas (including both large cities and small towns) across southern Ontario where older buildings (such as schools and churches) with traditional chimneys that lack a metal insert still exist.

Chimney Swift was documented at one station (BB-15). Notwithstanding this, the Study Area lacks suitable nesting sites for this species. MNRF guidance for establishing the spatial extent of Chimney Swift habitat to assist the impact assessment process is as follows:

- **Category 1** (lowest tolerance to alteration): Human-made nest/roost, or a natural nest/roost cavity and the area within 90 m of the natural cavity.

As it is unlikely that a Chimney Swift nest/roost was present within the Study Area or Adjacent Lands in 2019, Chimney Swift habitat is assumed to be absent.

4.6.3 Little Brown Myotis and Northern Myotis

All Myotis bat species in Ontario are designated Endangered per O. Reg. 230/08 pursuant to the ESA and are also federally designated Endangered by COSEWIC. Little Brown and Myotis and Northern Myotis form maternity colonies that roost in large-diameter trees with cracks, crevices, and/or exfoliating bark; Little Brown Myotis will also frequently roost in buildings (e.g., attics, barns, etc.). Individuals (i.e., non-reproductive females and males) of both bat species may roost in smaller diameter trees and other spaces (e.g., beneath house siding, etc.) which are not typically occupied by maternity colonies. Overwintering habitat includes caves and mines that maintain temperatures above 0°C. White Nose Syndrome (a fungal disease caused by an introduced pathogen) has devastated populations of both species across their ranges. The fungus causes hibernating individuals to become dehydrated, leading to excessive arousal, depleted fat reserves, and ultimately emaciation and/or death.

A *Myotis* species (likely Little Brown *Myotis* and/or Northern *Myotis*) was documented at acoustic monitoring stations in the Northern and Southern Slough Forests (see **Section 3.3.3.1**). While the time stamps of the *Myotis* recordings do not suggest that a maternity roost was present nearby (given that an overwhelming majority of the recordings occurred hours after sunset or before sunrise), the Slough Forests contain an abundance of potential roosting sites for both individuals and maternity colonies (e.g., mature trees with cavities/loose bark, snags). It is further noted that only a small portion of the Slough Forests were surveyed as part of acoustic monitoring.

4.6.4 Spoon-leaved Moss

Spoon-leaved Moss is designated Endangered per O. Reg. 230/08 pursuant to the ESA and federally designated Threatened by COSEWIC. This species occupies a wide variety of open or partially-open vegetation communities including cultural meadows, thickets, and woodlands, and in southern Ontario has been documented in early-successional features that were previously tilled (T. Knight, pers. obs.). No sporophytes (i.e., fruiting bodies) of this species have been found in Ontario; as a result, reproduction appears to be solely vegetative and many populations may be genetically identical (Doubt 2005).

Two (2) separate clumps of this species were documented within the WODM5-c community east of the Southern Slough Forest (see **Figure 6**).

4.7 Fish Habitat

Fish were documented at two (2) separate locations within the Study Area. While downstream reaches of the Designated Watercourse were not considered fish habitat based on a previous assessment (L. Campbell & Associates 2007), fish were observed in the shallow marsh upstream of where the Designated Watercourse is conveyed via concrete culvert beneath the railway line. This marsh appears to be at least partially sustained by a backwater effect of the undersized culvert. While the fish community at this location has not yet been sampled, all individuals observed were small-bodied (i.e., forage fish) and likely represent a species (or multiple species) tolerant of degraded water quality.

Fish were also documented in the Stormwater Pond. Visual observations from the shoreline indicated what are believed to be Pumpkinseed (*Lepomis gibbosus*) and Brown Bullhead (*Ameiurus nebulosus*). Other game fish species may also be present. Forage fish were also observed exiting the Stormwater Pond and entering the constructed drainage feature to the east on multiple dates. The Stormwater Pond and Designated Watercourse appear to be hydrologically connected, though the constructed drainage feature that connects them is densely vegetated. A Licence to Collect Fish for Scientific Purposes was secured to characterize the fish community via electrofishing and seine netting in March 2020; however, fieldwork was postponed due to the ongoing situation with COVID-19. A new Licence has been secured allowing fish surveys to proceed in late summer/fall 2020. These surveys will form part of the submission of a Request for Review to DFO.

The Designated Watercourse appears to outlet into the Welland Recreational Waterway between 184 and 196 Kingsway. It is not known if fish have seasonal access (i.e., at high water levels) to the Study Area from the Welland Recreational Waterway or if barriers to fish passage are present downstream of the Study Area.

5 EFFECTS ASSESSMENT AND MITIGATION

The purpose of this EIS is to present a biophysical characterization of the Study Area and Adjacent Lands as a means to identify the potential for adverse effects on the natural environment and natural heritage features stemming from the proposed redesignation of the former John Deere lands to residential and mixed uses. Several significant natural features and species were documented (or may occur) within the Study Area pursuant to the assessments in **Section 4**. The following effects assessment provides an evaluation of the potential for the proposed subdivision application to result in negative effects to such environmental components and offers technical recommendations to mitigate such effects where warranted. Certain technical recommendations offered herein apply to several natural features (e.g., wetlands and Significant Woodland in the Slough Forests, etc.) and/or species simultaneously; as such, all technical recommendations should be read and considered in their entirety. The baseline or existing conditions against which the subdivision application is assessed is treated as the state of the Study Area at the time of the site assessment(s) in 2019. The effects assessment herein is based on the proposed Draft Plan of Subdivision (Armstrong, 9 July 2020) provided in **Appendix 12** and technical plans listed in **Section 1.3**.

5.1 Avoidance Measures incorporated into the Proposed Development Plan

Since project commencement in April 2019 Terrastory has provided extensive feedback to and worked iteratively with the project team during formulation of the proposed lotting plan and associated technical reports. These discussions have centred on the need to avoid/minimize impacts to and maintain ecologically/policy appropriate setbacks from the significant natural features identified herein. As a result, the proposed lotting plan and associated technical plans have been subject to multiple revisions which are detailed as follows:

- While earlier drafts of the lotting plan proposed considerable encroachment into the Northern Slough Forest, the entirety of both Slough Forests (plus setbacks) will be retained as Open Space blocks through the Draft Plan.
- Portions of a cultural meadow containing the provincially rare Yellow-fruited Sedge were incorporated into the Open Space Block 73.
- While earlier drafts of the lotting plan lacked maintenance of ecological connectivity within the Study Area, a natural heritage corridor has been incorporated into the Draft Plan along the eastern portion of the lands (Linear Park Block 66).
- The Stormwater Management Block was positioned along the southern boundary of the Study Area, in part to provide supporting functions to the adjacent Southern Slough Forest.

5.2 Proposed Development Plan

The Draft Plan of Subdivision is provided in **Appendix 12** which proposes the following land uses:

- Residential Singles (670 units);
- Residential Townhomes (202 units);
- Mixed Uses (Block 63);
- School (Block 64);
- Stormwater Management Pond (Block 65);
- Parks (Blocks 66-67, 70), including a railway acoustic berm in Block 66;
- Walkways (Blocks 68-69);

- Open Space (Blocks 71-73); and
- Roads and rights-of-way.

It is further understood that a trails plan may be prepared for the lands and additional technical details (e.g., stormwater management pond design, etc.) will be prepared at detailed design.

Open Space Blocks 71-73 (totaling 26.518 ha) are incorporated into the Draft Plan to protect the entirety of both Slough Forests which are the most sensitive and high-quality wetland/woodland complex within the Study Area. The Slough Forests are dominated by oak swamp and mature deciduous forest and contain multiple overlapping natural heritage features/considerations (e.g., wetland, Significant Woodland, confirmed/candidate Significant Wildlife Habitat, candidate Endangered Species habitat). The greatest limit of the Slough Forests was reviewed and/or staked with Regional (A. Boudens) and NPCA (C. Lampman) staff on 30 September 2019. The Open Space blocks incorporate the following setbacks:

- Where forest/woodland or thicket vegetation communities form the greatest limit of the Slough Forests, a 15 m dripline setback is applied.
- Where wetland forms the greatest limit of the Slough Forests, a 30 m setback from the wetland boundary is applied.
- Southwest of the Northern Slough Forest, the Open Space block includes an additional meadow area to facilitate protection of the provincially rare Yellow-fruited Sedge population.

Linear Park Block 66 is to contain a railway acoustic berm and nature trail but will otherwise be in natural cover. This block is intended to maintain functional connectivity between the Southern Slough Forest and natural lands to the north supported by restoration/enhancement measures recommended herein (see **Section 5.4**).

While the proposed development plan serves to retain both Slough Forests and maintain functional connectivity with the broader landscape, additional mitigation and enhancement measures are necessary to address potential impacts to certain significant natural features (as defined in **Section 2.3.1**). This includes:

- Five (5) wetlands outside the Slough Forests are proposed for removal, the largest of which is 0.11 ha.
- Portions of one (1) wetland community east of the Northern Slough Forest is proposed for removal. This wetland is heavily disturbed and dominated by *Phragmites*.
- A naturalized former hedgerow acts as a narrow, southward extension of the Significant Woodland overlapping with the Northern Slough Forest. This portion of the Significant Woodland is proposed for removal.
- Candidate Significant Wildlife Habitat for bat maternity colonies and a confirmed terrestrial crayfish chimney overlap with the narrow, southward extension of the Significant Woodland and are proposed for removal;
- Potential and confirmed habitat of provincial species of concern (Monarch, Yellow-banded Bumble Bee, and Tapered Rush) occur in various locations, some of which are proposed for removal;
- While the Slough Forests have the greatest potential to support Endangered bats and will be protected in full, additional potential roosting habitat is found in the narrow, southward

extension of the Significant Woodland (and other treed portions of the Study Area) which are proposed for removal;

- Certain surface water features which appear to be regulated by NPCA will be altered (piped). Fish were documented in the Designated Watercourse at the railway culvert; this area may be considered fish habitat pursuant to the *Fisheries Act* (subject to DFO confirmation).

Mitigation measures to demonstrate achievement of “no negative impact” to the above significant natural features and/or address appropriate regulatory requirements are outlined in the sections that follow.

5.3 Feature-based Effects Assessment and Technical Recommendations

5.3.1 Wetlands

Where development and/or site alteration activities are proposed within or adjacent to wetlands, adverse effects may occur via the following pathways:

- Direct wetland removal, resulting in loss of wetland area and functions (e.g., wildlife habitat, nutrient processing, runoff attenuation, etc.).
- Alterations to surface water and/or groundwater contributions to the wetland from construction (e.g., dewatering, etc.), grading that modifies the existing topography or drainage, and/or increased coverage of impervious surfaces (e.g., roads, roofs, etc.);
- Increased sediment loadings and/or nutrient enrichment within the wetland via runoff exiting from development areas during and post construction. This may alter wetland water quality and vegetation communities via increased turbidity, eutrophication, contamination by toxic substances, changes in pH, etc.
- Noise and/or light pollution that may adversely affect the ability of wetland wildlife to successfully carry out their life processes (e.g., breeding, feeding, etc.); and
- Increased human activity (i.e., encroachment) within the wetland which may result in soil compaction, dumping, etc.

As noted in **Section 5.2**, all wetlands situated within the Slough Forests are captured within Open Space Blocks 72-73 and will be protected by the proposed development plan. These blocks incorporate a 30 metre wetland setback or 15 metre dripline setback, whichever forms the greatest limit. In certain areas where woodland forms the greatest limit (e.g., western portion of the Southern Slough Forest, etc.), the wetland setback is in fact greater than 30 m, while in areas where wetland approaches the dripline the wetland setback is no less than 15 m.

The configurations of Open Space Blocks 72-73 are considered to be of a sufficient size to protect all wetlands within the Slough Forests. This is supported by the estimated radius of influence for construction dewatering as outlined in the Hydrogeological Investigation (EXP Services Inc., 28 August 2020). The radius of influence from the sides of excavation was calculated to be 7.4 m (underground servicing), 9.1 metres (SWM pond southwest), 4.1 metres (SWM pond northeast), and 8.3 metres (fifty single dwellings). None of the calculated radii of influence encroach within the greatest wetland/dripline limit associated with the Slough Forests.

No changes to the drainage area of wetlands in the Southern Slough Forest are anticipated based on the existing and proposed catchment areas shown in the Preliminary Stormwater Management Plan

(UCC, 2020). For the Northern Slough Forest, wetlands situated therein appear to be slightly topographically upslope of (or level with) the proposed development area to the south, which will drain southward towards the SWM block. The post-development water balance (mitigated) indicates that 100% of the infiltration deficit (under the unmitigated scenario) can be addressed by directing residential lot roof runoff towards landscaped areas. Terrastory supports maintaining the pre-post development water balance for the site.

There is potential for the Slough Forest wetlands and setbacks areas to be impacted post-development through encroachment, dumping, vandalism, etc. To minimize the potential for long-term post-development impacts, the following measures are recommended.

- **Open Space Blocks 72-73 are to be zoned according to the appropriate Environmental Overlay (i.e., Environmental Protection or Environmental Conservation) to reflect their natural heritage values, and are to remain as natural, self-sustaining vegetation.**
- **Permanent chain-link fencing (black vinyl) is to be established where residential lots, mixed-uses (Block 63), and the school (Block 64) abut the boundary of Open Space Blocks 72-73.**

During construction it is anticipated that the proposed development areas will contain exposed soils, which are inherently unstable and have a greater potential for runoff into adjacent areas during rainfall events. The most effective erosion and sediment control system emphasizes the prevention of erosion first, minimizes sediment transport off-site through a multi-barrier approach, and involves regular inspection and maintenance. To protect Slough Forest wetlands within Open Space Blocks 72-73 from construction-related impacts, the following measures are recommended:

- **Comprehensive Sediment and Erosion Control Plans are to be prepared at detailed design. Such plans are to include the following (minimum) components:**
 - **Sediment and erosion control measures (e.g., fencing, biosox, etc.) placed at the limit of disturbance.**
 - **Timing of works (e.g., avoidance of working during adverse weather, avoidance of vegetation removal during the bird breeding and bat activity periods, etc.).**
 - **Measures to reduce the potential for erosion of stockpiles and/or temporarily stored topsoil, fill, or aggregate material (e.g., piled as low as practicable, etc.), and measures to situate these construction features away from Open Space Blocks 72-73 to the extent possible.**
 - **Measures to control and treat internal runoff during construction including temporary interceptor swales and/or sediment control basins (as necessary), which are to be stabilized (i.e., seeded) and maintained regularly.**
 - **Designated machinery servicing areas situated away from Open Space Blocks 72-73.**

- **Fill control measures (i.e., northern portion of the proposed development area to be lifted by nearly 4 metres).**
- **Measures to minimize the spread of invasive species, particularly *Phragmites*.**
- **Dust suppression measures.**
- **Spills reporting protocol.**
- **Catch-basin protection.**
- **Inspection, maintenance, and contingency measures.**
- **Decommissioning protocol (i.e., removal of non-biodegradable erosion and sediment control materials including accumulated sediment once construction is complete and disturbed areas are stabilized).**

It is understood that a trails plan may be proposed at detailed design. Based on the results of this study, a carefully designed and constructed nature trail system through the open space blocks is justifiable from a natural heritage perspective. To protect Slough Forest wetlands within Open Space Blocks 72-73 and other wetlands should a future trail system be devised, the following measures are recommended:

- **A Comprehensive Trails Plan is to be prepared through detailed design (should a trail system be proposed). This plan is to include the following (minimum) specifications:**
 - **Identification of a trail alignment that minimizes wetland impacts to the extent achievable, and avoids sensitive/significant areas (e.g., vernal pools, Endangered Spoon-leaved Moss, etc.).**
 - **Incorporation of permeable materials into the trail base.**
 - **Incorporation of existing trails/disturbed areas (e.g., abandoned railway spur, etc.) into the trail alignment, where appropriate.**
 - **Incorporation of signage to introduce trail users to the natural heritage functions of the area.**

Five (5) small wetland communities situated outside the Slough Forests are proposed for removal. Portions of one (1) additional wetland dominated by *Phragmites* will also be partially removed. These features are shown on **Figure 6** with each respective area reported below in **Table 6**.

Table 6. Wetlands Proposed to be Removed and Replaced.

Wetland Community	Areal Extent (ha)
Meadow Marsh (MAMM1)	0.024
Meadow Marsh (MAMM1-12)	0.039
Thicket Swamp (SWTM5-7) - northwest	0.034
Thicket Swamp (SWTM5-7) - southeast	0.110

Wetland Community	Areal Extent (ha)
Thicket Swamp (SWTM3-a)	0.073
Deciduous Swamp (SWDM4-2)	0.032
TOTAL	0.312

Wetlands to be removed total 0.312 hectares. While it is recognized that all wetlands perform some level of ecological and hydrological function on the landscape, the wetlands proposed for removal exhibit limited functions given the following characteristics:

- Each wetland proposed for removal is situated in a historically farmed area. As a result of farming, none of the wetlands contain a rich/conservative flora (which has persisted in the Slough Forest wetlands).
- None of the wetlands proposed for removal exhibited a hydroperiod in 2019 which would allow for successful Anuran (frog/toad) breeding. Although small numbers of Western Chorus Frog were heard vocalizing from these wetlands during the 2019 survey period, any breeding attempts would have been unsuccessful. These features may be routinely acting as population “sinks” as they are not expected to retain standing water for sufficient periods to allow for froglet emergence under average conditions.
- Most of the wetlands proposed for removal contain a high proportion of non-native or invasive flora, particularly Grey Willow, Glossy Buckthorn, Reed-canary Grass, and *Phragmites*.

In the opinion of Terrastory, based on detailed field data collected in support of this EIS, removal of these five (5) wetland communities (and partial removal of one additional wetland) can be supported by NPCA policies (see **Section 6.5**) provided that all applicable policy tests are met and that feature loss is addressed. A conceptual plan for wetland restoration/enhancement is provided in **Section 5.4**.

5.3.2 Significant Woodlands

Where development and/or site alteration activities are proposed within or adjacent to forests or woodlands, adverse effects may occur via the following pathways:

- Direct vegetation removal (e.g., trees, shrubs, herbaceous vegetation, etc.), resulting in loss of woodland area and functions (e.g., wildlife habitat, carbon sequestration, runoff attenuation, etc.).
- Mechanical injury to the trunk, roots, branches, and/or foliage of retained woody vegetation.
- Soil compaction from the use of heavy machinery.
- Smothering or exposure of roots due to changes in grade.
- Noise and/or light pollution that may adversely affect the ability of woodland wildlife to successfully carry out their life processes (e.g., breeding, feeding, etc.).
- Increased human activity (i.e., encroachment) within or adjacent to the woodland which may result in soil compaction, dumping, etc.

Oak swamp intermixed with late-successional moist deciduous forest likely represents the pre-settlement forest composition in the local area. All such portions of the Significant Woodland (and

overlapping wetland communities), equivalent to areas referred to herein as Slough Forests, will be retained through Open Space Blocks 72-73. In fact, Open Space Block 73 extends over 50 m south of the Northern Slough Forest to capture some additional large oak and hickory trees historically situated in a hedgerow. As described in **Section 5.2**, the minimum setback from the Significant Woodland overlapping with the Slough Forests is 15 metres, which is significantly larger in areas where wetland acts as the greatest development limit (minimum 30 m setback).

The recommendations provided in **Section 5.3.1** to protect the Slough Forest wetlands – in particular, the installation of permanent fencing at the Open Space block limit, preparation of comprehensive Erosion and Sediment Control Plans for construction, and preparation of a comprehensive Trails Plan – will also serve to protect the functions of the Significant Woodland.

As described in **Section 3.3.1**, a former hedgerow extends southward through the central portion of the Study Area from the Northern Slough Forest. This hedgerow is visible in both the 1934 and 1954 aerial photographs, appearing to extend about 30-40 m in width by 2003. Since then this area has further expanded to become woodland and (due to its connection with the Northern Slough Forest to the north) meets Regional Significant Woodland criteria. This narrow extension of the Significant Woodland (which also contains younger Eastern Cottonwood and Green Ash dominated portions) is proposed for removal as part of the proposed development plan. The total amount of Significant Woodland to be removed (i.e., beyond Open Space Block 73) is 2.707 ha.

In the opinion of Terrastory, based on detailed field data collected in support of this EIS, removal of the narrow (and former hedgerow) portion of the Significant Woodland can be supported by the prevailing policy context (see **Sections 6.2** and **6.3**) provided that all applicable policy tests are met and feature loss is addressed. A conceptual plan for woodland restoration and enhancement is provided in **Section 5.4**. Notwithstanding this, Regional OP Policy 7.B.1.19 requires the completion of a Tree Saving Plan (TSP) in support of development or site alteration within a Regionally Significant Woodland. During the 5 February 2020 meeting with Regional and NPCA environmental planning staff, Terrastory recommended that the tree inventory to form part of the TSP focus on the newly created edge habitat along the rear lot line of Block 39, since the remainder of the Significant Woodland proposed for removal has been surveyed through this EIS. The TSP would therefore act as a “Edge Management Plan”. As such, the following measure is recommended.

- **A Tree Saving Plan focused on the newly created woodland edge (i.e., rear lot line of Block 39) will be completed to address proposed development within the Regionally Significant Woodland.**

5.3.3 Significant Wildlife Habitat

Per the assessment in **Section 4.3**, eight (8) confirmed SWH features or candidate SWH features where no detailed information is available are considered further:

- Seasonal Concentration Areas of Animals
 1. Bat Maternity Colonies
 2. Deer Winter Congregation Areas
- Rare Vegetation Communities or Specialized Habitats for Wildlife
 3. Old Growth Forest
 4. Other Rare Vegetation Communities

5. Amphibian Breeding Habitat (Woodlands)
- Habitat of Species of Conservation Concern
 6. Special Concern and Rare Wildlife Species
 7. Terrestrial Crayfish
- Animal Movement Corridors
 8. Amphibian Movement Corridors

Also based on this assessment, a total of six (6) Special Concern or provincially rare species were confirmed from the Study Area or are considered to have a possible likelihood of occurrence:

- 1) Eastern Wood-pewee (*Contopus virens*)
- 2) Grasshopper Sparrow (*Ammodramus savannarum*)
- 3) Monarch (*Danaus plexippus*)
- 4) Yellow-banded Bumblebee (*Bombus terricola*)
- 5) Tapered Rush (*Juncus acuminatus*)
- 6) Yellow-fruited Sedge (*Carex annectens*)

Open Space Blocks 72-73 have been configured through the Draft Plan of Subdivision to protect the Slough Forests (and wetlands, Significant Woodlands, and Significant Wildlife Habitat therein). The following SWH features/areas will be sufficiently protected by Open Space Blocks 72-73 and no further mitigation measures are considered warranted:

- Old Growth Forest
- Other Rare Vegetation Communities (Provincially Rare Oak Swamp communities)
- Amphibian Breeding Habitats (Woodlands)

An effects assessment for each candidate/confirmed SWH feature that occurs partially or wholly outside of Open Space Blocks 72-73 is provided below.

5.3.3.1 *Bat Maternity Colonies*

Most large-diameter snags or cavity trees which may support Big Brown Bat and Silver-haired Bat maternity colonies are situated within Open Space Blocks 72-73. Notwithstanding this, certain large trees situated in the former hedgerow portion of the Significant Woodland (proposed to be removed) may also support roosting by maternity colonies. Although the results of bat acoustic monitoring did not confirm the presence of any bat maternity colonies within the vicinity of the bat acoustic monitoring stations, only (1) station (BA-3) was situated within the former hedgerow portion of the Significant Woodland. To protect any roosting Big Brown Bat and Silver-haired Bat during site preparation (i.e., tree removal) and post-development, the following measures are recommended:

- **Any necessary tree removal within the proposed development envelopes will only take place between October 1 and April 30 to avoid the active season for bats. Should minor tree removal be required between May 1 and September 31, a qualified Ecologist will complete an exit survey of suitable maternal roosting sites identified for removal a maximum of 24 hours before removal. The exit survey must make use of a bat detector and will occur for no less than the time period between sunset and 60 minutes after sunset.**

- **If construction activities occur during the active bat season (i.e., between May 1 and September 31), work will be restricted to daylight hours only and the use of artificial lighting will be avoided.**
- **Any lighting incorporated into the final building designs should be directed downward (i.e., towards the ground) and/or away from Open Space Blocks 72-73 to the extent practicable.**

5.3.3.2 Deer Winter Congregation Areas

MNRF has identified two (2) deer wintering areas within the Study Area as shown on **Figure 6**. On the basis of MNRF mapping, and in the absence more refined mapping determined through wintering surveys, such areas are treated as significant deer wintering habitat herein. The entirety of the mapped Deer Wintering Areas overlap with Open Space Blocks 72-73 and will be protected from development.

Block 66 (Linear Park) along the eastern portion of the lands has been established to provide a connective corridor for White-tailed Deer that seek to access the Southern Slough Forest from natural lands to the north. To allow for deer movement through Block 66, the following measures are recommended:

- **With the exception of a public trail and railway acoustic berm, Block 66 is to remain in natural, self-sustaining vegetation.**
- **The width and height of the railway acoustic berm will be minimized to the extent possible, allowing for no less than 30 m of natural, self-sustaining vegetation in Block 66.**

5.3.3.3 Terrestrial Crayfish

As described in **Section 4.4.5**, one terrestrial crayfish chimney was documented in the Designated Watercourse. While setback options to protect the identified terrestrial crayfish habitat were discussed with the project team, complete avoidance of this habitat (which must include specifying an ecologically appropriate buffer) does not appear warranted as only a single chimney was documented. A viable alternative option involves relocating the terrestrial crayfish to suitable open wetland habitat in Open Space Block 73.

Terrestrial crayfish spend a majority of their life belowground and can be difficult to capture. Physical excavation of burrows using bare or gloved hands (supported by a small shovel) has been employed successfully in the past to capture individuals. While this method is invasive (i.e., destroys the burrow) it has shown to be more effective than trapping methods (Ridge et al. 2008) and in any event the burrow would be destroyed during site preparation.

To minimize the potential for impacts to terrestrial crayfish, the following measures are recommended:

- **The identified terrestrial crayfish chimney location and adjacent suitable habitats within the Designated Watercourse will be surveyed for the presence of crayfish chimneys prior to fill placement or other disturbances. Should any chimneys be identified at that time, efforts to capture terrestrial crayfish individuals will occur and may involve**

physical excavation of burrows or use of an alternative methodology determined by a qualified Ecologist. Individuals will be relocated to suitable wetland habitat within Open Space Block 73.

- **A Relocation and Monitoring Plan will be developed to determine a suitable relocation site and assess the success of the relocation efforts (should any individuals be captured and relocated). Monitoring will include a two-year period post-relocation.**

5.3.3.4 Amphibian Breeding Habitats (Woodland) and Movement Corridors

The results of the Anuran calling surveys indicate that the southeastern portion of the Northern Slough Forest contains significant breeding habitat for woodland Anurans based on the presence of large congregations of Western Chorus Frog and Northern Leopard Frog. This feature will be protected via Open Space Block 73. Other wetlands within the Slough Forests contain abundantly breeding Western Chorus Frog but lack significant congregations of other Anuran species; such features do not appear to retain sufficient standing water to support significant congregations of mid- or late-season breeding Anurans.

Internal movement corridors within Open Space Blocks 72-73 will facilitate various Anuran movements (e.g., juvenile dispersal, seasonal movement between overwintering and breeding habitats, etc.). Notwithstanding this, it is recognized that certain Anuran movements are anticipated to occur between the Slough Forests through the linear, southward extension of the Significant Woodland along the Designated Watercourse (proposed for removal). To continue facilitating Anuran movement between the Southern Slough Forest and areas to the north, and address the need for on-site wetland replacement (see **Section 5.3.1**), the following measure is recommended:

- **Anuran breeding habitat (slough wetlands) will be created in the Linear Park Block 66 which will also act as an Anuran movement corridor.**

5.3.3.5 Eastern Wood-pewee

All locations where Eastern Wood-pewee was documented within the Study Area as a “possible” or “probable” breeder are contained within Open Space Blocks 72-73. Apart from a general prohibition on tree removal during the breeding season (see **Section 5.3.6**), additional mitigation measures to protect this species are not considered warranted.

5.3.3.6 Grasshopper Sparrow

Grasshopper Sparrow was recorded as a possible breeder at BB-16 and on Adjacent Lands to the north (heard from BB-9). As there is a relatively robust population of Grasshopper Sparrow in the local landscape (i.e., eastward in fields between the Welland Canal, Highway 140, and the railway lands), and the individual recorded at BB-16 was only documented on one (1) occasion, additional mitigation measures to protect this species as part of the proposed development plan are not considered warranted. A prohibition on vegetation removal during the breeding season will protect individuals that theoretically may breed prior to site preparation in the vicinity of BB-16 (see **Section 5.3.6**).

5.3.3.7 Monarch and Yellow-banded Bumble Bee

Monarch adults and larvae were documented within the Study Area. While Yellow-banded Bumble Bee was not documented (incidentally), suitable foraging and nesting habitat exists. No specific

recommendations are offered herein to minimize impacts to potential foraging and breeding habitat for Monarch or Yellow-banded Bumblebee. Both species are habitat generalists and abundant nectaring habitat exists within the wider landscape surrounding the Study Area. Oviposition sites for Monarch (e.g., Milkweed) and general feeding habitat for both Monarch and Yellow-banded Bumblebee will also be maintained in open portions of the Open Space Blocks and Stormwater Management Pond.

5.3.3.8 *Tapered Rush*

Tapered Rush occupies open, moist fields and marshes and was documented in five (5) different locations within the Study Area (see **Figure 6**). Three (3) of these locations overlap with proposed development areas. To achieve no negative impacts to this species and its habitat, the following measures are recommended:

- **All locations of Tapered Rush proposed for development will be surveyed for the presence of individuals of this species during the growing season and prior to fill placement or other disturbances. All individuals will be relocated to suitable open wetland habitat within Open Space Block 73.**
- **A Relocation and Monitoring Plan will be developed to determine a suitable relocation site and assess the success of the relocation efforts. Monitoring will include a two-year period post-relocation.**

5.3.3.9 *Yellow-fruited Sedge*

Yellow-fruited Sedge was documented in meadows at two (2) general locations within the Study Area (see **Figure 6**) including the area south of the Northern Slough Forest and the northern portion of the Eastern Disturbed Area. The more westerly population south of the Northern Slough Forest contained several hundred (perhaps thousands) of fruiting culms across a relatively wide area, while the more easterly population is much smaller and contained only a handful of mostly scattered clumps.

Open Space Block 73 was configured to protect a portion of the Yellow-fruited Sedge community southwest of the Northern Slough Forest. Since the population was documented in July 2019, the meadow area south of the Northern Slough Forest underwent maintenance (i.e., mowing) in late summer 2019. It is unclear how the existing meadow vegetation has responded to mowing, and whether or not the abundance of Yellow-fruited Sedge in this area has changed. Like grasses, sedges grow from a basal meristem (i.e., from the base) allowing them to withstand mowing, cutting, grazing, and burning; however, mowing events may cause stress, alter competition dynamics, and/or facilitate species turnover.

5.3.4 *Habitat of Endangered and Threatened Species*

Per the assessment in **Appendix 10** a total of five (5) Endangered or Threatened species were confirmed from the Study Area based the results of 2019 field activities:

- 1) Barn Swallow (*Hirundo rustica*)
- 2) Chimney Swift (*Chaetura pelagica*)
- 3) Little Brown Myotis (*Myotis lucifugus*)
- 4) Northern Myotis (*Myotis septentrionalis*)

5) Spoon-leaved Moss (*Bryoandersonia illecebra*)

Per the assessments in **Sections 4.6.1** and **4.6.2**, no Barn Swallow or Chimney Swift breeding sites were documented within the Study Area. Following redesignation to residential and mixed uses, the Study Area will continue to provide foraging opportunities for both species nesting in the local landscape. Potential impacts to Endangered bats and Spoon-leaved Moss are considered further below.

5.3.4.1 Little Brown Myotis and Northern Myotis

Consistent with the assessment of potential roosting habitat for Big Brown Bat and Silver-haired Bat in **Section 5.3.3.1**, most large-diameter snags or cavity trees are situated within Open Space Blocks 72-73. Notwithstanding this, certain large trees situated in the former hedgerow portion of the Significant Woodland (proposed for removal) may also support roosting by maternity colonies. Although the results of bat acoustic monitoring did not suggest the presence of any bat maternity colonies within the vicinity of the bat acoustic monitoring stations, only (1) station (BA-3) was situated within the former hedgerow portion of the Significant Woodland. The recommendations provided to protect potentially significant maternity roost habitat for Big Brown Bat and Silver-haired Bat will also serve to protect Little Brown Myotis and Northern Brown Myotis.

5.3.4.2 Spoon-leaved Moss

Two (2) separate clumps of Spoon-leaved Moss were documented within the woodland community (WODM5-c) east of the Southern Slough Forest. While no development is proposed within this area, a trails plan may be developed at detailed design. To protect this small Spoon-leaved Moss colony the following recommendation is provided:

- **Any future trails plan must maintain an ecologically appropriate setback from the identified Spoon-leaved Moss.**

5.3.5 Fish Habitat

Where development and/or site alteration activities are proposed adjacent to watercourses with fish habitat, adverse effects may occur via the following pathways (amongst others):

- Alterations to surface water and/or groundwater contributions to the watercourse from construction (e.g., dewatering, etc.), grading that modifies the existing topography or drainage, and/or increased coverage of impervious surfaces (e.g., roads, roofs, etc.);
- Increased sediment loadings and/or nutrient enrichment within the watercourse via runoff exiting from development areas during and post construction. This may alter water quality and/or degrade habitat quality via increased turbidity, eutrophication, contamination by toxic substances, changes in pH, etc.
- Introduction of invasive species including aquatic organisms and aquatic plants.
- Increased human activity (i.e., encroachment) in the vicinity of the watercourse which may result in bank compaction, exploitation of fish, dumping, etc.

As described in **Section 4.7**, fish were documented at two (2) separate locations within the Study Area. While downstream portions of the Designated Watercourse were not considered fish habitat based on a previous assessment (L. Campbell & Associates 2007), fish were observed in the shallow marsh upstream of where the Designated Watercourse is conveyed via concrete culvert beneath the

railway. This marsh appears to be at least partially sustained by a backwater effect of the undersized culvert.

Game fish were also documented in the Stormwater Pond, while small-bodied forage fish were observed exiting the Stormwater Pond and entering the constructed drainage feature to the east on multiple dates. The Stormwater Pond and Designated Watercourse appear to be hydrologically connected, though the constructed drainage feature that connects them is densely vegetated and contains water infrequently.

To demonstrate the proposed development plan is consistent with relevant requirements of the *Fisheries Act*, the following measures are recommended.

- **A fisheries survey will occur in summer/fall 2020 to characterize fish species present in the Designated Watercourse.**
- **The project works are to be submitted to DFO as part of a Request for Project Review.**

5.3.6 Other Natural Environment Considerations

Some vegetation removal (i.e., woody and herbaceous) is required to facilitate development. To avoid potential adverse effects on breeding birds during construction, the following measure is recommended:

- **All necessary vegetation removal (e.g., trees, meadow vegetation, etc.) will be completed outside the primary bird nesting period (i.e., to be completed between September 1 and March 31). Should minor vegetation removal be required during the bird nesting period, a bird nesting survey will occur prior to any vegetation removal.**

Noise and lighting from proposed land-uses adjacent to Open Space Blocks 72-73 have the potential to affect wildlife activities in the Slough Forests. To minimize post-development impacts to edge wildlife in the Slough Forests, the following measure is recommended:

- **Lighting will be directed away from Open Space Blocks 72-73 through detailed design, to the extent achievable.**

The Stormwater Pond subject to an existing ECA will be filled in to support the proposed development plan. To minimize wildlife impacts during this process, the following measure is recommended:

- **A fish/wildlife collection authorization will be secured from MNRF to facilitate elimination of the Stormwater Pond.**

The Southern Pond in the southwest corner of the Study Area is situated in the proposed Stormwater Management Block (Block 65). The Southern Pond appears to have been constructed to control stormwater from the John Deere manufacturing facilities but was observed to be in a naturalized state during 2019 field activities and contains dense emergent and aquatic vegetation. As such, the following measures are recommended:

- **Opportunities to incorporate the Southern Pond into the proposed stormwater pond will be explored through detailed design.**
- **The Stormwater Management Block will be planted with a diversity of native trees and shrubs to support the functions of the adjacent Southern Slough Forest.**

A limited amount of disturbance is expected in Open Space Block 73 in association with construction of the ditch inlet structure between Blocks 33 and 39. Per Section 5.3 of the SWM report, the ditch inlet structure is necessary to control flows within the Designated Watercourse conveyed from the Northern Slough Forest since the lower reaches of this feature are proposed to be filled in as part of the development plan. To rehabilitate this area following construction of the ditch inlet structure, the following measure is recommended:

- **Portions of Open Space Block 73 to be disturbed as part of constructing the ditch inlet structure will be rehabilitated through native plantings/seeding, as necessary.**

5.4 Conceptual Restoration and Enhancement Plan

Oak swamp intermixed with late-successional moist deciduous forest likely represents the pre-settlement forest composition in the local landscape. Based on a review of historical aerial photographs (e.g., 1934, 1954) supported by field observations in 2019, much of the original undulating topography (e.g., slough/pool depressions surrounded by slight rises in topography occupied by moist upland vegetation) has been lost from natural areas outside the Slough Forests. Other portions of the Study Area contain dense stands of invasive species (e.g., *Phragmites*) or are experiencing delayed ecological succession due to poor soil conditions (i.e., gravelly/compacted soil along the western boundary of the Southern Slough Forest).

A conceptual Restoration and Enhancement Plan for lands within and/or adjacent to Open Space Blocks 72 and 73 and Linear Park Block 66 is outlined below to address the proposed significant natural feature removal (i.e., 0.312 hectares of wetland and 2.707 hectares of Significant Woodland) and achieve “no negative impacts”. Areas subject to proposed restoration/enhancement are shown generally in **Figure 7**, including on other lands owned by the Applicant north of the Northern Slough Forest. Note that the areas shown on **Figure 7** may be subject to refinement based on more detailed restoration/enhancements plans to be prepared at detailed design.

To address significant natural feature impacts, the following measures are recommended:

- **A Wetland and Woodland Restoration and Enhancement Plan will be prepared at detailed design and may include following components:**
 - **Eliminating stands of *Phragmites* along the northern boundary of the Northern Slough Forest and in a meadow marsh/swamp east of the Northern Slough Forest. Following *Phragmites* removal, such areas can then be replanted and reseeded with native species tolerant of site conditions.**
 - **Installing native trees and shrubs north of the Northern Slough Forest (on other lands owned by the Applicant).**

- Improving the gravelly, compacted substrate which is restricting woody plant establishment on the west side of the Southern Slough Forest with a more suitable planting medium. Such areas can then be replanted and reseeded with native species.
- Transitioning the wooded/thicket portions of Linear Park Block 66 to native forest by removing/girdling non-native canopy trees (Common Pear) and interplanting with native trees and shrubs. Downed woody debris from any cleared woody vegetation should be retained on the forest floor. A forest management plan may be required to appropriately steer successional processes.
- Contouring areas of the Linear Park Block to restore the original slough topography (i.e., vernal pools). Grades within the sloughs should be designed to allow sufficient water depths to support early- or mid-season Anuran breeding; however, the sloughs should dry out in late summer. Pin Oak, Bur Oak, and/or Swamp White Oak can be interplanted along the slough margins. The sloughs should be seeded with a native (Carolinian) hydrophytic grass and sedge mixture.
- Deepening existing sloughs within the Northern Slough Forest (where access by small machinery is feasible) to improve the productivity of Anuran breeding habitats.
- Ecological monitoring over a minimum 2-year period will be required to demonstrate that the restored/enhanced features are performing as designed.

6 APPLICABLE NATURAL HERITAGE AND ENVIRONMENTAL POLICIES

The following sections summarize the various municipal, provincial, and federal environmental policies that may apply to the proposed development plan and describe how the recommendations provided in this EIS will address these policies (where applicable).

6.1 City of Welland Official Plan (revised June 20, 2017)

The City's OP is a legal document prepared as required under section 14.7(3) of the *Planning Act*. An OP sets out goals, objectives, and policies that direct and manage land-use and future development activities and their effects on the social and natural environment of the municipality. Provided herein is a description of relevant environmental and natural heritage policies contained within the City's OP and an assessment of how the proposed development plan addresses such policies.

Per Schedule C of the City's OP, the Study Area contains components of the City's Core NHS. Per Schedule C1, these components include "Significant Woodlots" and a designated watercourse.

Per **Policy 6.1.2.1.E**, Environmental Protection Areas consist of provincially significant wetlands, provincially significant Life Science Areas of Natural and Scientific Interest (ANSIs), and significant habitat of threatened and endangered species. Per **Policy 6.1.2.1.F**, Environmental Conservation Areas consist of significant woodlands, significant wildlife habitat, significant habitat of species of

concern, regionally significant Life Science ANSIs, other evaluated wetlands, significant valleylands, savannahs and tall grass prairies, alvars, and publicly owned conservation lands. Per the results of this study, several features that appear to meet City ECA criteria (not mapped on Schedule C1) have been identified.

As the more specific natural heritage policies of the City's OP largely mirror those of the Regional OP, a more fulsome assessment of such policies is provided in **Section 6.2** below.

6.2 Regional Municipality of Niagara Official Plan (2014)

Like the City's OP, the Regional OP directs land-use and land management within its jurisdiction. Relevant natural heritage policies contained in the Regional OP are largely consistent with the City's OP. For example, **Policy 7.B.1.1** defines the Core Natural Heritage System as consisting of Core Natural Areas (EPA and ECA), Natural Heritage Corridors, Greenbelt Natural Heritage and Water Resources Systems, and Fish Habitat. Further, **Policy 7.B.1.3** defines EPAs consistent with **Policy 6.1.2.1.E** of the City's OP, while **Policy 7.B.1.4** defines ECAs consistent with **Policy 6.1.2.1.F** of the City's OP. **Policy 7.B.1.5** provides criteria for determining Significant Woodlands (outlined in **Section 4.2** of this report). Consistent with the City's ECA designation mapping per Schedule C, the Region has identified existing ECA designations within the Slough Forests per Schedule C of the Regional OP.

A simplified and condensed summary of relevant Regional natural heritage policies which the subdivision application must address is as follows:

- **Policy 7.A.2.1** – development and site alteration must not have negative impacts (including cross-jurisdictional and cross-watershed impacts) on the natural hydrologic characteristics of watercourses, the quantity/quality of surface and groundwater resources, and the functions that surface and groundwater resources provide to natural features and functions of the Core Natural Heritage System.
- **Policy 7.B.1.1** – the Core Natural Heritage System consists of: a) Core Natural Areas (EPA or ECA), b) Potential Natural Heritage Corridors, c) Greenbelt Natural Heritage and Water Resources Systems, and d) Fish Habitat.
- **Policy 7.B.1.2** – development and site alteration within the Core Natural Heritage System shall be subject to the Healthy Landscape Policies of Chapter 7.A and the Core Natural Heritage System Policies.
- **Policy 7.B.1.3** – Environmental Protection Areas (EPAs) include PSWs, Significant Life Science ANSIs, and significant habitat of Endangered and Threatened species.
- **Policy 7.B.1.4** – Environmental Conservation Areas (ECAs) include Significant Woodlands, Significant Wildlife Habitat, significant habitat of species of concern, Regionally significant Life Science ANSIs, other evaluated wetlands, significant valleylands, savannahs and tallgrass prairies, and alvars.
- **Policy 7.B.1.11** – development and site alteration may be permitted within and adjacent to Environmental Conservation Areas if it has been demonstrated that, over the long term, there will be no significant negative impact on the Core Natural Heritage System component or adjacent lands and the proposed development or site alteration is not prohibited by other Regional Policies.

- **Policy 7.B.1.13** – where development or site alteration is proposed in or near a Potential Natural Heritage Corridor, development should be located, designed, and constructed to maintain and, where possible, enhance the ecological functions of the Corridor in linking Core Natural Areas or an alternative corridor should be developed.
- **Policy 7.B.1.18** – where development or site alteration is approved in or adjacent to the Core Natural Heritage System, new created lots shall not extend into either the area to be retained in a natural state as part of the Core Natural Heritage System or the buffer zone identified through an Environmental Impact Study prepared in accordance with Policies 7.B.2.1 to 7.B.2.5. The lands to be retained in a natural state and the adjacent buffer zone shall be maintained as a single block and zoned to protect their natural features and ecological functions.
- **Policy 7.B.1.19** – where development or site alteration is approved within the Core Natural Heritage System or adjacent lands, a Tree Saving Plan must be prepared to maintain or enhance the remaining natural features and ecological functions.

In addition to the areas designated ECA in Schedule C of the Regional OP, the results of this study have documented additional overlapping ECA features (e.g., Significant Wildlife Habitat) along with habitat of the Endangered Spoon-leaved Moss, which would be designated EPA.

Open Space Blocks 71-73 (totaling 26.518 ha) are incorporated into the Draft Plan to protect the entirety of the Slough Forests which are the most sensitive and high-quality wetlands/woodland within the Study Area. To address encroachment into a narrow, southward extension of the Significant Woodland (also a former hedgerow), requiring an estimated 2.707 ha of Significant Woodland removal, a conceptual Restoration and Enhancement Plan is provided in **Section 5.4** to ensure no negative impacts to this feature. A multitude of recommendations and mitigation measures are outlined in **Section 5.3** to protect natural features with Regional policy significance, including (among others) placing a timing restriction on vegetation removal to protect breeding birds and roosting bats, relocating terrestrial crayfish and provincial rare vascular plants outside the development area prior to construction, and formulating a comprehensive Erosion and Sediment Control Plan to steer construction activities. A Tree Saving Plan must also be prepared as part of a future development submission consistent with **Policy 7.B.1.19**.

Provided that all recommended mitigation measures outlined in **Section 5.3** and **5.4** are carried out in full (and are included as Draft Plan conditions, where appropriate), no negative impacts are anticipated to the significant natural heritage features identified herein. Based on the preceding discussion, Terrastory can conclude that the proposed development plan appropriately addresses the natural heritage protection provisions of the City and Regional OPs.

6.3 Provincial Policy Statement 2020, pursuant to the Planning Act, R.S.O. 1990, c. P. 13

The Provincial Policy Study (PPS) is promulgated under the authority of the *Planning Act* and came into effect on 1 May 2020. The PPS provides direction to municipalities on land-use matters of provincial interest and sets the policy framework for regulating the use and development of land. Municipal OP's must be consistent with the PPS. Per its preamble, the PPS *provides for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural and built environment.*

The principal PPS policies that apply to natural heritage protection are outlined in section 2.1. While recognizing that the natural heritage protection framework is not intended to limit the ability of agricultural uses to continue (**Policy 2.1.9**), the PPS instructs that *natural features and areas shall be protected for the long term* (**Policy 2.1.1**) and that their diversity and connectivity be *maintained, restored or, where possible, improved* (**Policy 2.1.2**). In Ecoregions 6E and 7E the PPS separates significant features into three categories:

- 1) Those in which development and site alteration are not permitted, including 1) Provincially Significant Wetlands and 2) Significant Coastal Wetlands (**Policy 2.1.4**);
- 2) Those in which development and site alteration are not permitted unless it can be demonstrated that no negative impacts on the significant natural feature and/or function will occur, including: 1) Significant Woodlands, 2) Significant Valleylands, 3) Significant Wildlife Habitat, 4) Significant Areas of Natural and Scientific Interest, 5) Non-significant Coastal wetlands, and 6) Adjacent Lands (**Policy 2.1.5** and **2.1.8**).
- 3) Those in which development and site alteration are not permitted except in accordance with federal/provincial requirements, including: 1) Fish Habitat (Policy 2.1.6) and 2) Habitat of Endangered and Threatened Species (**Policy 2.1.7**).

In the context of the PPS, the results of this study revealed the presence of Significant Woodlands, candidate and confirmed SWH, Endangered species habitat, and potential fish habitat. The subdivision application considered herein must demonstrate “no negative impact” to the Significant Woodlands and SWH and be undertaken consistent with the requirements of the *Endangered Species Act* and *Fisheries Act*.

In considering the aforementioned PPS policies, Terrastory has determined that the proposed development plan addresses relevant natural heritage provisions of the PPS for the following reasons:

- Per **Table 5**, no Provincially Significant Wetlands, Significant Areas of Natural or Scientific Interest, or Significant Valleylands are present within the Study Area or Adjacent Lands.
- Per **Section 5.3.2**, no negative impacts to the Significant Woodland are anticipated given implementation of the proposed development plan provided that the recommended mitigation measures are implemented in full. This includes (among other measures) the implementation of a Restoration/Enhancement Plan to replace lost Significant Woodland and recreate Slough Forest.
- Per **Section 5.3.3**, no negative impacts to Significant Wildlife Habitat are anticipated given implementation of the proposed development plan provided that the recommended mitigation measures are implemented in full.
- Per **Section 5.3.4**, no negative impacts to the Habitat of Endangered and Threatened Species are anticipated given implementation of the proposed development plan provided that the recommended mitigation measures are implemented in full.
- Per **Section 5.3.5**, a fisheries survey and Request for Review submission to DFO is necessary to ensure the requirements of the *Fisheries Act* are achieved.

6.4 Growth Plan 2019, pursuant to the *Places to Grow Act*, S.O. 2005, c. 13

The Growth Plan provides a framework for growth management across the Greater Golden Horseshoe. Provisions related to the protection of natural heritage features and areas are contained in **Section 4.2.2** through **Section 4.2.4**.

Policy 4.2.2 authorizes the creation of a Natural Heritage System (NHS) which is to be incorporated by municipalities as an overlay into their OP schedules. **Policy 4.2.3** prohibits development or site alteration within Key Natural Heritage Features (KNHFs) and Key Hydrologic Features (KHF) within the NHS, with certain activities and land-uses excepted (e.g., wildlife management, flood control projects, infrastructure authorized under an environmental assessment process, etc.). New development or site alteration within the NHS must demonstrate that there will be no negative impacts to KNHFs and KHF or their functions, and that the connectivity between KNHFs and KHF located within 240 metres of each other is to be maintained or enhanced. New development and site alteration must also consider and avoid other non-significant natural features where possible. **Policy 4.2.2(3)(iv)** further requires that developments within the NHS not generate disturbance in excess of 25% of the total developable area, nor create impervious surfaces in excess of 10% of the total developable area.

While the Growth Plan NHS does not extend within the Study Area, **Policy 4.2.2(4)** defers implementation of the Growth Plan NHS until it has been incorporated into the applicable upper- or single-tier OP. Until then, the policies of the Growth Plan NHS only apply outside settlement areas to the existing NHS identified in upper- or single-tier OPs approved and in effect as of 1 July 2017. Notwithstanding the presence of components of the Regional NHS within the Study Area (particularly Significant Woodland), the Study Area is situated wholly within a settlement area. As such, the policies of the Growth Plan NHS do not apply to the subdivision application considered herein.

6.5 Niagara Peninsula Conservation Authority Regulation 155/06, pursuant to the *Conservation Authorities Act*, R.S.O. 1990, c. C.27

NPCA's regulatory jurisdiction includes areas within and adjacent to valley and stream corridors, the Lake Erie and Lake Ontario shorelines, hazard lands (e.g., floodplains, steep slopes, etc.), watercourses, and wetlands as provided by O. Reg. 155/06 of the *Conservation Authorities Act*.

NPCA regulated features within the Study Area include wetlands (deciduous swamp, thicket swamp, marshes) including some that exceed 2 hectares in size, and watercourses (including their meanderbelts and regulatory floodplains). The Study Area contains several stormwater ditches (**Figure 4**) constructed to support the former manufacturing facilities. The form and function of the stormwater ditches, and the fact that they are surrounded by paved areas, suggests that these features should not be considered regulated by NPCA pursuant to O. Reg. 155/06. The Designated Watercourse, and at least some of the constructed drainage features (**Figure 4**), are expected to be regulated by NPCA. Further discussion with NPCA to determine which constructed drainage features are considered "watercourses" (and therefore regulated) pursuant to the *Conservation Authorities Act* definition (subsection 28[25]) is required.

A simplified and condensed summary of relevant NPCA policies respecting wetlands which the application must address is as follows:

- **Policy 8.1.2.3** – a wetland evaluation is required where development or site alteration is proposed on a property with unevaluated wetlands and is to be approved by MNRF. Exceptions include situations where an appropriate natural buffer (as determined by NPCA) has been established.
- **Policy 8.2.2.1** – unless otherwise permitted by NPCA policies, no development and/or site alteration shall be permitted within a wetland.
- **Policy 8.2.2.6** – passive recreational development (i.e., trails and boardwalks) may be permitted within wetlands where the risk to public safety (e.g., flooding, etc.) is not increased, construction disturbance is minimized, topography is maintained, permeable surfaces are incorporated, and a revegetation plan is prepared.
- **Policy 8.2.2.8** – where no reasonable alternative exists to locate a proposed development, site alteration, or other activities outside of a non-provincially significant wetland (or adjacent land), the NPCA may require that an area of wetland be created to offset the disturbance that is greater than (in area and function) the area of wetland and adjacent land being disturbed. All wetlands created under this policy will be added to the NPCA regulated area and identified on appropriate screening maps. Wetland “reconfiguration” can only occur if the wetland has been evaluated per OWES and is not significant, the proposed development will not impact species of concern and significant habitat types, the reconfigured wetland will not have a negative impact on hydrological or ecological functions, and restoration and monitoring plans are prepared.
- **Policy 8.2.3.1** – unless otherwise permitted by NPCA policies, no development and/or site alteration shall be permitted within 30 metres of a wetland.
- **Policy 8.2.3.2** – permitted uses within 30 metres of a wetland include infrastructure (in accordance with **Policy 8.2.4**), conservation and restoration projects, passive recreational uses, and other forms of development and site alteration which do not adversely impact the ecological and hydrological function of the wetland.
- **Policy 8.2.3.4** – lot creation within 15 metres of a wetland is not permitted. Lot creation within 15 and 30 metres of a wetland may be permitted where **Policy 8.2.3.3** is addressed (i.e., where an application includes replacement structures, accessory structures, or minor additions).

Open Space Blocks 71-73 (totaling 26.518 ha) are incorporated into the Draft Plan to protect the entirety of the Slough Forests which are the most sensitive and high-quality wetlands/woodland within the Study Area. To address the removal of 0.312 hectares of identified wetland, a conceptual Restoration and Enhancement Plan is provided in **Section 5.4**. The wetlands proposed to be removed exhibit limited functions as outlined in **Section 5.3.1**; in particular, most are dominated by non-native or invasive vascular plants and all appear to be acting as a sink for the local Anuran breeding population. Slough restoration is proposed in Linear Park Block 66 which will provide improved Anuran breeding habitat and recreate the original topographic conditions which prevailed historically across the local landscape. Elimination of dense stands of *Phragmites* in wetlands east of the Northern Slough Forest will also serve to improve wetland values within the Study Area.

A simplified and condensed summary of relevant NPCA policies respecting watercourses which the application must address is as follows:

- **Policy 9.2.2** – unless otherwise permitted by NPCA policies, interference with a watercourse is not permitted.

- **Policy 9.2.3.2** – the need to alter a watercourse must be demonstrated to the satisfaction of NPCA and the works must be in accordance with NPCA standards. Watercourse alterations must not increase flood plain elevations, flood frequency, or erosion rates. The works must not adversely affect the ecological and hydrological function of the watercourse and riparian zone.
- **Policy 9.2.5.1** – a buffer between 10 metres and 15 metres must be established from a watercourse.
- **Policy 9.2.5.2** – reductions in buffer requirements will be considered in special circumstances taking into consideration (amongst other factors) the nature of the proposed development/site alteration, adjacent land uses, and the condition of the lands in the riparian area.

A permit to facilitate alteration of any regulated watercourses is required from NPCA.

6.6 Provincial Endangered Species Act, S.O. 2007, c. 6

The *Endangered Species Act* (ESA) is administered by MECP and protects designated Endangered and Threatened species in Ontario from being killed, harmed, or harassed (s. 9) or having their habitat damaged or destroyed (s. 10). The protection afforded to Endangered and Threatened species “habitat” is either prescribed by O. Reg. 242/08, or (for those species that lack regulated habitat) is defined as *an area on which the species depends, directly or indirectly, to carry on its life processes, including life processes such as reproduction, rearing, hibernation, migration or feeding*. Activities that constitute habitat damage and/or destruction can only proceed subject to requirements of s. 17 or (in limited circumstances) an activity registration under O. Reg. 242/08.

A total of five (5) Endangered or Threatened species were confirmed from the Study Area based on the results of 2019 field activities:

- 1) Barn Swallow (*Hirundo rustica*)
- 2) Chimney Swift (*Chaetura pelagica*)
- 3) Little Brown Myotis (*Myotis lucifugus*)
- 4) Northern Myotis (*Myotis septentrionalis*)
- 5) Spoon-leaved Moss (*Bryoandersonia illecebra*)

A detailed assessment of potential Endangered and Threatened habitat within the Study Area is provided in **Appendix 11** supported by an impact assessment in **Section 5.3.4**. Per these assessments, and provided that relevant technical recommendations outlined in **Section 5.3** are implemented in full, Terrastory has determined that the proposed development plan is consistent with the species and habitat protection provisions of the ESA. Confirmation from MECP that the any trails located in the vicinity of the small Spoon-leaved Moss population will not pose habitat impacts may be warranted depending upon the future trail alignment (if proposed).

6.7 Federal Fisheries Act, R.S.C. 1985, c. F-14

The amended federal *Fisheries Act* (Bill C-68) received Royal Assent in June 2019 while the updated fish and fish habitat protection provisions came into force in August 2019. **Subsection 34.4(1)** of the amended *Fisheries Act* prohibits all work, undertaking, or activity from causing the death of fish (other than fishing). **Subsection 35(1)** requires that project activities not result in the “*harmful alteration, disruption or destruction of fish habitat*” (HADD) unless undertaken in accordance with the

requirements of a statutory exemption per **Subsection 35(2)**. Based on the Fish and Fish Habitat Protection Policy Statement (August 2019), HADD is interpreted by DFO to include “*any temporary or permanent change to fish habitat that directly or indirectly impairs the habitat’s capacity to support one or more life processes of fish*”.

As detailed in **Section 4.7** fish were documented at two separate locations within the Study Area: 1) within the Designated Watercourse at the railway culvert, and 2) within the Stormwater Pond and adjacent constructed drainage feature. The exact fish community in these locations is unknown. It is also unknown if these fish are directly connected to other downstream fish-bearing waterbodies. Further correspondence with DFO to determine the applicability of the federal *Fisheries Act* is required.

A fisheries survey (via electrofishing and seine netting) will take place in late summer/fall 2020 under the authority of a Licence to Collect Fish for Scientific Purposes. The fish community data will support a Request for Review submission to DFO to ensure the requirements of the *Fisheries Act* are met.

6.8 **Federal Migratory Birds Convention Act, S.C. 1994, c. 22**

Section 6 of the Migratory Birds Regulations under the *Migratory Birds Convention Act, 1994* (MBCA) prohibits the disturbance or destruction of nests, eggs, or nest shelters of a migratory bird. The provincial *Fish and Wildlife Conservation Act, 1997* extends the protection of bird nests and eggs to certain species not listed under the Migratory Birds Regulations (e.g., Corvids, Strigids, Accipitrids, etc.).

A timing restriction on vegetation removal must be established to protect nesting birds (see **Section 5.3.6**). Provided that this timing restriction is adhered to, no impacts to breeding birds or bird nests protected by the MBCA or FWCA are anticipated.

7 **CONCLUSIONS**

The preceding Environmental Impact Statement provides a detailed characterization of the natural environment occurring within and adjacent to the Dain West Subdivision at 475/555/635 Canal Bank Street in Dain City. This EIS has been prepared in support of the City OPA, Regional OPA, ZBA, and subdivision applications submitted to redesignate the lands to residential and mixed uses, and to support NPCA’s regulatory review under O. Reg. 155/06 pursuant to the *Conservation Authorities Act*. Included herein is a comprehensive approach to identifying the presence or absence of significant natural features afforded varying degrees of protection by relevant natural heritage policies. Significant natural heritage features documented within the Study Area include:

- **Identified wetlands** greater than 2 hectares (primarily oak- and ash-dominated swamps) occurring in a mosaic of Slough Forests.
- **Other identified wetlands** less than 2 hectares (deciduous swamp, thicket swamp, marshes) located in the Slough Forests and in more disturbed portions of the Study Area.
- **Significant Woodlands** occupying the entirety of the Slough Forests and contiguous second-growth forests/woodlands.
- **Candidate and confirmed Significant Wildlife Habitat** including bat maternity colonies, deer winter congregation areas (identified by MNRFP), old-growth forest, provincially rare vegetation communities, terrestrial crayfish, and amphibian breeding and movement habitats.

- **Potential and confirmed habitat of Provincial and Regional Species of Concern**, including Eastern Wood-pewee, Grasshopper Sparrow, Monarch, Yellow-banded Bumble Bee, Yellow-fruited Sedge, and Tapered Rush.
- **Potential and confirmed habitat of Endangered species** (Myotis bats and Spoon-leaved Moss) and the presence of **Threatened species** in the local landscape (Barn Swallow and Chimney Swift).
- **Watercourses** regulated by NPCA, all of which represent drainage features that appear to have been historically constructed to drain the slough wetlands.
- **Potential fish habitat** pursuant to the *Fisheries Act* (subject to DFO confirmation).

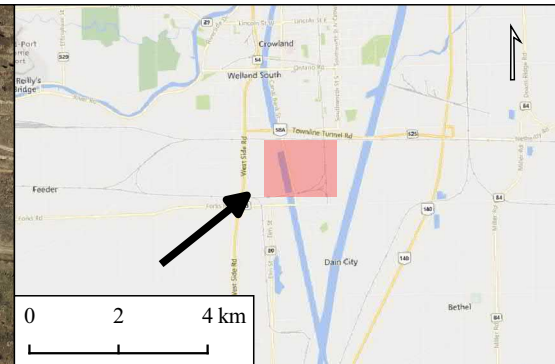
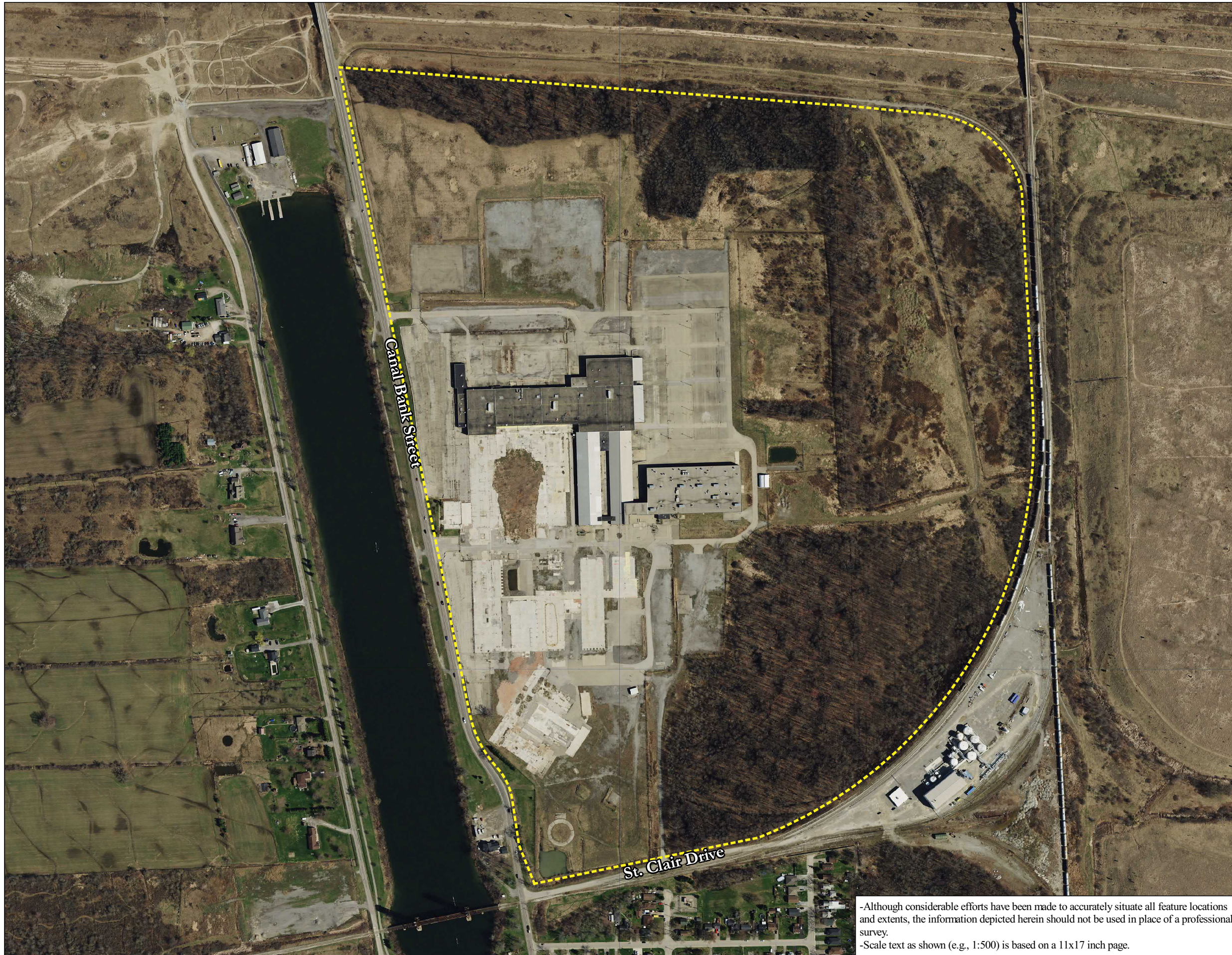
Based on the presence of the above-mentioned significant natural heritage features, a comprehensive set of recommendations and mitigation measures are offered in **Sections 5.3** and **5.4** to achieve “no negative impact” and address applicable municipal, provincial, and federal policies outlined in **Section 6**. This includes the formulation of a conceptual Restoration and Enhancement Plan to address proposed removal of 0.312 hectares of identified wetland (outside the Slough Forests) and 2.707 hectares of Significant Woodland (outside the Slough Forests). A permit from NPCA pursuant to O. Reg. 155/06 is required to interfere with and/or alter the on-site wetlands and regulated watercourses.

Terrastory has determined that no negative impacts to the above-noted features will occur and that the application appropriately addresses applicable natural heritage policies provided that all technical mitigation measures recommended herein are implemented in full. It is advised that such technical recommendations be incorporated into any necessary development approvals that permit the applications.

8 REFERENCES

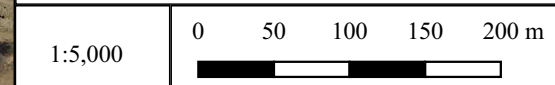
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Legend

Study Area
 Study Area



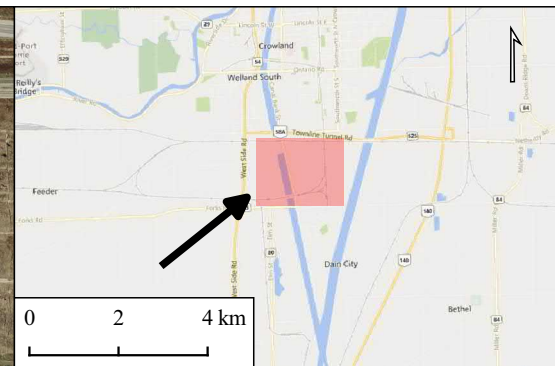
	Project No.:	By:	Date:
	1908	TK	2020-01-10

Orthophotograph Date: 2015 (SWOOP).

Location: 475/555/635 Canal Bank Street, City of Welland.

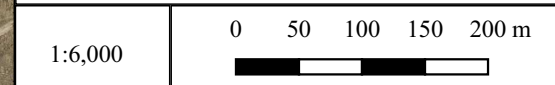
Figure 1. Location of the Study Area.

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
 -Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.



Legend

- Study Area**
- Study Area
 - Adjacent Lands



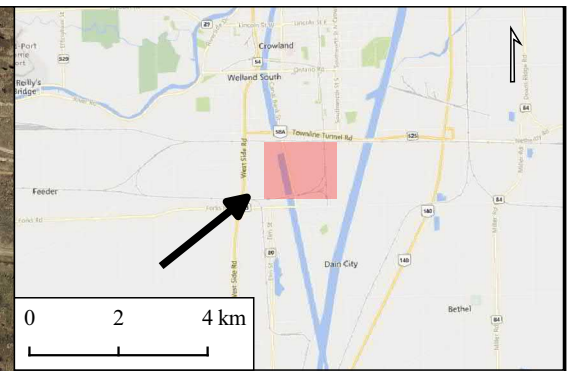
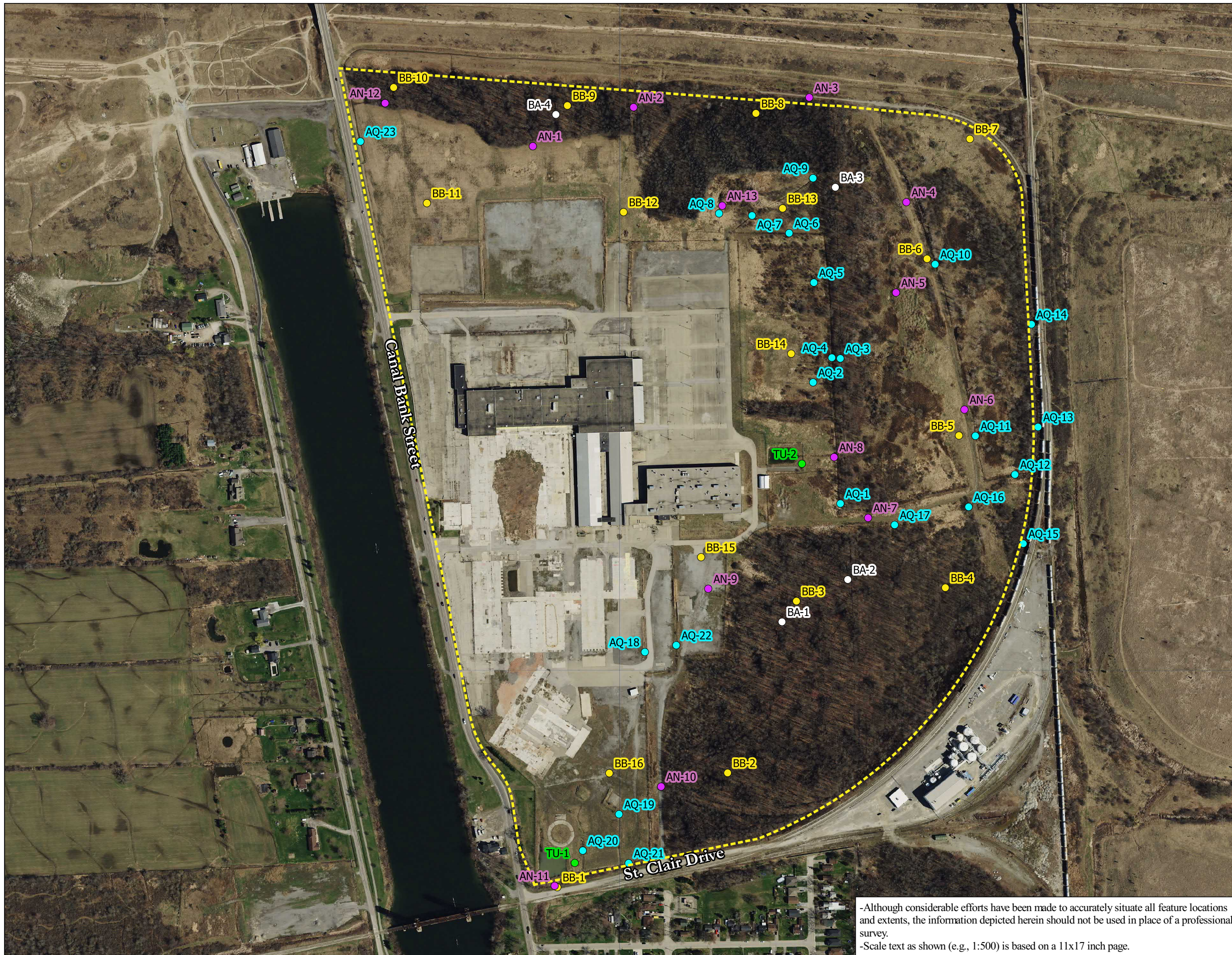
N 	Project No.: 1908	By: TK	Date: 2020-01-10
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Orthophotograph Date: 2015 (SWOOP).

Location: 475/555/635 Canal Bank Street, City of Welland.

Figure 2. Reference Map.

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
 -Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.



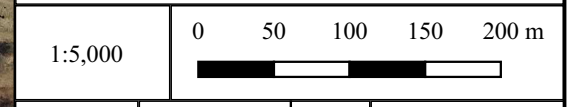
Legend

Study Area

- Study Area (Yellow dashed line)

Survey Stations

- Anuran Calling Stations (Purple dot)
- Drainage Channel Morphology Stations (Cyan dot)
- Bat Acoustic Monitoring Stations (White dot)
- Breeding Bird Survey Stations (Yellow dot)
- Turtle Visual Encounter Survey Stations (Green dot)



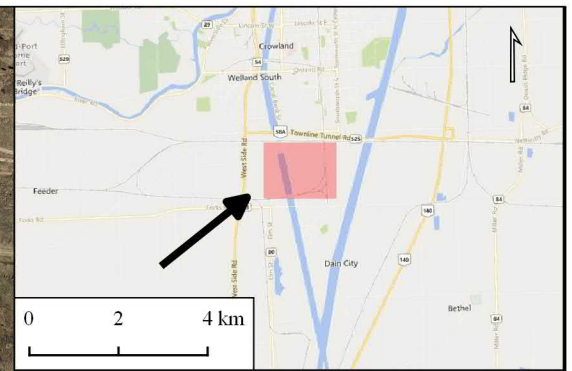
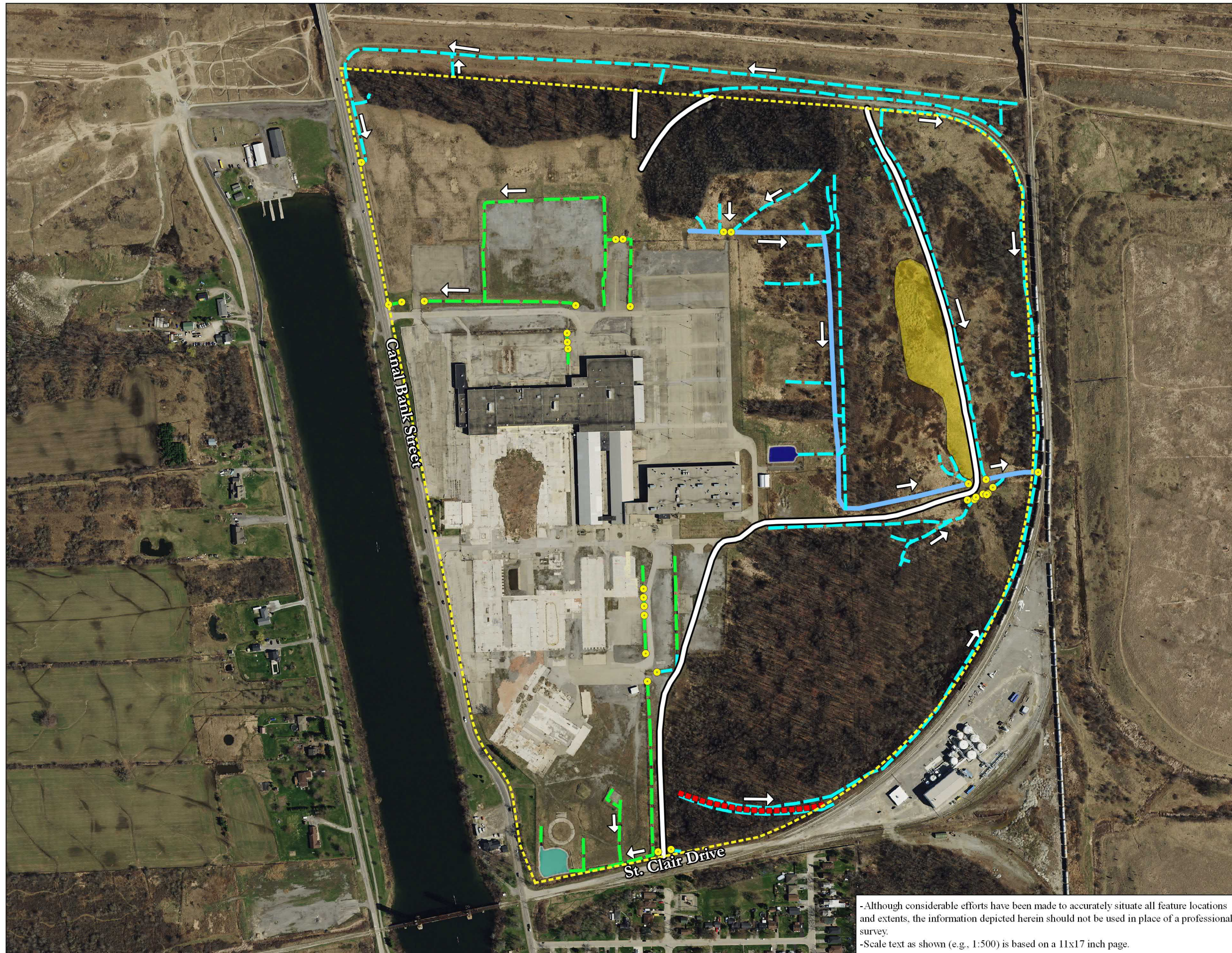
N	Project No.:	By:	Date:
	1908	TK	2020-01-10

Orthophotograph Date: 2015 (SWOOP).

Location: 475/555/635 Canal Bank Street, City of Welland.

Figure 3. Survey Stations.

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
 -Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.



Legend

Study Area

- Study Area

Built Structures and Infrastructure

- Culverts
- Gravel Trail
- Old Railway Bed

Biophysical Conditions - Terrastory

- Designated Watercourse (intermittent)
- Constructed Drainage Features (intermittent)
- Stormwater Ditches
- Apparant Flow Direction
- Stormwater Pond (subject to existing ECA)
- Southern Pond
- Sloped Fill (approx.)

1:5,000

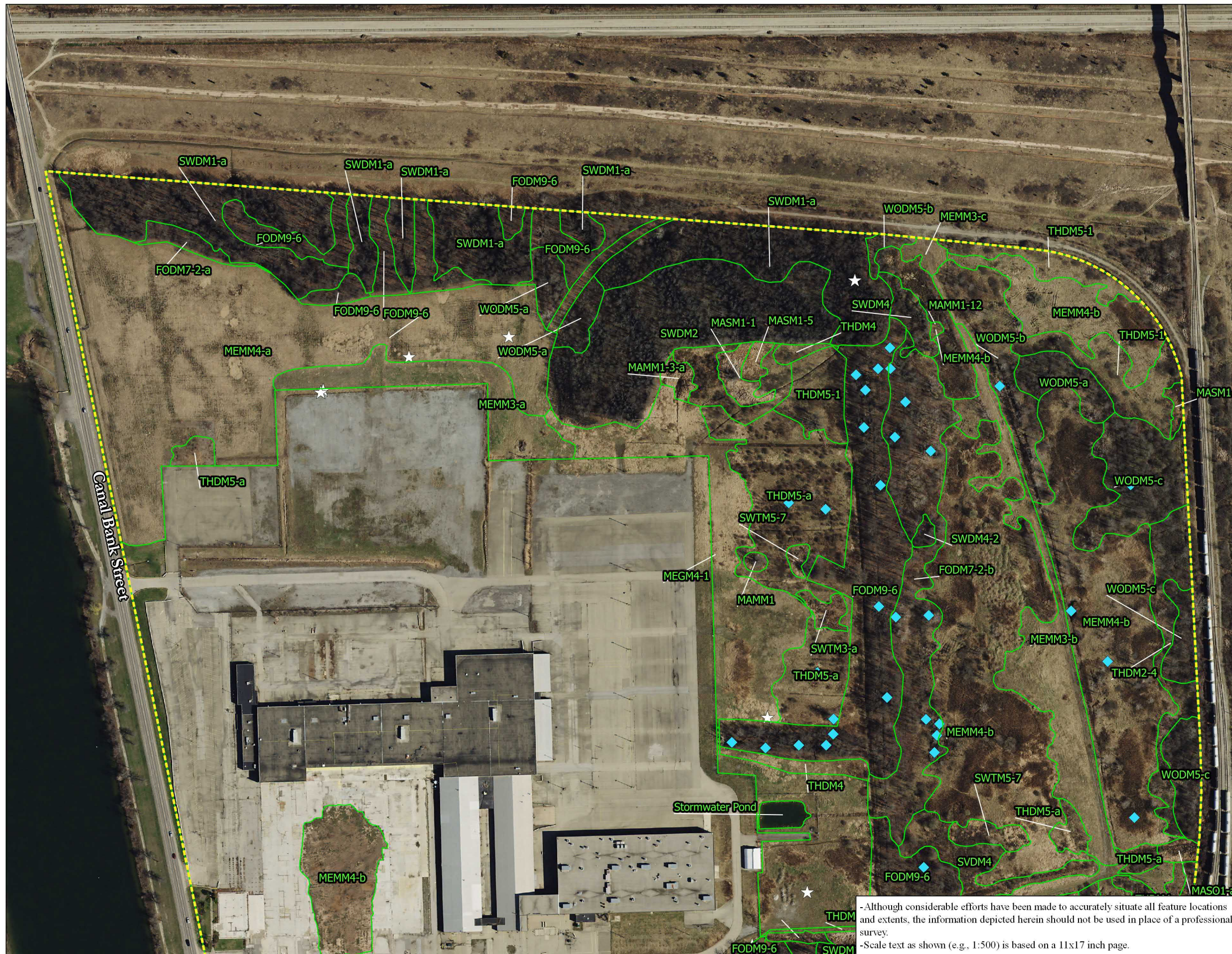
N	Project No.:	By:	Date:
	1908	TK	2020-08-20

Orthophotograph Date: 2015 (SWOOP).

Location: 475/555/635 Canal Bank Street, City of Welland.

Figure 4. Physiographic Features and Conditions.

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
 -Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.



Legend

Study Area
 [Yellow dashed line] Study Area

Biophysical Conditions - Terrastory
 [Green outline] Vegetation Communities
 [Blue diamond] Vernal Pools
 [White star] Eastern Garter Snake

Vegetation Community Codes:

UPLAND
 FODM7-2: Fresh - Moist Green Ash - Hardwood Lowland Deciduous Forest
 FODM9-6: Fresh - Moist Oak - Hardwood Deciduous Forest
 WODM5: Fresh - Moist Deciduous Woodland
 SVDM4: Fresh - Moist Deciduous Savanna
 THDM2-4: Grey Dogwood Deciduous Shrub Thicket
 THDM4: Dry - Fresh Deciduous Regeneration Thicket
 THDM5: Fresh - Moist Deciduous Thicket
 THDM5-1: Grey Dogwood Deciduous Thicket
 MEMM3: Dry - Fresh Mixed Meadow
 MEMM4: Fresh - Moist Mixed Meadow
 MEGM4-1: Open Graminoid Meadow

WETLAND
 SWDM1: Oak Mineral Deciduous Swamp
 SWDM2: Green Ash Mineral Deciduous Swamp
 SWDM4-2: White Elm Mineral Deciduous Swamp
 SWTM5-7: Meadowsweet Mineral Deciduous Swamp
 SWTM3: Willow Mineral Deciduous Thicket Swamp
 SWTM2: Dogwood Mineral Deciduous Thicket Swamp
 MASO1: Graminoid Organic Shallow Marsh
 MASM1-1: Cattail Mineral Shallow Marsh
 MASM1-5: Broad-leaved Sedge Mineral Shallow Marsh
 MAMM1: Graminoid Mineral Meadow Marsh
 MAMM1-3: Reed-canary Grass Graminoid Mineral Meadow Marsh
 SAS1-3: Stonewort Submerged Shallow Aquatic

TERRASTORY
 environmental consulting inc.

1:3,000 0 25 50 75 100 m

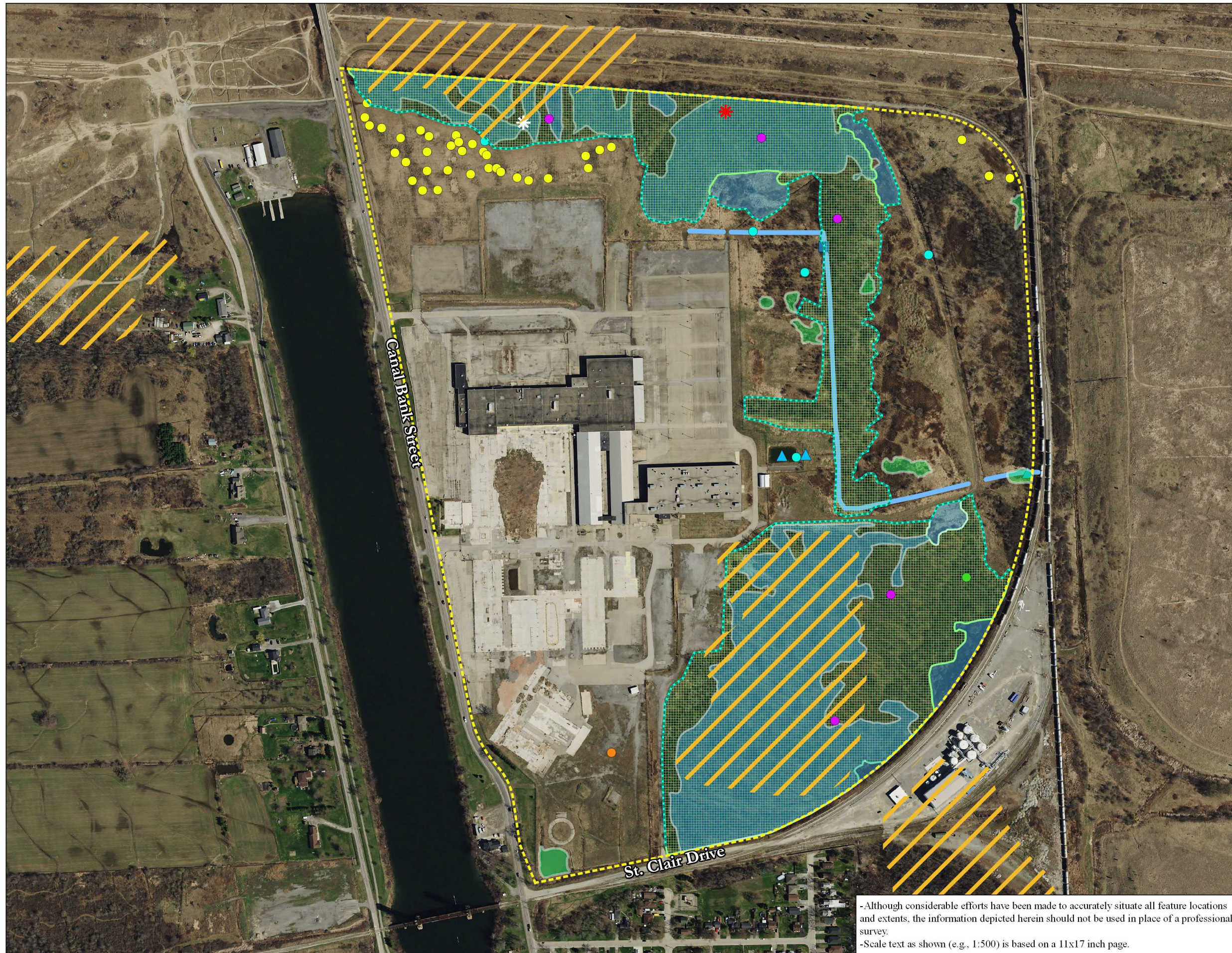
N	Project No.: 1908	By: TK	Date: 2020-07-10
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Orthophotograph Date: 2015 (SWOOP).

Location: 475/555/635 Canal Bank Street, City of Welland.

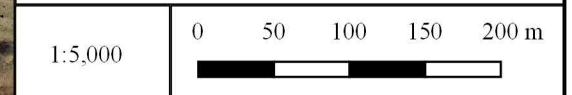
Figure 5a. Ecological Features and Conditions (north).

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
 -Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.



- ### Legend
- Study Area**
 Study Area
- Significant Natural Features - Agency Identified**
 Deer Wintering Area (mapped by MNRF)
 Greatest Extent of the Natural Feature Limit (Woodland Dripline or Wetland Boundary) - staked 30 September 2019
- Significant Natural Features - Terrastory**
 Wetland
 Small Wetland (beyond Slough Forests)
 Significant Woodland
 Fish Observed
 Designated Watercourse (intermittent)
- Provincially At Risk and Rare Species**
 Spoon-leaved Moss - Endangered
 Eastern Wood-pewee - Special Concern
 Grasshopper Sparrow - Special Concern
 Tapered Rush - Provincially Rare (S3)
 Yellow-fruited Sedge - Provincially Rare (S2)
 Terrestrial Crayfish Chimney
- Features of Local Interest**
 Great Horned Owl - Nesting Area
 Red-tailed Hawk - Nest

Notes:
 - Additional significant natural features occur (or have the potential to occur) within the Study Area apart from those shown on this figure (particularly candidate and confirmed SWH). See report text for greater details.



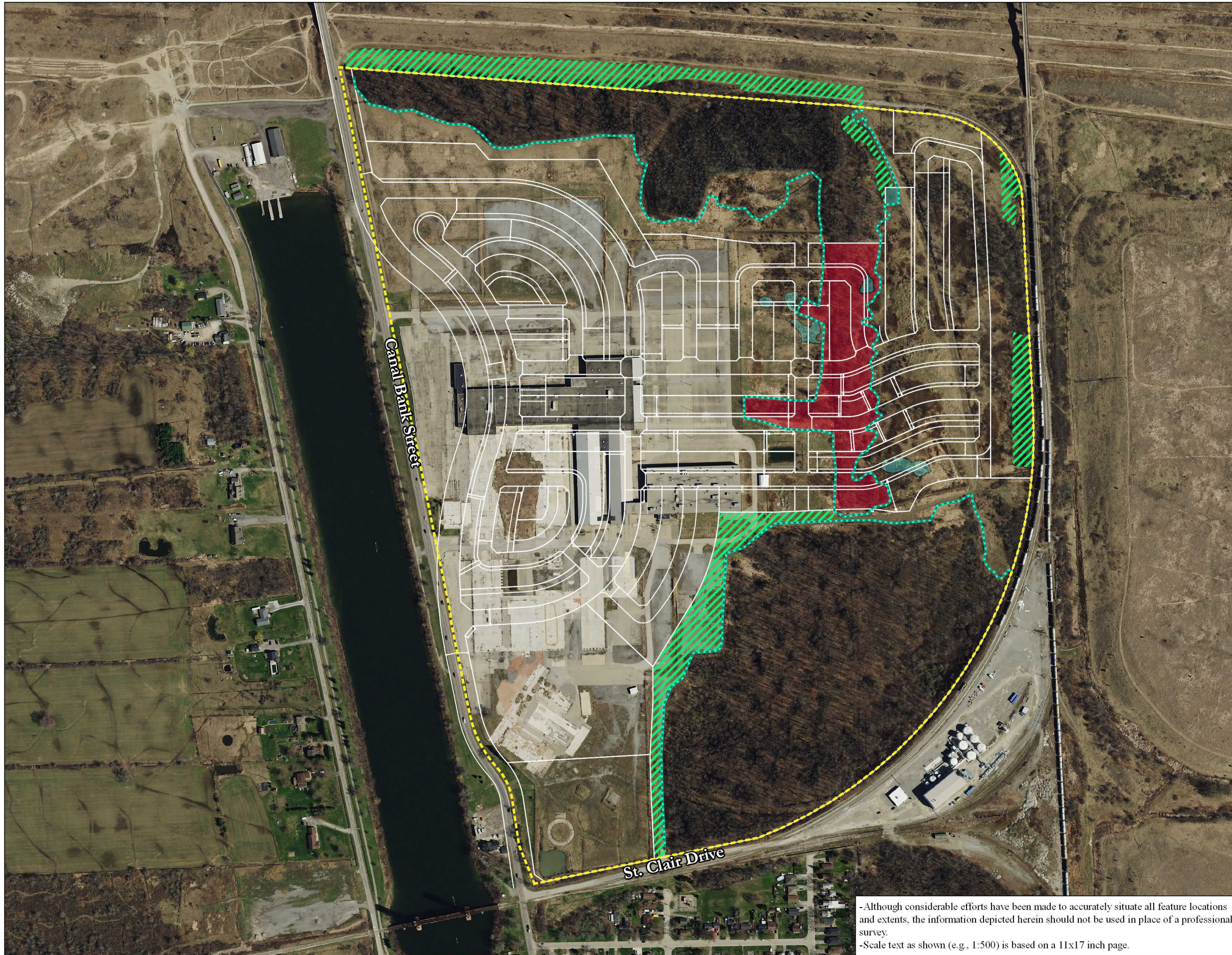
N	Project No.:	By:	Date:
	1908	TK	2020-08-20

Orthophotograph Date: 2015 (SWOOP).

Location: 475/555/635 Canal Bank Street, City of Welland.

Figure 6. Significant Natural Features.

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
 -Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.



Legend

- Study Area**
 [Yellow dashed line] Study Area
- Significant Natural Features - Agency Identified**
 [Cyan dashed line] Greatest Extent of the Natural Feature Limit (Woodland Dripline or Wetland Boundary)
- Proposed Activities**
 [White line] Draft Plan of Subdivision
- Natural Feature Removal**
 [Light blue] Wetland
 [Red] Significant Woodland
- Conceptual Mitigation and Enhancement Plan**
 [Green hatched] Conceptual Wetland and Woodland Restoration and Enhancement Areas

Notes:
 -Additional mitigation and enhancement measures are offered for consideration apart from those shown on this figure. See report text for greater details.



N	Project No.:	By:	Date:
	1908	TK	2020-08-20

Orthophotograph Date: 2015 (SWOOP).

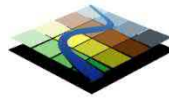
Location: 475/555/635 Canal Bank Street, City of Welland.

Figure 7. Draft Plan of Subdivision and Conceptual Restoration and Enhancement Areas.

-Although considerable efforts have been made to accurately situate all feature locations and extents, the information depicted herein should not be used in place of a professional survey.
 -Scale text as shown (e.g., 1:500) is based on a 11x17 inch page.

Appendix 1. Terms of Reference

March 25, 2019
Project No.: 1908



TERRASTORY
environmental consulting inc.

Jennifer Whittard, B.E.S., PMP
Manager, Environmental Planning
Planning and Development Services, Niagara Region
Jennifer.Whittard@niagararegion.ca

**SUBJECT: Terms of Reference for Ecological Study
475/555/675 Canal Bank Street
City of Welland**

Field Work Plan

The proposed 2019 fieldwork plan is outlined below in **Table 1**. Field activities will be principally restricted to natural features/vegetation within or adjacent to (i.e., <120 m from) areas of proposed development or disturbance.

Table 1. Fieldwork Plan.

2019 Site Assessments and Field Activities	Schedule
<ul style="list-style-type: none">• Bat snag/cavity tree habitat assessment based on the Survey Protocol for SAR Bats within Treed Habitats (MNRF 2017). Habitat assessment to be restricted to areas in which tree removal is anticipated. Need for acoustic monitoring to be determined based on the results of the habitat assessment and proposed development plan.	<ul style="list-style-type: none">• April (i.e., before leaf-out)
<ul style="list-style-type: none">• Anuran calling surveys in accordance with the Marsh Monitoring Protocol (Bird Studies Canada et al. 2008). Number of surveys contingent on potential anuran habitat (i.e., habitat for late season breeders may not be present).	<ul style="list-style-type: none">• late-April to late-June (if necessary)
<ul style="list-style-type: none">• Two (2) rounds of breeding bird surveys in accordance with the Ontario Breeding Bird Atlas protocol (Bird Studies Canada et al. 2001).	<ul style="list-style-type: none">• late-May to early-July
<ul style="list-style-type: none">• Spring/summer vascular plant survey via an area search (i.e., “wandering transects”). All species recorded will be listed in an appendix along with their respective Coefficient of Conservatism and Wetness Coefficient.	<ul style="list-style-type: none">• mid-May-early July
<ul style="list-style-type: none">• Vegetation community characterization in accordance with Ecological Land Classification (ELC) System for Southern Ontario (Lee et al. 1998).	<ul style="list-style-type: none">• June
<ul style="list-style-type: none">• Wetland boundaries in accordance with the “50% wetland vegetation rule” and presence of hydric soils specified by the Ontario Wetland Evaluation System (MNRF 2014).	<ul style="list-style-type: none">• June
<ul style="list-style-type: none">• Aquatic habitat assessment of all on-site surface water features (e.g., bankfull width, substrates, aquatic vegetation, etc.).	<ul style="list-style-type: none">• April-July
<ul style="list-style-type: none">• Incidental observations of herpetofauna and mammals.	<ul style="list-style-type: none">• April-July

Proposed Table of Contents

The on-site biophysical information collected per **Table 1** will be assessed and reviewed in concert with background biophysical information (from NHIC, MNRF, etc.). The information will be

summarized into a report that will address the requirements of the Region’s Environmental Impact Study Guidelines (Jan. 2018) and relevant environmental policies. A proposed Table of Contents for the ecological study will generally follow the outline below:

- 1) Introduction
 - a. Study Background
 - b. Study Purpose
- 2) Approach and Methods
 - a. Background Biophysical Information Collected (e.g., NHIC, MNRF SAR screening request, OBBA, Herpetofaunal Atlas, DFO Aquatic SAR Mapping, etc.)
 - b. Site Assessments and Survey Methodologies (*see fieldwork plan in **Table 1**).
 - c. Impact/Effects Assessment and Mitigation
 - d. Natural Heritage and Environmental Policy Context
 - i. City of Welland Official Plan
 - ii. Regional Municipality of Niagara Official Plan
 - iii. Provincial Policy Statement pursuant to the *Planning Act*
 - iv. NPCA regulation (O. Reg. 155/06) and related policies pursuant to the *Conservation Authorities Act*
 - v. *Endangered Species Act* including Ontario Regulation 242/08
 - vi. *Fisheries Act*
 - vii. *Fish and Wildlife Conservation Act*
 - viii. *Migratory Birds Convention Act*
- 3) Existing Biophysical Conditions
 - a. Land-use Setting
 - b. Physical Setting (e.g., hydrology, surficial geology, etc.)
 - c. Ecological Setting
 - i. Vegetation Communities, including ELC mapping
 - ii. Wetland Boundaries (per OWES), including wetland mapping
 - iii. Vascular Plants
 - iv. Calling Anurans
 - v. Breeding Birds
 - vi. Bat Habitat
 - vii. Incidental Wildlife Recorded
- 4) Biophysical Analysis
 - a. Significant Natural Features
 - i. Wetlands
 - ii. Wooded Areas
 - iii. Significant Wildlife Habitat (*if present)
 - iv. Habitat of Endangered and Threatened Species (*if present)
 - v. Fish Habitat (*if present)
 - b. Significant Species (*if present)
 - c. Other
- 5) Description of the Proposed Development
- 6) Impact Assessment
 - a. Development Alternatives and Avoidance Measures incorporated into Project Design
 - b. Effects Assessment (e.g., Spatial extent, magnitude, frequency, duration, adjacent lands, etc.), including direct, indirect, and cumulative effects.

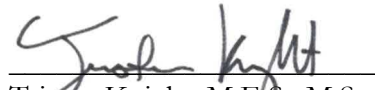
- 7) Mitigation Strategies
 - a. Mitigation Measures Proposed (e.g., setbacks, ESC measures, construction timing and phasing, etc.)
- 8) Monitoring Plan (*if necessary)
- 9) Conclusions
- 10) References

Closure

Thank you for the opportunity to submit this TOR for Regional review. Should you have any questions or comments on the proposed TOR I would be happy to discuss them with you and can be reached by phone (905.745.5398) or email (tristan@terrastoryenviro.com).

Sincerely,

Terrastory Environmental Consulting Inc.



Tristan Knight, M.E.S., M.Sc.
Senior Ecologist / President

References

- Bird Studies Canada, Environment Canada, Ontario Field Ornithologists, and Ontario Ministry of Natural Resources Ontario Nature. 2001. "Ontario Breeding Bird Atlas: Guide for Participants."
- Bird Studies Canada, United States Environmental Protection Agency, and Environment Canada. 2008. "Marsh Monitoring Program Participant's Handbook for Surveying Amphibians."
- Lee, H. T., W. D. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, and S. McMurray. 1998. "Ecological Land Classification for Southern Ontario: First Approximation and Its Application."
- MNRF. 2014. "Ontario Wetland Evaluation System."
- . 2017. "Survey Protocol for Species at Risk Bats within Treed Habitats."

MEMORANDUM

Subject: Response to TOR for 475/555/675 Canal Bank Street, Welland
Date: April 15, 2019
To: Tristan Knight, Terrastory Environmental Consulting Inc.
From: Jennifer Whittard, Niagara Region

Further to your March 25, 2019 Terms of Reference (TOR) (Attachment 1) for completion of an Ecological Study at 475/555/675 Canal Bank Street, Welland, the following information was previously prepared for this property and is provided for your reference.

Background

The site is approximately 75 hectares (ha) (185 acres) in size, bounded by Canal Bank Street and the Welland Recreational Canal to the west, railways to the east and north, and St. Clair Drive and Atlantic Biodiesel (oil refinery) to the south. Permitted uses are limited to General Industrial purposes as per the City of Welland. As per Regional Core Natural Heritage System mapping (Figure 1), the site contains three woodlands mapped as Environmental Conservation Area (ECA), and drainage features regulated by the Niagara Peninsula Conservation Authority (NPCA). In addition, the Ministry of Natural Resources and Forestry (MNR) has indicated the potential for an unevaluated wetland onsite and Species At Risk (SAR) (Attachment 2).

The northwestern woodland (Figure 2) is mapped as approximately 2.9 ha (7 acres) in size and considered healthy mature forest with minimal ash mortality. The northeastern woodland (Figure 3) is mapped as approximately 2.3 ha (6 acres) in size and predominately ash (~80%) with 100% ash mortality. According to the MNR, this northeastern woodland could be considered wetland based on high-level Ecological Land Classification (ELC) mapping (i.e., FOD/SWX). The southernmost woodland (no photo available) is mapped as approximately 10 ha (25 acres) in size and appears predominately healthy.

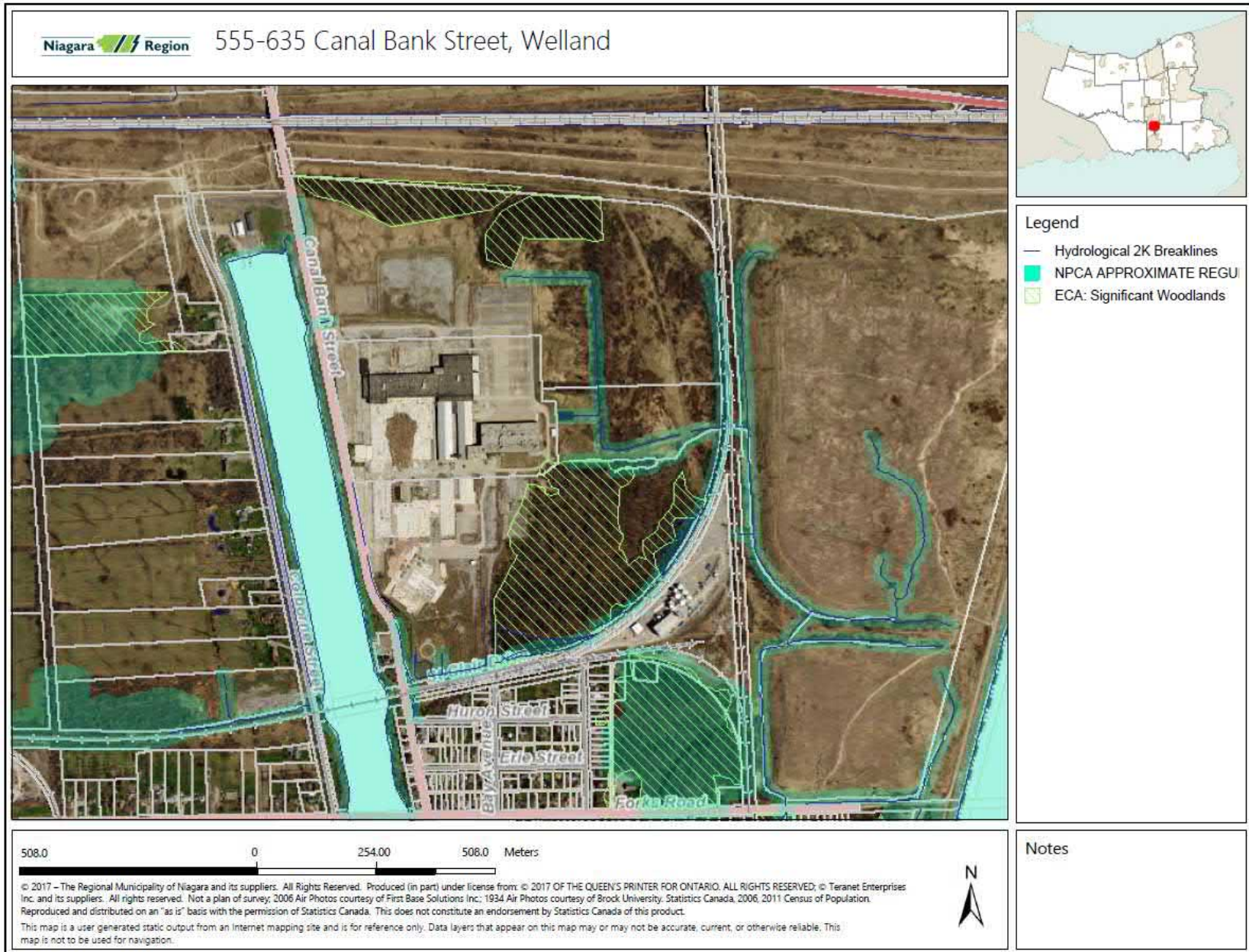




Figure 2: Northwestern woodland with minimal ash mortality.



Figure 3: Northeastern woodland with 100% ash mortality.

Environmental Impact Study

Provincial and Regional policies permit development and site alteration in natural heritage features and on adjacent lands if it has been demonstrated that the proposed development will have no negative impact on the natural heritage feature or its ecological and/or hydrologic functions. An Environmental Impact Study (EIS) should be completed to assess potential impacts of proposed development on the Core Natural Heritage features identified above, as well as any other important environmental features or functions identified through the EIS process, including potential unevaluated wetlands. The purpose of the EIS will be to clearly identify significant environmental constraints, recommend mitigation (and if applicable compensation measures), and provide the information needed by Approval Agencies to determine whether the proposal complies with applicable plans, policies and regulations.

Scope of Work

The EIS shall be completed in accordance with Niagara Region's EIS Guidelines (January 2018). The EIS must be prepared by qualified professionals with relevant environmental expertise, with various field surveys completed by competent, professional experts in the fields relevant to the study components they are addressing.

As described in the EIS Guidelines, the EIS must identify, describe and delineate all significant natural heritage features onsite and their ecological function(s) in order to avoid impacts to them. The EIS should also address the site setting in the broader landscape and its role in any linkages to the broader natural heritage system. It must assess unavoidable impacts of proposed development, the implications of those impacts, recommend mitigation measures to reduce negative impacts, identify specific requirements for restoration or enhancement, and recommend monitoring measures, as applicable.

Additional Details not Specified in the March 25, 2019 TOR

The following additional items, not specifically stated in the preliminary TOR, are required:

- 1) Species at Risk (SAR) Screening: A SAR screening to determine the need for additional SAR surveys in the field, if any, should be completed. Refer to MNRF correspondence for details (Attachment 2).
- 2) Significant Wildlife Habitat (SWH) Screening: A SWH screening against the SWH Criteria Schedules for Ecoregion 7E (MNRF, 2015) should be completed to determine the need for additional field surveys to evaluate candidate SWH, if any. Refer to the example provided (Attachment 3).

Should additional species-specific surveys resulting from the screenings for SAR and SWH be recommended by the consultant, these should also be included in the EIS.

- 3) Feature Delineation: Where ECA boundaries may differ from what is currently mapped, the feature boundaries must be staked and surveyed in the field with the appropriate authority (i.e., Regional, NPCA, MNRF and/or City staff).
- 4) Mapping: Based on the results of the data collection program, it is expected that the EIS will including mapping as follows:
 - a. Delineation and classification of vegetation communities (ELC protocols for Southern Ontario), including dripline/wetland surveys of the site, overlaid on the most recent leaf-off orthoimagery that is of sufficient resolution for clearly showing features at the scale required.
 - b. Natural heritage features fulfilling criteria for Provincial, Regional, Municipal and NPCA significance, individually mapped and overlain on one another. Any proposed changes from what is currently mapped should be clearly identified, along with adequate protection buffers.
 - c. Characterization of all watercourses (i.e., intermittent/permanent, marginal/important/critical fish habitat).
 - d. If threatened or endangered SAR are found on site or within adjacent lands, their locations must be mapped (according to MNRF data sensitivity standards) and the extent of their habitat delineated and approved by MNRF. If Special Concern and S1-S3 species are found on site or within adjacent lands, their locations and habitat extent must also be mapped and included within the assessment to afford appropriate protection to the species or its habitat.
- 5) Reporting: Raw data (e.g., field data sheets) and a copy of all agency correspondence must be included in the EIS as appendices. Any mitigation required by the agencies and key comments should also be summarized in the main body of the EIS report. Submission of electronic copies will suffice.
- 6) Should any supporting studies be undertaken (e.g., stormwater management, geotechnical, hydrogeology, etc.), they should also be integrated in the EIS.

In the absence of a specific development proposal and not knowing what features may be impacted, if any, the following additional items are requested:

- 7) Wetland Characterization: In addition to the “wetland boundaries” task noted in the TOR Table 1, wetland characterization according to the Ontario Wetland Evaluation

System (OWES) is required to evaluate the northeastern woodland for wetland characteristics.

- 8) Watercourse Characterization: The “aquatic habitat assessment” noted in the TOR Table 1 should include characterization of the watercourses onsite (i.e., intermittent/permanent, direct/indirect and marginal/important/critical fish habitat) following the Ontario Stream Assessment Protocol (OSAP).
- 9) Snake Surveys: Snake surveys are required according to the Survey Protocol for Ontario’s Species at Risk Snakes (MNRF, 2016). Milksnake Protocol (MNRF, 2013) is recommended for species that are not at risk.
- 10) Turtle Basking Surveys: Turtle basking surveys are required according to the Blanding’s Turtle Protocol (MNRF, 2015).

Next Steps

If the consultant is of the opinion that one or more of the requirements listed above should not be included within the EIS scope, a reduced scope will be considered if sufficient rationale is provided. The opportunity for refinements to the scope should take place in the form of a finalized TOR to be submitted by the consultant. The finalized TOR could simply be an e-mail acknowledgement of this information and the intention to comply with the requests above and/or the rationale for a reduced scope.

Attachments to covering e-mail:

Att 1: Preliminary TOR

Att 2: MNRF Correspondence

Att 3: SWH Screening Example

Appendix 2. Information Request received from MECP
and MNRF

Tristan Knight

From: Karam, Michelle (MECP) <Michelle.Karam@ontario.ca>
Sent: April 4, 2019 3:23 PM
To: Tristan Knight
Subject: FW: information request - 475/555/635 Canal Bank Street, Welland

Hi Tristan,

To follow up from our phone conversation. As requested here is the reply from the SAROntario account. Any further questions on the file under discussion please feel free to contact me directly. All other enquiries can be sent to SAROntario@ontario.ca.

Kind Regards,

Michelle Karam

Management Biologist

Permissions and Compliance, Species at Risk Branch
Ministry of Environment, Conservation and Parks
(905) 562-0041 phone
(905) 562-1154 fax
michelle.karam@ontario.ca

From: Species at Risk (MECP)
Sent: April 4, 2019 7:08 AM
To: ESA Guelph (MNRF) <ESAGUELPH@ontario.ca>
Cc: Karam, Michelle (MECP) <Michelle.Karam@ontario.ca>
Subject: RE: information request - 475/555/635 Canal Bank Street, Welland

Hi Tristan

Thank you for your email.

Given everything that you have done so far, you have all of the official information that should be available to clients.

At this point, it is advisable to retain the proper experts to carry out what you feel are the necessary site-specific inventories or investigations to determine what species and/or habitat actually exist on the site.

If you have any questions or concerns, please do not hesitate to contact me at paul.heeney@ontario.ca

Thank you.

Paul

From: ESA Guelph (MNRF)
Sent: March 29, 2019 10:10 AM
To: Species at Risk (MECP) <SAROntario@ontario.ca>
Subject: FW: information request - 475/555/635 Canal Bank Street, Welland

From: Tristan Knight <tristan@terrastoryenviro.com>
Sent: March-25-19 4:19 PM
To: ESA Guelph (MNRF) <ESAGUELPH@ontario.ca>
Subject: information request - 475/555/635 Canal Bank Street, Welland

Good Afternoon,

Terrastory has been retained to prepare an Environmental Impact Statement (EIS) in relation to the proposed redevelopment of several parcels (475/555/635 Canal Bank Street) in Welland. By way of this email we request information from MNRF regarding records of species at risk and natural heritage features that may be available for the Study Area or adjacent lands. Please see the attached Information Request Form and map of the Subject Property.

Please note that we have reviewed MNRF's list of SAR for Welland (dated July 2018) and have conducted a preliminary screening of several databases including NHIC "Make-a-Map" and other NHIC data, Ontario Breeding Bird Atlas, Ontario Reptile and Amphibian Atlas, Ontario Butterfly Atlas, DFO Aquatic SAR Mapping, etc. The intent of this information request is to further confirm if MNRF has additional information pertaining to SAR or natural heritage features from the Study Area or adjacent lands.

Thank you,
T.

Tristan Knight M.E.S., M.Sc.
Senior Ecologist | President
Terrastory Environmental Consulting Inc.
(c) 905-745-5398
www.terrastoryenv.com

Tristan Knight

From: ESA Guelph (MNRF) <ESAGUELPH@ontario.ca>
Sent: April 15, 2019 3:42 PM
To: Tristan Knight
Cc: Durst, Joad (MNRF)
Subject: RE: information request - 475/555/635 Canal Bank Street, Welland
Attachments: InfoRequest_555CanalBankStreet.pdf

Hello Tristan,

I have attached a copy of the original natural heritage screening response that was completed for the above-noted site on July 16, 2018 . Please be advised that the Ministry of Environment, Conservation and Parks (MECP) has now assumed responsibly for the Endangered Species Act (ESA), including species at risk (SAR) in Ontario. All future correspondence related to ESA or SAR should be sent to SAROntario@ontario.ca to reach the MECP directly.

Please note that the study area itself may include unevaluated wetlands (in both the Northern and Southern Woodlots) and that they should be examined to determine if these are stand-alone wetland(s) or part of a wetland complex as per the Ontario Wetland Evaluation System (OWES).

Based on our October 9, 2018 site visit, it was clear based on vegetative cover that the Southern woodlot warrants a wetland evaluation using OWES. The Northern woodlot is obviously wetland and needs to have the boundary delineated using OWES. As such, the entire wetland complex will need to be looked at to determine if these woodlots are PSW.

If you have any questions, please don't hesitate to contact me.

Best Regards,

David

David Denyes

Management Biologist
Ministry of Natural Resources and Forestry
Vineland Field Office
4890 Victoria Avenue North
Vineland Station ON, L0R 2E0
Tel: 905 562-1196 Fax: 905 562-1154
david.denyesh@ontario.ca

From: Tristan Knight <tristan@terrastoryenviro.com>
Sent: April 9, 2019 5:03 PM
To: ESA Guelph (MNRF) <ESAGUELPH@ontario.ca>
Cc: Durst, Joad (MNRF) <joad.durst@ontario.ca>
Subject: RE: information request - 475/555/635 Canal Bank Street, Welland

Hi David,

Nice to hear from you. I received a response from MECP in relation to SAR, but it did not capture MNRF's previous screening of the property (which I was unaware had occurred until recently). Any information previously provided by MNRF in relation to SAR and/or natural features on the property would be appreciated.

Cheers,
T.

Tristan Knight M.E.S., M.Sc.
Senior Ecologist | President
Terrastory Environmental Consulting Inc.
(c) 905-745-5398
www.terrastoryenv.com

From: ESA Guelph (MNRF) <ESAGUELPH@ontario.ca>
Sent: April 9, 2019 2:05 PM
To: Tristan Knight <tristan@terrastoryenviro.com>
Cc: Durst, Joad (MNRF) <joad.durst@ontario.ca>
Subject: RE: information request - 475/555/635 Canal Bank Street, Welland

Hello Tristan,

The Ministry of Natural Resources and Forestry (MNRF) previously completed a screening for this site back on July 16, 2018. Can you please advise if that information got passed along to you?

Furthermore, was there anything specific that you needed from the Ministry pertaining to natural heritage features for this site?

Regards,

David

David Denyes
Management Biologist
Ministry of Natural Resources and Forestry
Vineland Field Office
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david.denyas@ontario.ca

From: Tristan Knight <tristan@terrastoryenviro.com>
Sent: March-25-19 4:19 PM
To: ESA Guelph (MNRF) <ESAGUELPH@ontario.ca>
Subject: information request - 475/555/635 Canal Bank Street, Welland

Good Afternoon,

Terrastory has been retained to prepare an Environmental Impact Statement (EIS) in relation to the proposed redevelopment of several parcels (475/555/635 Canal Bank Street) in Welland. By way of this email we request information from MNRF regarding records of species at risk and natural heritage features that may be available for the Study Area or adjacent lands. Please see the attached Information Request Form and map of the Subject Property.

Please note that we have reviewed MNRF's list of SAR for Welland (dated July 2018) and have conducted a preliminary screening of several databases including NHIC "Make-a-Map" and other NHIC data, Ontario Breeding

Bird Atlas, Ontario Reptile and Amphibian Atlas, Ontario Butterfly Atlas, DFO Aquatic SAR Mapping, etc. The intent of this information request is to further confirm if MNRF has additional information pertaining to SAR or natural heritage features from the Study Area or adjacent lands.

Thank you,
T.

Tristan Knight M.E.S., M.Sc.
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Appendix 3. Representative Photographs



Photo 1. Gravel trail through the Study Area looking south towards St. Clair Drive with dense *Phragmites* (7 April 2019).



Photo 2. Standing water (vernal pool) in the Southern Slough Forest (7 April 2019).



Photo 3. Standing water (vernal pool) in the Northern Slough Forest (18 April 2019).

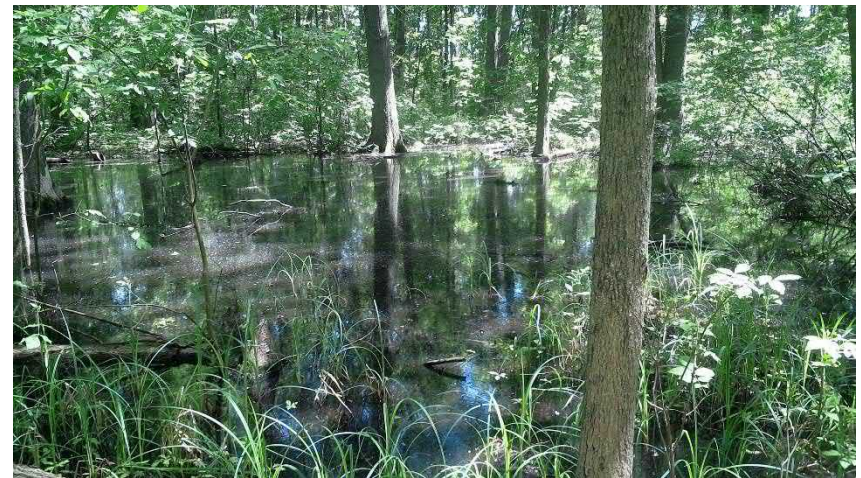


Photo 4. Standing water (vernal pool) in the Southern Slough Forest (12 June 2019).



Photo 5. Many of the vernal pools within and outside the Slough Forest dry out by July, as shown here (15 July 2019).



Photo 6. Many of the vernal pools within and outside the Slough Forest dry out by July, as shown here (18 July 2019).

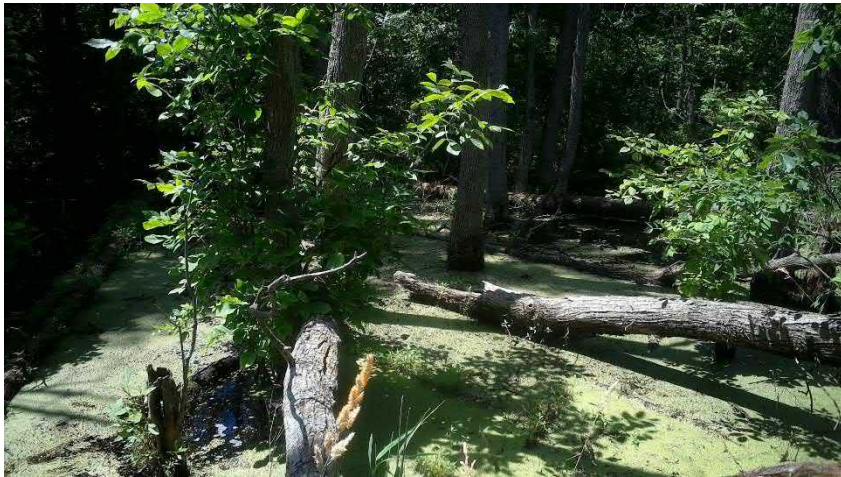


Photo 7. Some areas within the southeastern portion of the Northern Slough Forest retain water semi-permanently (15 July 2019).



Photo 8. Some areas within the southeastern portion of the Northern Slough Forest retain water semi-permanently (17 September 2019).



Photo 9. One of the many constructed drainage features actively draining the Slough Forests (30 April 2019).



Photo 10. Upland component of the Southern Slough Forest (12 June 2019).



Photo 11. Designated Watercourse looking east (18 April 2019).



Photo 12. Designated Watercourse looking south, mostly dry by mid-summer in 2019 (18 July 2019).



Photo 13. Gravel trail through the Eastern Disturbed Area looking north showing significant fill (left side) and stands of *Phragmites* (7 April 2019).



Photo 14. Stand of *Phragmites* in the Eastern Disturbed Area (7 April 2019).



Photo 15. Southern Pond (18 April 2019).

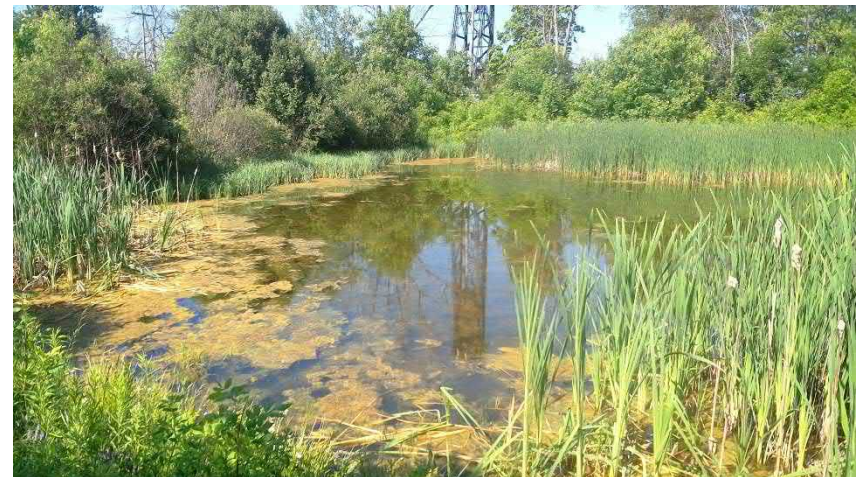


Photo 16. Southern Pond (21 June 2019).



Photo 17. Significant ash dieback and mortality in the Eastern Disturbed Area (24 July 2019).



Photo 18. Meadow in the southern portion of the Study Area looking north (21 June 2019).



Photo 19. Marshes along the southern edge of the Northern Slough Forest (15 July 2019).



Photo 20. Juvenile Red-tailed Hawk and nest in the Northern Slough Forest (16 May 2019).



Photo 21. Recently fledged Great Horned Owl in the Northern Slough Forest (16 May 2019).



Photo 22. Endangered Spoon-leaved Moss (7 April 2019).



Photo 23. Stand of provincially rare Yellow-fruited Sedge looking east with the Northern Slough Forest on the left (26 July 2019).



Photo 24. Provincially rare Tapered Rush (26 July 2019).



Photo 25. Two Milksnakes and one Eastern Garter Snake beneath a cover object (3 June 2019).

Appendix 4. Drainage Feature and Aquatic Assessment

Station ID ¹	Date Assessed	Physical Conditions	Aquatic Habitat Conditions	Comments
AQ-1	18 April 2019	Bankfull Width: 320 cm Wetted Width: 285 cm Bank Height: 75 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 75 cm Water Temp. (Air Temp.): 13°C (18°C)	In-stream Cover: none Aquatic Vegetation: <i>Phragmites australis</i> ssp. <i>australis</i> , <i>Lythrum salicaria</i> Riparian Vegetation (<2 m from channel): <i>Salix atrocinerea</i> , <i>Quercus macrocarpa</i> Observed Aquatic Species: none	Constructed channel draining on-site wetlands; water stagnant (no flow) during April OSAP investigation.
AQ-2	18 April 2019	Bankfull Width: 120 cm Wetted Width: 100 cm Bank Height: 15 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 8 cm Water Temp. (Air Temp.): 13°C (18°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): <i>Poa pratensis</i> , <i>Dipsacus fullonum</i> Observed Aquatic Species: none	Constructed channel draining on-site wetlands; water stagnant (no flow) during April OSAP investigation.
AQ-3	18 April 2019	Bankfull Width: 220 cm Wetted Width: 175 cm Bank Height: 15 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus (overlain by iron precipitates) Flow/Velocity: stagnant Max. Water Depth (thalweg): 10 cm Water Temp. (Air Temp.): 12°C (18°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): <i>Quercus rubra</i> , <i>Quercus macrocarpa</i> , <i>Quercus palustris</i> , <i>Cornus racemosa</i> Observed Aquatic Species: none	Constructed channel draining on-site wetlands; water stagnant (no flow) during April OSAP investigation. Iron precipitates and sheen suggest possible high groundwater table.
AQ-4	18 April 2019	Bankfull Width: 160 cm Wetted Width: 65 cm Bank Height: 60 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: 5 mm hydraulic head (approx. 0.3 m/sec) Max. Water Depth (thalweg): 10 cm Water Temp. (Air Temp.): 12°C (16°C)	In-stream Cover: none Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): <i>Ulmus americana</i> , <i>Salix</i> sp., bryophytes, pasture grasses Observed Aquatic Species: Water Scavenger Beetle (Hydrophiloidea)	Constructed channel draining on-site wetlands; water stagnant (no flow) during April OSAP investigation.

Station ID ¹	Date Assessed	Physical Conditions	Aquatic Habitat Conditions	Comments
AQ-5	18 April 2019	Bankfull Width: 125 cm Wetted Width: 20 cm Bank Height: 25 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 5 cm Water Temp. (Air Temp.): 12°C (17°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): pasture grasses, <i>Fragaria virginiana</i> Observed Aquatic Species: none	Constructed channel draining on-site wetlands; water stagnant (no flow) during April OSAP investigation.
AQ-6	18 April 2019	Bankfull Width: 400 cm Wetted Width: 270 cm Bank Height: 25 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 18 cm Water Temp. (Air Temp.): 12°C (17°C)	In-stream Cover: none Aquatic Vegetation: <i>Phragmites australis</i> Riparian Vegetation (<2 m from channel): <i>Salix atrocinerea</i> , <i>Cornus racemosa</i> , pasture grasses Observed Aquatic Species: none	Constructed channel draining on-site wetlands; water stagnant (no flow) during April OSAP investigation.
AQ-7	18 April 2019	Bankfull Width: 110 cm Wetted Width: 85 cm Bank Height: 20 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: barely perceptible flow (<0.1 m/sec) Max. Water Depth (thalweg): 10 cm Water Temp. (Air Temp.): 12°C (17°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): <i>Salix atrocinerea</i> , <i>Pyrus communis</i> , pasture grasses Observed Aquatic Species: none	Constructed channel draining on-site wetlands; water stagnant (no flow) during April OSAP investigation.
AQ-8	18 April 2019	Bankfull Width: 125 cm Wetted Width: 75 cm Bank Height: 25 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 12 cm Water Temp. (Air Temp.): 12°C (17°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): <i>Phalaris arundinacea</i> Observed Aquatic Species: none	Constructed channel draining on-site wetlands; water stagnant (no flow) during April OSAP investigation.

Station ID ¹	Date Assessed	Physical Conditions	Aquatic Habitat Conditions	Comments
AQ-9	18 April 2019	Bankfull Width: 110 cm Wetted Width: 80 cm Bank Height: 15 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 10 cm Water Temp. (Air Temp.): 12°C (17°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): <i>Fraxinus pennsylvanica</i> , <i>Cornus racemosa</i> , <i>Crataegus</i> sp. Observed Aquatic Species: none	Constructed channel draining on-site wetlands; stagnant water in channel observed to be at the same level as sloughs to the north (i.e., indicating the sloughs are actively being drained) during April OSAP investigation.
AQ-10	18 April 2019	Bankfull Width: 170 cm Wetted Width: 130 cm Bank Height: 20 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 28 cm Water Temp. (Air Temp.): 12°C (17°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): <i>Populus deltoides</i> , pasture grasses Observed Aquatic Species: none	Constructed channel; water stagnant (no flow) during April OSAP investigation.
AQ-11	18 April 2019	Bankfull Width: 120 cm Wetted Width: 105 cm Bank Height: 15 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 8 cm Water Temp. (Air Temp.): 12°C (17°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: <i>Phragmites australis</i> , <i>Lythrum salicaria</i> Riparian Vegetation (<2 m from channel): Pasture grasses, <i>Salix</i> sp. Observed Aquatic Species: none	Constructed channel; water stagnant (no flow) during April OSAP investigation.
AQ-12	18 April 2019	Bankfull Width: 440 cm Wetted Width: 410 cm Bank Height: 15 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: some fibric organics over clay Flow/Velocity: stagnant Max. Water Depth (thalweg): 22 cm Water Temp. (Air Temp.): 12°C (17°C)	In-stream Cover: none. Aquatic Vegetation: <i>Phragmites australis</i> Riparian Vegetation (<2 m from channel): <i>Salix atrocinerea</i> , <i>Cornus racemosa</i> , pasture grasses Observed Aquatic Species: none	Constructed channel draining on-site wetlands; water stagnant (no flow) during April OSAP investigation.
AQ-13	18 April 2019	Bankfull Width: 140 cm Wetted Width: 85 cm Bank Height: 30 cm	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none	Constructed channel; channel aligned along margin of railway embankment.

Station ID ¹	Date Assessed	Physical Conditions	Aquatic Habitat Conditions	Comments
		<p>Bank Stability: right-stable, left-stable Substrates: 50% sand, 50% gravel (sand/gravel likely represents influence from adjacent railway embankment) Flow/Velocity: 5 mm hydraulic head (~0.3 m/sec) Max. Water Depth (thalweg): 3 cm Water Temp. (Air Temp.): 11°C (20°C)</p>	<p>Riparian Vegetation (<2 m from channel): <i>Fraxinus pennsylvanica</i>, <i>Prunus virginiana</i>, <i>Alliaria petiolata</i> Observed Aquatic Species: none</p>	
AQ-14	18 April 2019	<p>Bankfull Width: 240 cm Wetted Width: 200 cm Bank Height: 10 cm (not including railway embankment) Bank Stability: right-stable, left-stable Substrates: clay and detritus Flow/Velocity: minimal flow (<0.1 m/sec) Max. Water Depth (thalweg): 10 cm Water Temp. (Air Temp.): 11°C (20°C)</p>	<p>In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): <i>Agrostis gigantea</i>, <i>Cornus racemosa</i>, dead <i>Fraxinus pennsylvanica</i> Observed Aquatic Species: none</p>	Constructed channel; channel aligned along margin of railway embankment.
AQ-15	18 April 2019	<p>Bankfull Width: 200 cm Wetted Width: 120 cm Bank Height: 20 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: 30% large gravel, 70% muck and detritus (gravel likely represents influence from adjacent railway embankment) Flow/Velocity: 10 mm hydraulic head (~0.4 m/sec) Max. Water Depth (thalweg): 7 cm Water Temp. (Air Temp.): 11°C (19°C)</p>	<p>In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): <i>Pyrus communis</i>, <i>Prunus virginiana</i>, <i>Cornus amomum</i> Observed Aquatic Species: none</p>	Constructed channel draining on-site wetlands; channel aligned along margin of railway embankment.
AQ-16	18 April 2019	<p>Bankfull Width: 200 cm Wetted Width: 130 cm Bank Height: 35 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: 5 mm hydraulic head (~0.2 m/sec) Max. Water Depth (thalweg): 12 cm Water Temp. (Air Temp.): 11°C (19°C)</p>	<p>In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): <i>Salix x fragilis</i>, <i>Fraxinus pennsylvanica</i>, <i>Cornus racemosa</i> Observed Aquatic Species: none</p>	Constructed channel draining on-site wetlands; several culverts surrounding station though only some of which appear to convey flows.

Station ID ¹	Date Assessed	Physical Conditions	Aquatic Habitat Conditions	Comments
AQ-17	18 April 2019	Bankfull Width: 130 cm Wetted Width: 100 cm Bank Height: 20 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: barely perceptible flow (<0.1 m/sec) Max. Water Depth (thalweg): 9 cm Water Temp. (Air Temp.): 12°C (19°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): Pasture grasses, <i>Centaurea</i> sp., <i>Fraxinus pennsylvanica</i> , <i>Salix atrocinerea</i> Observed Aquatic Species: none	Constructed channel draining on-site wetlands.
AQ-18	18 April 2019	Bankfull Width: n/a Wetted Width: 70 cm Bank Height: 30 cm Bank Stability: right-stable (riprap), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 4 cm Water Temp. (Air Temp.): 13°C (19°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): <i>Symphytotrichum lanceolatum</i> , pasture grasses Observed Aquatic Species: none	Constructed channel in former parking lot; water stagnant (no flow) during April OSAP investigation.
AQ-19	18 April 2019	Bankfull Width: 100 cm Wetted Width: 75 cm Bank Height: 5 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 6 cm Water Temp. (Air Temp.): 13°C (19°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): pasture grasses, <i>Fraxinus pennsylvanica</i> Observed Aquatic Species: none	Constructed channel.
AQ-20	18 April 2019	Bankfull Width: 110 cm Wetted Width: 80 cm Bank Height: 15 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 4 cm Water Temp. (Air Temp.): 13°C (18°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): pasture grasses, <i>Fraxinus pennsylvanica</i> Observed Aquatic Species: none	Constructed channel.
AQ-21	18 April 2019	Bankfull Width: 240 cm Wetted Width: 145 cm	In-stream Cover: none (not fish habitat) Aquatic Vegetation: <i>Typha angustifolia</i>	Constructed channel; flow conveyed west towards pond.

Station ID ¹	Date Assessed	Physical Conditions	Aquatic Habitat Conditions	Comments
		Bank Height: 15 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: barely perceptible flow (<0.1 m/sec) Max. Water Depth (thalweg): 8 cm Water Temp. (Air Temp.): 12°C (20°C)	Riparian Vegetation (<2 m from channel): pasture grasses, <i>Salix atrocinerea</i> Observed Aquatic Species: none	
AQ-22	30 April 2019	Bankfull Width: 320 cm Wetted Width: 220 cm Bank Height: 25 cm Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: stagnant Max. Water Depth (thalweg): 10 cm Water Temp. (Air Temp.): 12°C (20°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: none Riparian Vegetation (<2 m from channel): pasture grasses, <i>Dipsacus fullonum</i> , <i>Fraxinus pennsylvanica</i> Observed Aquatic Species: none	Constructed channel in former built areas; water stagnant (no flow) during April OSAP investigation.
AQ-23	30 April 2019	Bankfull Width: 275 cm Wetted Width: 140 cm wetted width Bank Height: n/a (no discrete bank inflection) Bank Stability: right-stable (deposition zone), left-stable (deposition zone) Substrates: clay and detritus Flow/Velocity: barely perceptible flow (<0.1 m/sec) Max. Water Depth (thalweg): 17 cm Water Temp. (Air Temp.): 13°C (20°C)	In-stream Cover: none (not fish habitat) Aquatic Vegetation: <i>Typha angustifolia</i> Riparian Vegetation (<2 m from channel): pasture grasses Observed Aquatic Species: none	Constructed channel draining on-site wetlands; some flow at this station (nearby stations stagnant) during April OSAP investigation.

¹ Locations of drainage channel morphology stations are shown in **Figure 3**.

Appendix 5. Vegetation Community Characterization

Community Series	Ecosite / Vegetation Type ¹	Dominant Vegetation ²	Coverage by Dominant Vegetation Layer	Substrate	Slope Position	Comments
UPLAND						
Deciduous Forest	FODM7-2-a	Canopy: Green Ash (<i>Fraxinus pennsylvanica</i>), Bur Oak (<i>Quercus macrocarpa</i>). Sub-canopy: Hawthorns (<i>Crataegus</i> spp.), Green Ash (<i>Fraxinus pennsylvanica</i>), Grey Dogwood (<i>Cornus racemosa</i>), American Hazelnut (<i>Corylus americana</i>). Shrub/Regenerating: Green Ash (<i>Fraxinus pennsylvanica</i>), Grey Dogwood (<i>Cornus racemosa</i>), American Hazelnut (<i>Corylus americana</i>). Herbaceous: Spotted Jewelweed (<i>Impatiens capensis</i>), Enchanters Nightshade (<i>Circaea canadensis</i>).	70%	Silty clay (mottling at 10 cm)	Flat bottomland	Community is part of the Slough Forest but does not contain a wetland component. Hawthorns had finished flowering by the time of vegetation community mapping and therefore generally were not identified to species though several were documented in the early summer including Long-thorned Hawthorn (<i>Crataegus macracantha</i>), Pear Hawthorn (<i>Crataegus calpodendron</i>), Dotted Hawthorn (<i>Crataegus punctata</i>), and Cockspur Hawthorn (<i>Crataegus crus-galli</i>).
Deciduous Forest	FODM7-2-b	Canopy: Green Ash (<i>Fraxinus pennsylvanica</i>), Green Ash snags, Eastern Cottonwood (<i>Populus deltoides</i>), Pin Oak (<i>Quercus palustris</i>). Sub-canopy: Green Ash (<i>Fraxinus pennsylvanica</i>), Eastern Cottonwood (<i>Populus deltoides</i>). Shrub/Regenerating: Grey Dogwood (<i>Cornus racemosa</i>), European Buckthorn (<i>Rhamnus cathartica</i>), Multiflora Rose (<i>Rosa multiflora</i>). Herbaceous: Common Reed (<i>Phragmites australis</i> spp. <i>australis</i>), White Avens (<i>Geum canadense</i>), Enchanters Nightshade (<i>Circaea canadensis</i>), Fowl Manna Grass (<i>Glyceria striata</i>).	60%	Silty clay	Flat bottomland	Ash dieback has created a patchwork of canopy gaps. Community is second-growth with well-established non-native shrubs. Several vernal pools are present but are generally shallow, small, and do not support significant Anuran breeding populations.
Deciduous Forest	FODM7-2-c	Canopy: Green Ash (<i>Fraxinus pennsylvanica</i>), Red Maple (<i>Acer rubrum</i>), White Ash (<i>Fraxinus americana</i>), White Elm (<i>Ulmus americana</i>), Eastern Cottonwood (<i>Populus deltoides</i>). Sub-canopy: White Elm (<i>Ulmus americana</i>), Green Ash (<i>Fraxinus pennsylvanica</i>). Shrub/Regenerating: Grey Dogwood (<i>Cornus racemosa</i>), Glossy Buckthorn (<i>Frangula alnus</i>), Narrow-leaved Meadowsweet (<i>Spiraea alba</i>). Herbaceous: Tall Agrimony (<i>Agrimonia gryposepala</i>), Jumpseed (<i>Persicaria virginiana</i>), Black Snakeroot (<i>Sanicula marilandica</i>), Rough-leaved Goldenrod (<i>Solidago rugosa</i>), Virginia Creeper (<i>Parthenocissus quinquefolia</i>), White Avens (<i>Geum canadense</i>), Enchanters Nightshade (<i>Circaea canadensis</i>).	60%	Silty clay	Flat bottomland	Community is second-growth and appears to have been farmed in 1934 based on historical aerial photographs. While some vernal pools remain, original slough topography appears to have been partially homogenized by tilling. Some areas moister and more open due to Ash canopy dieback and shallow standing water in spring.
Deciduous Forest	FODM7-2-d	Canopy: Green Ash (<i>Fraxinus pennsylvanica</i>), Green Ash snags, Manitoba Maple (<i>Acer negundo</i>), Large-toothed Aspen (<i>Populus grandidentata</i>). Sub-canopy: Green Ash (<i>Fraxinus pennsylvanica</i>). Shrub/Regenerating: Green Ash (<i>Fraxinus pennsylvanica</i>), Grey Dogwood (<i>Cornus racemosa</i>), Black Raspberry (<i>Rubus occidentalis</i>), Staghorn Sumac (<i>Rhus typhina</i>). Herbaceous: Enchanters Nightshade (<i>Circaea canadensis</i>), Garlic Mustard (<i>Alliaria petiolata</i>), Virginia Creeper (<i>Parthenocissus quinquefolia</i>).	60%	Silty clay	Upper/middle	Community slopes eastward toward swamp.
Deciduous Forest	FODM9-6	Canopy: Shagbark Hickory (<i>Carya ovata</i>), Pin Oak (<i>Quercus palustris</i>), Red Oak (<i>Quercus rubra</i>), Bur Oak (<i>Quercus macrocarpa</i>), Green Ash (<i>Fraxinus pennsylvanica</i>). Sub-canopy: Pin Oak (<i>Quercus palustris</i>), Green Ash (<i>Fraxinus pennsylvanica</i>), Musclewood (<i>Carpinus caroliniana</i>), Hawthorns (<i>Crataegus</i> spp.). Shrub/Regenerating: Poison-ivy (<i>Toxicodendron radicans</i>), Pin Oak (<i>Quercus palustris</i>), Grey Dogwood (<i>Cornus racemosa</i>), Wild Grape (<i>Vitis riparia</i>). Herbaceous: Spotted Jewelweed (<i>Impatiens capensis</i>), Enchanters Nightshade (<i>Circaea canadensis</i>), White Avens (<i>Geum canadense</i>), Jumpseed (<i>Persicaria virginiana</i>), Spotted Geranium (<i>Geranium maculatum</i>).	65%	Silty clay (mottling at 10 cm)	Flat bottomland	Community represents the upland dominated component of the Slough Forest.
Deciduous Woodland	WODM5-a	Canopy: Green Ash (<i>Fraxinus pennsylvanica</i>), dead Green Ash (<i>Fraxinus pennsylvanica</i>), Pin Oak (<i>Quercus palustris</i>). Sub-canopy: Green Ash (<i>Fraxinus pennsylvanica</i>), dead Green Ash (<i>Fraxinus pennsylvanica</i>), Pin Oak (<i>Quercus palustris</i>). Shrub/Regenerating: Green Ash (<i>Fraxinus pennsylvanica</i>), European Buckthorn (<i>Rhamnus cathartica</i>), Hawthorns (<i>Crataegus</i> spp.), Grey Dogwood (<i>Cornus racemosa</i>), Narrow-leaved Meadowsweet (<i>Spiraea alba</i>). Herbaceous: Jumpseed (<i>Persicaria virginiana</i>), Enchanters Nightshade (<i>Circaea canadensis</i>), Rough-leaved Goldenrod (<i>Solidago rugosa</i>), Fowl Meadow Grass (<i>Glyceria striata</i>), Virginia Creeper (<i>Parthenocissus quinquefolia</i>), Spotted Jewelweed (<i>Impatiens capensis</i>), White Avens (<i>Geum canadense</i>), Common Woodland Sedge (<i>Carex blanda</i>).	35%	Silty clay	Flat bottomland	Green Ash in canopy is succeeding to Pin Oak and/or thicket vegetation due to larval feeding by Emerald Ash Borer.
Deciduous Woodland	WODM5-b	Canopy: Eastern Cottonwood (<i>Populus deltoides</i>), Green Ash (<i>Fraxinus pennsylvanica</i>), dead Green Ash (<i>Fraxinus pennsylvanica</i>), Pin Oak (<i>Quercus palustris</i>), Hybrid Crack Willow (<i>Salix x fragilis</i>).	45%	Clay (mottles at 10 cm)	Flat bottomland	Green Ash in canopy is succeeding to Eastern Cottonwood, Pin Oak, and/or thicket vegetation due to larval feeding by Emerald Ash Borer. Portions of

Community Series	Ecosite / Vegetation Type ¹	Dominant Vegetation ²	Coverage by Dominant Vegetation Layer	Substrate	Slope Position	Comments
		<u>Sub-canopy:</u> Eastern Cottonwood (<i>Populus deltoides</i>), Green Ash (<i>Fraxinus pennsylvanica</i>), dead Green Ash (<i>Fraxinus pennsylvanica</i>), Common Pear (<i>Pyrus communis</i>). <u>Shrub/Regenerating:</u> Grey Dogwood (<i>Cornus racemosa</i>), Grey Willow (<i>Salix atrocinerea</i>), Red Raspberry (<i>Rubus idaeus</i>). <u>Herbaceous:</u> Tall Goldenrod (<i>Solidago altissima</i>), White Sweet Clover (<i>Melilotus albus</i>), Birds-foot Tre-foil (<i>Lotus corniculatus</i>), Redtop (<i>Agrostis gigantea</i>), New England Aster (<i>Symphotrichum novae-angliae</i>) Cow Vetch (<i>Vicia cracca</i>), Common Reed (<i>Phragmites australis</i> spp. <i>australis</i>).				community along the drainage feature contain seasonal standing water and occupation by hydrophytic vegetation.
Deciduous Woodland	WODM5-c	<u>Canopy:</u> Common Pear (<i>Pyrus communis</i>), Green Ash (<i>Fraxinus pennsylvanica</i>), dead Green Ash (<i>Fraxinus pennsylvanica</i>), Pin Oak (<i>Quercus palustris</i>). <u>Sub-canopy:</u> Green Ash (<i>Fraxinus pennsylvanica</i>). <u>Shrub/Regenerating:</u> Green Ash (<i>Fraxinus pennsylvanica</i>), European Buckthorn (<i>Rhamnus cathartica</i>), Hawthorns (<i>Crataegus</i> spp.), Grey Dogwood (<i>Cornus racemosa</i>), Narrow-leaved Meadowsweet (<i>Spiraea alba</i>). <u>Herbaceous:</u> Jumpseed (<i>Persicaria virginiana</i>), Enchanters Nightshade (<i>Circaea canadensis</i>), Rough-leaved Goldenrod (<i>Solidago rugosa</i>), Fowl Meadow Grass (<i>Glyceria striata</i>), Heal-all (<i>Prunella vulgaris</i>), Virginia Creeper (<i>Parthenocissus quinquefolia</i>), Yellow Wood-sorrel (<i>Oxalis stricta</i>), White Avens (<i>Geum canadense</i>), Rough Avens (<i>Geum laciniatum</i>), Strawberry (<i>Fragaria virginiana</i>).	40%	Clay (mottling at 10 cm)	Flat bottomland	Green Ash in canopy is succeeding to Common Pear and/or thicket vegetation due to larval feeding by Emerald Ash Borer. Community is distinguished in part by high percentage of Common Pear in the canopy.
Deciduous Savanna	SVDM4	<u>Canopy:</u> Green Ash (<i>Fraxinus pennsylvanica</i>), dead Green Ash (<i>Fraxinus pennsylvanica</i>), Pin Oak (<i>Quercus palustris</i>) <u>Sub-canopy:</u> Green Ash (<i>Fraxinus pennsylvanica</i>) <u>Shrub/Regenerating:</u> Green Ash (<i>Fraxinus pennsylvanica</i>), European Buckthorn (<i>Rhamnus cathartica</i>), Hawthorns (<i>Crataegus</i> spp.), Grey Dogwood (<i>Cornus racemosa</i>), Narrow-leaved Meadowsweet (<i>Spiraea alba</i>)	25%	Clay	Flat bottomland	Very scrubby and young.
Deciduous Thicket	THDM2-4	<u>Canopy:</u> Green Ash (<i>Fraxinus pennsylvanica</i>), Eastern Cottonwood (<i>Populus deltoides</i>). <u>Shrub/Regenerating:</u> Grey Dogwood (<i>Cornus racemosa</i>), Green Ash (<i>Fraxinus pennsylvanica</i>), European Buckthorn (<i>Rhamnus cathartica</i>), Hawthorns (<i>Crataegus</i> spp.) <u>Herbaceous:</u> Common Reed (<i>Phragmites australis</i> spp. <i>australis</i>), Enchanters Nightshade (<i>Circaea canadensis</i>), Calico Aster (<i>Symphotrichum lateriflorum</i>), White Avens (<i>Geum canadense</i>), Kentucky Blue Grass (<i>Poa pratensis</i>).	70%	Silty clay	Flat bottomland	Grey Dogwood forms a dense monotypic stand in some areas. Tree cover is roughly 5%.
Deciduous Thicket	THDM4	<u>Shrub/Regenerating:</u> Green Ash (<i>Fraxinus pennsylvanica</i>), Grey Dogwood (<i>Cornus racemosa</i>). <u>Herbaceous:</u> Wild Carrot (<i>Daucus carota</i>), Kentucky Blue Grass (<i>Poa pratensis</i>), Tall Goldenrod (<i>Solidago altissima</i>).	Variable but above 35%	Silty clay	Flat bottomland	Community generally represents scrubby regenerating Green Ash and Grey Dogwood at the edge of a forest/woodland community.
Deciduous Thicket	THDM5-a	<u>Shrub/Regenerating:</u> Grey Willow (<i>Salix atrocinerea</i>), Glossy Buckthorn (<i>Frangula alnus</i>), Grey Dogwood (<i>Cornus racemosa</i>), Sandbar Willow (<i>Salix interior</i>), Narrow-leaved Meadowsweet (<i>Spiraea alba</i>), Green Ash (<i>Fraxinus pennsylvanica</i>). <u>Herbaceous:</u> Reed-canary Grass (<i>Phalaris arundinacea</i>), Strawberry (<i>Fragaria virginiana</i>), Heal-all (<i>Prunella vulgaris</i>), Panicked Aster (<i>Symphotrichum lanceolatum</i>), White Avens (<i>Geum canadense</i>), New England Aster (<i>Symphotrichum novae-angliae</i>), Kentucky Blue Grass (<i>Poa pratensis</i>), Tall Goldenrod (<i>Solidago altissima</i>).	35%	Silty clay (mottling at 5 cm)	Flat bottomland	Community dominated by invasive Grey Willow (<i>Salix atrocinerea</i>) occupying historically farmed areas (based on 1934 aerial photograph) and previously maintained/cut areas (based on 2003 aerial photograph).
Deciduous Thicket	THDM5-b	<u>Shrub/Regenerating:</u> Grey Dogwood (<i>Cornus racemosa</i>), Green Ash (<i>Fraxinus pennsylvanica</i>), Common Pear (<i>Pyrus communis</i>), European Buckthorn (<i>Rhamnus cathartica</i>), Silky Dogwood (<i>Cornus amomum</i>). <u>Herbaceous:</u> Cow Vetch (<i>Vicia cracca</i>), Meadow Fescue (<i>Lolium arundinaceum</i>), Birds-foot Trefoil (<i>Lotus corniculatus</i>), Ox-eye Daisy (<i>Leucanthemum vulgare</i>), Compressed Blue Grass (<i>Poa compressa</i>), Graceful Sedge (<i>Carex gracillima</i>).	30%	Fill?	Flat bottomland	Flat knoll topographically above the adjacent woodlands (overlying fill materials?).
Deciduous Thicket	THDM5-1	<u>Shrub/Regenerating:</u> Grey Dogwood (<i>Cornus racemosa</i>), Grey Willow (<i>Salix atrocinerea</i>), Common Pear (<i>Pyrus communis</i>), Black Raspberry (<i>Rubus occidentalis</i>). <u>Herbaceous:</u> St. John's Wort (<i>Hypericum perforatum</i>), Meadow Fescue (<i>Lolium arundinaceum</i>), Kentucky Blue Grass (<i>Poa pratensis</i>), Cow Vetch (<i>Vicia cracca</i>), Virginia Creeper (<i>Parthenocissus quinquefolia</i>), Calico Aster (<i>Symphotrichum lateriflorum</i>), Common Woodland Sedge (<i>Carex blanda</i>).	50%	Silty clay	Flat bottomland	Grey Dogwood (<i>Cornus racemosa</i>) dominated thickets.
Meadow	MEGM4-1	<u>Herbaceous:</u> Reed-canary Grass (<i>Phalaris arundinacea</i>), Kentucky Blue Grass (<i>Poa pratensis</i>), Purple Loosestrife (<i>Lythrum salicaria</i>), Redtop (<i>Agrostis gigantea</i>), Canada Thistle (<i>Cirsium arvense</i>).	95%	Silty clay and fill(?)	Flat bottomland	Reed-canary Grass (<i>Phalaris arundinacea</i>) dominated meadows.

Community Series	Ecosite / Vegetation Type ¹	Dominant Vegetation ²	Coverage by Dominant Vegetation Layer	Substrate	Slope Position	Comments
Meadow	MEMM3-a	Herbaceous: Meadow Fescue (<i>Lolium arundinaceum</i>), Reed-canary Grass (<i>Phalaris arundinacea</i>), Canada Thistle (<i>Cirsium arvense</i>), Kentucky Blue Grass (<i>Poa pratensis</i>), Birds-foot Tre-foil (<i>Lotus corniculatus</i>), Teasel (<i>Dipsacus fullonum</i>), Timothy (<i>Phleum pratense</i>), Quackgrass (<i>Elymus repens</i>), Common Milkweed (<i>Asclepias syriaca</i>).	95%	Fill (?)	Upper/middle	Community is slightly topographically elevated and slopes northward/eastward towards MEMM4.
Meadow	MEMM3-b	Herbaceous: Meadow Fescue (<i>Lolium arundinaceum</i>), Frost Aster (<i>Symphyotrichum pilosum</i>), Birds-foot Tre-foil (<i>Lotus corniculatus</i>), Timothy (<i>Phleum pratense</i>), White Sweet Clover (<i>Melilotus albus</i>), Kentucky Blue Grass (<i>Poa pratensis</i>).	95%	Silty clay and fill?	Middle/bottom	Southern portion of community was previously filled and occurs along a north/south trending slope raised above the adjacent MEMM4 communities.
Meadow	MEMM3-c	Herbaceous: Meadow Fescue (<i>Lolium arundinaceum</i>), Poverty Oat Grass (<i>Danthonia spicata</i>), Frost Aster (<i>Symphyotrichum pilosum</i>), Birds-foot Tre-foil (<i>Lotus corniculatus</i>), Timothy (<i>Phleum pratense</i>), White Sweet Clover (<i>Melilotus albus</i>).	90%	Silty clay	Flat bottomland	Community is distinguishable from other on-site meadows but the abundance of Poverty Oat Grass (<i>Danthonia spicata</i>).
Meadow	MEMM3-d	Herbaceous: Redtop (<i>Agrostis gigantea</i>), Frost Aster (<i>Symphyotrichum pilosum</i>), Wild Carrot (<i>Daucus carota</i>), White Sweet Clover (<i>Melilotus albus</i>).	65%	Silty clay	Fill/gravel	Area occupied by this community was heavily disturbed as part of previous manufacturing activities. Community has been naturalizing since 2009, although areas with surficial gravel still exhibit limited vegetation established. Cottonwood (<i>Populus deltoides</i>) regeneration is scattered but widespread.
Meadow	MEMM4-a	Herbaceous: Redtop (<i>Agrostis gigantea</i>), Kentucky Blue Grass (<i>Poa pratensis</i>), Meadow Fescue (<i>Lolium arundinaceum</i>), Teasel (<i>Dipsacus fullonum</i>), Dudley's Rush (<i>Juncus dudleyi</i>), Fox Sedge (<i>Carex vulpinoidea</i>), Quackgrass (<i>Elymus repens</i>), Quill Sedge (<i>Carex tenera</i>).	95%	Silty clay	Flat bottomland	Community was previously maintained (i.e., cut) during previous manufacturing activities. Community has been naturalizing since 2009 but was maintained again in late summer 2019. Portions of this community contain standing water in spring (historical sloughs) and support a greater density of hydrophytic vegetation including Fox Sedge (<i>Carex vulpinoidea</i>), Quill Sedge (<i>Carex tenera</i>), Troublesome Sedge (<i>Carex molesta</i>), and Black Bulrush (<i>Scirpus atrovirens</i>).
Meadow	MEMM4-b	Canopy: Eastern Cottonwood (<i>Populus deltoides</i>), Trembling Aspen (<i>Populus tremuloides</i>). Shrub/Regenerating: Grey Dogwood (<i>Cornus racemosa</i>), Green Ash (<i>Fraxinus pennsylvanica</i>), Grey Willow (<i>Salix atrocinerea</i>). Herbaceous: Common Reed (<i>Phragmites australis</i> spp. <i>australis</i>), Teasel (<i>Dipsacus fullonum</i>), Kentucky Blue Grass (<i>Poa pratensis</i>), Birds-foot Trefoil (<i>Lotus corniculatus</i>), Redtop (<i>Agrostis gigantea</i>), Common St. John's Wort (<i>Hypericum perforatum</i>), Tall Goldenrod (<i>Solidago altissima</i>), Meadow Fescue (<i>Lolium arundinaceum</i>), Canada Thistle (<i>Cirsium arvense</i>).	85%	Clay (mottling at 5 cm) and fill.	Flat bottomland	Community is variable and includes heavily disturbed areas that contain several stands/patches of Common Reed (<i>Phragmites australis</i> spp. <i>australis</i>) amongst scattered Eastern Cottonwood (<i>Populus deltoides</i>) regeneration and thickets of Grey Dogwood (<i>Cornus racemosa</i>) and Grey Willow (<i>Salix atrocinerea</i>). Some areas previously filled. Vernal pooling and/or seasonal standing water present in certain areas.
WETLAND						
Deciduous Swamp	SWDM1-a	Canopy: Pin Oak (<i>Quercus palustris</i>), Bur Oak (<i>Quercus macrocarpa</i>), Swamp White Oak (<i>Quercus bicolor</i>), Green Ash (<i>Fraxinus pennsylvanica</i>). Sub-canopy: Pin Oak (<i>Quercus palustris</i>), Bur Oak (<i>Quercus macrocarpa</i>), Swamp White Oak (<i>Quercus bicolor</i>), American Elm (<i>Ulmus americana</i>). Shrub/Regenerating: Pin Oak (<i>Quercus palustris</i>), American Elm (<i>Ulmus americana</i>), Green Ash (<i>Fraxinus pennsylvanica</i>), Grey Dogwood (<i>Cornus racemosa</i>), Musclewood (<i>Carpinus caroliniana</i>). Herbaceous: Spotted Jewelweed (<i>Impatiens capensis</i>), Jumpseed (<i>Persicaria virginiana</i>), White Avens (<i>Geum canadense</i>), Blunt Broom Sedge (<i>Carex tribuloides</i>).	75%	Silty clay (mottling at 5 cm)	Flat bottomland	Community is a Slough Forest pockmarked by swamps and vernal pools. Community is characterized as wetland given the predominance Pin Oak and wet hollows over moist upland associates. Upland inclusions slightly elevated above the wet hollows contain greater dominance by Musclewood, several species of hawthorn, Red Raspberry (<i>Rubus idaeus</i>), Black Raspberry (<i>Rubus occidentalis</i>), and Enchanters Nightshade (<i>Circaea canadensis</i>). Vernal pools dry out in summer creating mudflats occupied by Fowl Manna Grass (<i>Glyceria striata</i>), Fringed Sedge (<i>Carex crinita</i>), Floating Manna Grass (<i>Glyceria septentrionalis</i>), and Bladder Sedge (<i>Carex intumescens</i>). Numerous ditches throughout this community represent historical drainage efforts.
Deciduous Swamp	SWDM1-b	Canopy: Pin Oak (<i>Quercus palustris</i>), Bur Oak (<i>Quercus macrocarpa</i>), Swamp White Oak (<i>Quercus bicolor</i>), Green Ash (<i>Fraxinus pennsylvanica</i>), Freeman's Maple (<i>Acer x freemanii</i>). Sub-canopy: Pin Oak (<i>Quercus palustris</i>). Shrub/Regenerating: Green Ash (<i>Fraxinus pennsylvanica</i>), Pin Oak (<i>Quercus palustris</i>), Grey Dogwood (<i>Cornus racemosa</i>), Spicebush (<i>Lindera benzoin</i>), Poison-ivy (<i>Toxicodendron radicans</i>). Herbaceous: Spotted Jewelweed (<i>Impatiens capensis</i>), Fowl Manna Grass (<i>Glyceria striata</i>), Blunt Broom Sedge (<i>Carex tribuloides</i>), Quill Sedge (<i>Carex tenera</i>), Jumpseed (<i>Persicaria virginiana</i>), White Avens (<i>Geum canadense</i>), Sweet Wood-reed (<i>Cinna arundinacea</i>).	75%	Silty clay (mottling at 0 cm)	Flat bottomland	Community is Slough Forest pockmarked by swamps and vernal pools. Community is characterized as wetland given the predominance Pin Oak and wet hollows over moist upland associates. Upland inclusions slightly elevated above the wet hollows are dominated by Shagbark Hickory (<i>Carya ovata</i>), Musclewood (<i>Carpinus caroliniana</i>), Prickly Ash (<i>Zanthoxylum americanum</i>) several species of hawthorn, and Enchanters Nightshade (<i>Circaea canadensis</i>). Vernal pools dry out in summer creating mudflats occupied by Fowl Manna Grass (<i>Glyceria striata</i>), Fringed Sedge (<i>Carex crinita</i>), Bladder Sedge (<i>Carex intumescens</i>), Spotted Water-hemlock (<i>Cicuta maculata</i>), Hop Sedge (<i>Carex lupulina</i>), and Brome-like Sedge (<i>Carex bromoides</i>). Numerous ditches throughout this community represent historical drainage efforts.

Community Series	Ecosite / Vegetation Type ¹	Dominant Vegetation ²	Coverage by Dominant Vegetation Layer	Substrate	Slope Position	Comments
Deciduous Swamp	SWDM2	Canopy: Green Ash (<i>Fraxinus pennsylvanica</i>), Green Ash snags, Pin Oak (<i>Quercus palustris</i>). Sub-canopy: Green Ash (<i>Fraxinus pennsylvanica</i>), Green Ash snags, Pin Oak (<i>Quercus palustris</i>). Shrub/Regenerating: Green Ash (<i>Fraxinus pennsylvanica</i>), Green Ash snags, Pin Oak (<i>Quercus palustris</i>), Grey Dogwood (<i>Cornus racemosa</i>). Herbaceous: Blunt Broom Sedge (<i>Carex tribuloides</i>), Hop Sedge (<i>Carex lupulina</i>), Fowl Manna Grass (<i>Glyceria striata</i>), Spotted Jewelweed (<i>Impatiens capensis</i>).	25%	Silty clay	Flat bottomland	Pin Oak will likely replace Green Ash as the primary canopy constituent. Significant areal coverage and depth of standing water occurs in this community during and following the spring freshet (exceeding 50 cm deep in some locations). Some pools appear to be semi-permanent and provide habitat for Green Frogs and dragonfly nymphs. Wetter hollows that become dry during summer contain Floating Manna Grass (<i>Glyceria septentrionalis</i>), Northern Water-plantain (<i>Alisma trivale</i>), Fringed Sedge (<i>Carex crinita</i>), and Water Parsnip (<i>Sium suave</i>). Numerous ditches throughout this community represent historical drainage efforts.
Deciduous Swamp	SWDM4-2	Canopy: Green Ash (<i>Fraxinus pennsylvanica</i>), White Elm (<i>Ulmus americana</i>) Shrub/Regenerating: Green Ash (<i>Fraxinus pennsylvanica</i>), Grey Dogwood (<i>Cornus racemosa</i>). Herbaceous: Blunt Broom Sedge (<i>Carex tribuloides</i>), Fowl Manna Grass (<i>Glyceria striata</i>), Spotted Jewelweed (<i>Impatiens capensis</i>).	70%	Silty clay	Flat bottomland	
Thicket Swamp	SWTM3-a	Shrub/Regenerating: Grey Willow (<i>Salix atrocinerea</i>), Green Ash (<i>Fraxinus pennsylvanica</i>), Pin Oak (<i>Quercus palustris</i>), Glossy Buckthorn (<i>Frangula alnus</i>), Narrow-leaved Meadowsweet (<i>Spiraea alba</i>). Herbaceous: Quill Sedge (<i>Carex tenera</i>), Tall Agrimony (<i>Agrimonia gryposepala</i>), Ground-ivy (<i>Glechoma hederacea</i>), Soft Rush (<i>Juncus effusus</i>), American Water-horehound (<i>Lycopus americanus</i>), Purple Loosestrife (<i>Lythrum salicaria</i>), Fringed Loosestrife (<i>Lysimachia ciliata</i>), Graceful Sedge (<i>Carex gracillima</i>), White Avens (<i>Geum canadense</i>).	40%	Silty clay	Flat bottomland	Less standing water apparent in spring than adjacent marshes.
Thicket Swamp	SWTM3-b	Shrub/Regenerating: Grey Dogwood (<i>Cornus racemosa</i>), Silky Dogwood (<i>Cornus amomum</i>), Pin Oak (<i>Quercus palustris</i>).	85%	Silty clay	Flat bottomland	Community is difficult to navigate given the density of woody vegetation.
Thicket Swamp	SWTM5-7	Canopy: Green Ash (<i>Fraxinus pennsylvanica</i>), Eastern Cottonwood (<i>Populus deltoides</i>). Shrub/Regenerating: Narrow-leaved Meadowsweet (<i>Spiraea alba</i>), Grey Dogwood (<i>Cornus racemosa</i>). Herbaceous: Reed-canary Grass (<i>Phalaris arundinacea</i>), Fowl Blue Grass (<i>Poa palustris</i>), Spotted Jewelweed (<i>Impatiens capensis</i>), Soft Rush (<i>Juncus effusus</i>).	50%	Silty clay	Flat bottomland	Tree cover approximately 15%.
Shallow Marsh	MASM1-1	Herbaceous: Narrow-leaved Cattail (<i>Typha angustifolia</i>), Reed-canary Grass (<i>Phalaris arundinacea</i>), Fowl Blue Grass (<i>Poa palustris</i>), Late Goldenrod (<i>Solidago gigantea</i>), Creeping Bentgrass (<i>Agrostis stolonifera</i>), Purple Loosestrife (<i>Lythrum salicaria</i>).	90%	Clay (mottling at 0 cm)	Flat bottomland	
Shallow Marsh	MASM1-5	Herbaceous: Lake Sedge (<i>Carex lacustris</i>), Reed-canary Grass (<i>Phalaris arundinacea</i>), Narrow-leaved Cattail (<i>Typha angustifolia</i>).	95%	Silty clay	Flat bottomland	
Shallow Marsh	MASO1-a	Herbaceous: Broad-leaved Bur-reed (<i>Sparganium eurycarpum</i>), Lake Sedge (<i>Carex lacustris</i>), Common Reed (<i>Phragmites australis</i> spp. <i>australis</i>), Purple Loosestrife (<i>Lythrum salicaria</i>).	40%	Mesic organic	Depression	Community flanks the drainage feature and is supported in part by a backwater effect produced by an undersized culvert beneath the railway line.
Shallow Marsh	MASO1-b	Herbaceous: Broad-leaved Cattail (<i>Typha latifolia</i>), Narrow-leaved Cattail (<i>Typha angustifolia</i>), Broad-leaved Bur-reed (<i>Sparganium eurycarpum</i>), Lake Sedge (<i>Carex lacustris</i>).	30%	Mesic organic	Depression	Community occupies the flooded fringe of a dug-out pond.
Meadow Marsh	MAMM1	Shrub/Regenerating: Narrow-leaved Meadowsweet (<i>Spiraea alba</i>), Grey Dogwood (<i>Cornus racemosa</i>). Herbaceous: Dudley's Rush (<i>Juncus dudleyi</i>), Reed-canary Grass (<i>Phalaris arundinacea</i>), Purple Loosestrife (<i>Lythrum salicaria</i>).	50%	Silty clay	Flat bottomland	Seasonal standing water appears to dry out before early summer, providing limited Anuran breeding habitat.
Meadow Marsh	MAMM1-3-a	Herbaceous: Reed-canary Grass (<i>Phalaris arundinacea</i>), Purple Loosestrife (<i>Lythrum salicaria</i>), Fowl Blue Grass (<i>Poa palustris</i>).	95%	Silty clay	Flat bottomland	Deeper (likely dugout) pool contains Broad-fruited Bur-reed (<i>Sparganium eurycarpum</i>), Tall Manna Grass (<i>Glyceria grandis</i>), and Narrow-leaved Meadowsweet (<i>Spiraea alba</i>). Community is being drained southward by ditch.
Meadow Marsh	MAMM1-3-b	Herbaceous: Reed-canary Grass (<i>Phalaris arundinacea</i>), Broad-fruited Bur-reed (<i>Sparganium eurycarpum</i>), Three-lobed Beggar-ticks (<i>Bidens tripartita</i>).	40%	Silty clay	Flat bottomland	Vernal pooling is extensive but dries out by summer. Scattered Green Ash (<i>Fraxinus pennsylvanica</i>) also present.
Meadow Marsh	MAMM1-12	Canopy: Eastern Cottonwood (<i>Populus deltoides</i>), Green Ash (<i>Fraxinus pennsylvanica</i>) Shrub/Regenerating: Grey Dogwood (<i>Cornus racemosa</i>), Sandbar Willow (<i>Salix interior</i>). Herbaceous: Common Reed (<i>Phragmites australis</i> spp. <i>australis</i>)	50%	Silty clay	Flat bottomland	Community dominated by Common Reed (<i>Phragmites australis</i> spp. <i>australis</i>) with scattered trees and shrubs. Difficult to access given the density of woody vegetation.
Shallow Aquatic	SAS1-3	Herbaceous: Stonewort (<i>Chara</i> sp.), Eurasian Water-milfoil (<i>Myriophyllum spicatum</i>).	~25%	Mesic organic	Depression	Dug-out pond. Density of aquatic vegetation difficult to gauge from the shoreline. Diversity of odonates observed including Blue Dasher, Black Saddlebags, Widow Skimmer, and several species of Meadowhawk and Bluet.

¹ Vegetation communities classified to Vegetation Type except where Ecosite descriptions were considered more appropriate.

² **Bolded** vegetation layers dominant.

Appendix 6. Vascular Plant List

Scientific Name	Common Name	Family	S-Rank (per NHIC)	Local Rank (per Oldham 2017)	Coefficient of Conservatism	Coefficient of Wetness
<i>Acalypha rhomboidea</i>	Common Three-seeded Mercury	Euphorbiaceae	S5	X	0	3
<i>Acer negundo</i>	Manitoba Maple	Aceraceae	S5	X	0	0
<i>Acer rubrum</i>	Red Maple	Aceraceae	S5	X	4	0
<i>Acer saccharum</i>	Sugar Maple	Aceraceae	S5	X	4	3
<i>Acer x freemanii</i>	Freeman's Maple	Aceraceae	SNA	hyb	6	-5
<i>Achillea millefolium</i>	Common Yarrow	Asteraceae	SNA	C	0	3
<i>Agalinus tenuifolia</i>	Slender-leaved False Foxglove	Scrophulariaceae	S4S5	R	7	-3
<i>Agrimonia gryposepala</i>	Hooked Agrimony	Rosaceae	S5	C	2	3
<i>Agrostis gigantea</i>	Redtop	Poaceae	SNA	IC	0	-3
<i>Agrostis perennans</i>	Upland Bentgrass	Poaceae	S4?	U	5	3
<i>Agrostis stolonifera</i>	Creeping Bentgrass	Poaceae	SNA	IC	0	-3
<i>Alisma subcordatum</i>	Southern Water-plantain	Alismataceae	S4?	X	1	-5
<i>Alisma triviale</i>	Northern Water-plantain	Alismataceae	S5	X	1	-5
<i>Alliaria petiolata</i>	Garlic Mustard	Brassicaceae	SNA	IC	0	0
<i>Allium sativum</i>	Cultivated Garlic	Liliaceae	SNA	IU	0	5
<i>Ambrosia artemisiifolia</i>	Common Ragweed	Asteraceae	S5	C	0	3
<i>Apocynum androsaemifolium</i>	Spreading Dogbane	Apocynaceae	S5	C	3	5
<i>Apocynum cannabinum</i>	Hemp Dogbane	Apocynaceae	S5	C	3	0
<i>Arctium lappa</i>	Great Burdock	Asteraceae	SNA	IU	0	3
<i>Arenaria serpyllifolia</i>	Thyme-leaved Sandwort	Caryophyllaceae	SNA	IU	0	0
<i>Artemisia vulgaris</i>	Common Wormwood	Asteraceae	SNA	IU	0	5
<i>Asclepias incarnata</i>	Swamp Milkweed	Asclepiadaceae	S5	C	6	-5
<i>Asclepias syriaca</i>	Common Milkweed	Asclepiadaceae	S5	C	0	5
<i>Athyrium filix-femina</i> var. <i>angustum</i>	Northeastern Lady Fern	Dryopteridaceae	S5	C	4	0
<i>Berberis thunbergii</i>	Japanese Barberry	Berberidaceae	SNA	IC	0	3
<i>Betula pendula</i>	Weeping Birch	Betulaceae	SNA	IU	0	0
<i>Bidens comosa</i>	Three-parted Beggarticks	Asteraceae	S5	X	2	-5
<i>Bidens connata</i>	Three-parted Beggarticks	Asteraceae	S4?	X	5	-3
<i>Bidens frondosa</i>	Three-parted Beggarticks	Asteraceae	S5	C	3	-3
<i>Bidens vulgata</i>	Tall Beggarticks	Asteraceae	S5	U	5	0
<i>Boehmeria cylindrica</i>	False Nettle	Urticaceae	S5	C	4	-5
<i>Bromus inermis</i>	Smooth Brome	Poaceae	SNA	IC	0	5
<i>Calamagrostis canadensis</i>	Bluejoint Reedgrass	Poaceae	S5	C	4	-5
<i>Calystegia sepium</i>	Hedge False Bindweed	Convolvulaceae	S5	C	2	0
<i>Carex annectens</i>	Yellow-fruited Sedge	Cyperaceae	S2	R	6	-3
<i>Carex blanda</i>	Woodland Sedge	Cyperaceae	S5	C	3	0
<i>Carex bromoides</i>	Brome-like Sedge	Cyperaceae	S5	C	7	-3
<i>Carex brunnescens</i>	Brownish Sedge	Cyperaceae	S5	U	6	-3
<i>Carex crinita</i>	Fringed Sedge	Cyperaceae	S5	U	6	-5
<i>Carex cristatella</i>	Crested Sedge	Cyperaceae	S5	C	3	-3
<i>Carex gracillima</i>	Graceful Sedge	Cyperaceae	S5	C	4	3
<i>Carex hystericina</i>	Porcupine Sedge	Cyperaceae	S5	C	5	-5

Scientific Name	Common Name	Family	S-Rank (per NHIC)	Local Rank (per Oldham 2017)	Coefficient of Conservatism	Coefficient of Wetness
<i>Carex intumescens</i>	Bladder Sedge	Cyperaceae	S5	C	6	-3
<i>Carex lacustris</i>	Lake Sedge	Cyperaceae	S5	C	5	-5
<i>Carex lupulina</i>	Hop Sedge	Cyperaceae	S5	C	6	-5
<i>Carex molesta</i>	Troublesome Sedge	Cyperaceae	S4S5	U	5	0
<i>Carex projecta</i>	Necklace Sedge	Cyperaceae	S5	R	5	-3
<i>Carex radiata</i>	Eastern Star Sedge	Cyperaceae	S5	C	4	0
<i>Carex scoparia</i>	Pointed Broom Sedge	Cyperaceae	S5	U	5	-3
<i>Carex stipata</i>	Awl-fruited Sedge	Cyperaceae	S5	C	3	-5
<i>Carex tenera</i>	Tender Sedge	Cyperaceae	S5	C	4	0
<i>Carex vulpinoidea</i>	Fox Sedge	Cyperaceae	S5	C	3	-5
<i>Carpinus caroliniana</i>	Blue-beech	Betulaceae	S5	C	6	0
<i>Carya ovata</i>	Shagbark Hickory	Juglandaceae	S5	C	6	3
<i>Catalpa speciosa</i>	Northern Catalpa	Bignoniaceae	SNA	IR	0	3
<i>Centaurea nigrescens</i>	Short-fringed Knapweed	Asteraceae	SNA	IR	0	5
<i>Centaurea stoebe</i> ssp. <i>micranthos</i>	Spotted Knapweed	Asteraceae	SNA	IU	0	5
<i>Centaurium pulchellum</i>	Branching Centaury	Gentianaceae	SNA	IR	0	0
<i>Cephalanthus occidentalis</i>	Eastern Buttonbush	Rubiaceae	S5	C	7	-5
<i>Cerastium fontanum</i>	Common Mouse-ear Chickweed	Caryophyllaceae	SNA	IC	0	3
<i>Chaenorhinum minus</i>	Dwarf Snapdragon	Scrophulariaceae	SNA	IU	0	5
<i>Cichorium intybus</i>	Chicory	Asteraceae	SNA	IC	0	5
<i>Cicuta maculata</i>	Spotted Water-hemlock	Apiaceae	S5	C	6	-5
<i>Cinna arundinacea</i>	Stout Woodreed	Poaceae	S4	C	7	-3
<i>Circaea canadensis</i> ssp. <i>canadensis</i>	Canada Enchanter's Nightshade	Onagraceae	S5	C	2	3
<i>Cirsium arvense</i>	Canada Thistle	Asteraceae	SNA	IC	0	3
<i>Cirsium vulgare</i>	Bull Thistle	Asteraceae	SNA	IC	0	3
<i>Claytonia virginica</i>	Narrow-leaved Spring Beauty	Portulacaceae	S5	C	5	3
<i>Convolvulus arvensis</i>	Field Bindweed	Convolvulaceae	SNA	IC	0	5
<i>Cornus amomum</i>	Alternate-leaved Dogwood	Cornaceae	S5	C	6	3
<i>Cornus racemosa</i>	Gray Dogwood	Cornaceae	S5	C	2	0
<i>Corylus americana</i>	American Hazelnut	Betulaceae	S5	R	5	3
<i>Crataegus calpodendron</i>	Pear Hawthorn	Rosaceae	S4	U	4	5
<i>Crataegus coccinea</i> var. <i>pringlei</i>	Pringle's Hawthorn	Rosaceae	S5	R	4	5
<i>Crataegus crus-galli</i>	Cockspur Hawthorn	Rosaceae	S4	C	4	0
<i>Crataegus macrosperma</i>	Big-fruited Hawthorn	Rosaceae	S5	U	4	5
<i>Crataegus pruinosa</i> var. <i>pruinosa</i>	Frosted Hawthorn	Rosaceae	S4S5	U	4	5
<i>Crataegus punctata</i>	Dotted Hawthorn	Rosaceae	S5	C	4	5
<i>Cyperus strigosus</i>	Straw-colored Flatsedge	Cyperaceae	S5	U	5	-3
<i>Dactylis glomerata</i>	Orchard Grass	Poaceae	SNA	IC	0	3
<i>Danthonia spicata</i>	Poverty Oatgrass	Poaceae	S5	C	5	5
<i>Daucus carota</i>	Wild Carrot	Apiaceae	SNA	IC	0	5
<i>Dichanthelium implicatum</i>	Slender-stemmed Panicgrass	Poaceae	S5	C	3	0
<i>Dipsacus fullonum</i>	Common Teasel	Dipsacaceae	SNA	IC	0	3

Scientific Name	Common Name	Family	S-Rank (per NHIC)	Local Rank (per Oldham 2017)	Coefficient of Conservatism	Coefficient of Wetness
<i>Doellingeria umbellata</i>	Flat-top White Aster	Asteraceae	S5	U	6	-3
<i>Draba verna</i>	Spring Draba	Brassicaceae	SNA	IC	0	5
<i>Echinochloa crus-galli</i>	Large Barnyard Grass	Poaceae	SNA	IC	0	-3
<i>Echinochloa muricata</i> var. <i>microstachya</i>	Western Barnyard Grass	Poaceae	S5	R	4	-5
<i>Echium vulgare</i>	Common Viper's Bugloss	Boraginaceae	SNA	IC	0	5
<i>Elaeagnus umbellata</i>	Autumn Olive	Elaeagnaceae	SNA	IU	0	3
<i>Eleocharis obtusa</i>	Blunt Spikerush	Cyperaceae	S5	C	5	-5
<i>Elymus hystrix</i>	Bottlebrush Grass	Poaceae	S5	C	5	5
<i>Elymus repens</i>	Creeping Wildrye	Poaceae	SNA	IC	0	3
<i>Elymus virginicus</i>	Virginia Wildrye	Poaceae	S5	C	5	-3
<i>Epilobium ciliatum</i>	Northern Willowherb	Onagraceae	S5	C	3	-3
<i>Epilobium hirsutum</i>	Hairy Willowherb	Onagraceae	SNA	IC	0	-3
<i>Equisetum arvense</i>	Field Horsetail	Equisetaceae	S5	C	0	0
<i>Erigeron annuus</i>	Annual Fleabane	Asteraceae	S5	C	0	3
<i>Erigeron canadensis</i>	Canada Horseweed	Asteraceae	S5	C	0	3
<i>Erigeron philadelphicus</i>	Philadelphia Fleabane	Asteraceae	S5	C	1	-3
<i>Erigeron strigosus</i>	Rough Fleabane	Asteraceae	S5	R	4	3
<i>Erucastrum gallicum</i>	Common Dogmustard	Brassicaceae	SNA	IR	0	5
<i>Erythronium americanum</i>	Yellow Trout-lily	Liliaceae	S5	C	5	5
<i>Euonymus obovatus</i>	Running Strawberry Bush	Celastraceae	S4	C	6	5
<i>Eupatorium altissimum</i>	Tall Boneset	Asteraceae	S1	IR	3	5
<i>Eupatorium perfoliatum</i>	Common Boneset	Asteraceae	S5	C	2	-3
<i>Euphorbia maculata</i>	Spotted Spurge	Euphorbiaceae	SNA	IU	0	3
<i>Euphorbia nutans</i>	Nodding Spurge	Euphorbiaceae	S4	R	0	3
<i>Eurybia macrophylla</i>	Large-leaved Aster	Asteraceae	S5	C	5	5
<i>Euthamia graminifolia</i>	Grass-leaved Goldenrod	Asteraceae	S5	C	2	0
<i>Eutrochium maculatum</i>	Spotted Joe Pye Weed	Asteraceae	S5	C	3	-5
<i>Fagus grandifolia</i>	American Beech	Fagaceae	S4	C	6	3
<i>Floerkea proserpinacoides</i>	False Mermaidweed	Limnanthaceae	S4	R	9	0
<i>Fragaria virginiana</i>	Wild Strawberry	Rosaceae	S5	C	2	3
<i>Frangula alnus</i>	Glossy Buckthorn	Rhamnaceae	SNA	IC	0	0
<i>Fraxinus americana</i>	White Ash	Oleaceae	S4	C	4	3
<i>Fraxinus nigra</i>	Black Ash	Oleaceae	S4	U	7	-3
<i>Fraxinus pennsylvanica</i>	Green Ash	Oleaceae	S4	C	3	-3
<i>Galium aparine</i>	Cleavers	Rubiaceae	S5	C	4	3
<i>Galium obtusum</i>	Blunt-leaved Bedstraw	Rubiaceae	S4S5	R	6	-3
<i>Geranium maculatum</i>	Spotted Geranium	Geraniaceae	S5	C	6	3
<i>Geum aleppicum</i>	Yellow Avens	Rosaceae	S5	C	2	0
<i>Geum canadense</i>	White Avens	Rosaceae	S5	C	3	0
<i>Geum laciniatum</i>	Rough Avens	Rosaceae	S4	C	4	-3
<i>Glyceria grandis</i>	Tall Mannagrass	Poaceae	S5	C	5	-5
<i>Glyceria septentrionalis</i>	Eastern Mannagrass	Poaceae	S4	C	7	-5

Scientific Name	Common Name	Family	S-Rank (per NHIC)	Local Rank (per Oldham 2017)	Coefficient of Conservatism	Coefficient of Wetness
<i>Glyceria striata</i>	Fowl Mannagrass	Poaceae	S5	C	3	-5
<i>Helianthus decapetalus</i>	Thin-leaved Sunflower	Asteraceae	S4	R	7	3
<i>Hesperis matronalis</i>	Dame's Rocket	Brassicaceae	SNA	IX	0	3
<i>Hordeum jubatum</i> subsp. <i>jubatum</i>	(<i>Hordeum brachyantherum</i> X <i>Hordeum jubatum</i>)	Poaceae	SNA	IX	0	0
<i>Hypericum perforatum</i>	Common St. John's-wort	Clusiaceae	SNA	IC	0	5
<i>Hypericum punctatum</i>	Spotted St. John's-wort	Clusiaceae	S5	C	5	0
<i>Ilex verticillata</i>	Black Holly	Aquifoliaceae	S5	C	5	-3
<i>Impatiens capensis</i>	Spotted Jewelweed	Balsaminaceae	S5	C	4	-3
<i>Inula heleniun</i>	Elecampane	Asteraceae	SNA	IC	0	3
<i>Iris versicolor</i>	Harlequin Blue Flag	Iridaceae	S5	C	5	-5
<i>Juncus acuminatus</i>	Sharp-fruited Rush	Juncaceae	S3	R	6	-5
<i>Juncus alpinoarticulatus</i>	Alpine Rush	Juncaceae	S5	R	5	-5
<i>Juncus effusus</i>	Soft Rush	Juncaceae	S5	C	4	-5
<i>Juncus nodosus</i>	Knotted Rush	Juncaceae	S5	R	5	-5
<i>Juncus torreyi</i>	Torrey's Rush	Juncaceae	S5	U	3	-3
<i>Juniperus virginiana</i>	Eastern Red Cedar	Cupressaceae	S5	C	4	3
<i>Leersia oryzoides</i>	Rice Cutgrass	Poaceae	S5	C	3	-5
<i>Lemna minor</i>	Lesser Duckweed	Lemnaceae	S5?	C	5	-5
<i>Lepidium campestre</i>	Field Peppergrass	Brassicaceae	SNA	IC	0	5
<i>Leucanthemum vulgare</i>	Oxeye Daisy	Asteraceae	SNA	IC	0	5
<i>Ligustrum vulgare</i>	European Privet	Oleaceae	SNA	IC	0	3
<i>Lilium michiganense</i>	Michigan Lily	Liliaceae	S4	C	7	-3
<i>Linaria vulgaris</i>	Butter-and-eggs	Scrophulariaceae	SNA	IC	0	5
<i>Lindera benzoin</i>	Spicebush	Lauraceae	S4	C	6	-3
<i>Lolium arundinaceum</i>	Tall Fescue	Poaceae	SNA	IC	0	3
<i>Lonicera dioica</i>	Limber Honeysuckle	Caprifoliaceae	S5	C	5	3
<i>Lotus corniculatus</i>	Garden Bird's-foot Trefoil	Fabaceae	SNA	IC	0	3
<i>Ludwigia palustris</i>	Marsh Seedbox	Onagraceae	S5	C	5	-5
<i>Lycopus americanus</i>	American Water-horehound	Lamiaceae	S5	C	4	-5
<i>Lycopus europaeus</i>	European Water-horehound	Lamiaceae	SNA	IU	0	-5
<i>Lycopus uniflorus</i>	Northern Water-horehound	Lamiaceae	S5	C	5	-5
<i>Lysimachia ciliata</i>	Fringed Loosestrife	Primulaceae	S5	C	4	-3
<i>Lysimachia thyrsoiflora</i>	Water Loosestrife	Primulaceae	S5	U	7	-5
<i>Lythrum salicaria</i>	Purple Loosestrife	Lythraceae	SNA	IC	0	-5
<i>Malva moschentos</i>	Musk Cheeseweed	Malvaceae	SNA	IR	0	5
<i>Medicago lupulina</i>	Black Medic	Fabaceae	SNA	IC	0	3
<i>Melilotus albus</i>	White Sweet-clover	Fabaceae	SNA	IC	0	3
<i>Moehringia lateriflora</i>	Grove Sandwort	Caryophyllaceae	S5	C	7	3
<i>Muhlenbergia mexicana</i>	Mexican Muhly	Poaceae	S5	C	1	-3
<i>Myosotis scorpioides</i>	True Forget-me-not	Boraginaceae	SNA	IU	0	-5
<i>Myriophyllum spicatum</i>	Eurasian Water-milfoil	Haloragaceae	SNA	IR	0	-5
<i>Oenothera parviflora</i>	Small-flowered Evening Primrose	Onagraceae	S5	X	1	3

Scientific Name	Common Name	Family	S-Rank (per NHIC)	Local Rank (per Oldham 2017)	Coefficient of Conservatism	Coefficient of Wetness
<i>Onoclea sensibilis</i>	Sensitive Fern	Dryopteridaceae	S5	C	4	-3
<i>Ostrya virginiana</i>	Eastern Hop-hornbeam	Betulaceae	S5	C	4	3
<i>Oxalis dillenii</i>	Slender Yellow Wood-sorrel	Oxalidaceae	S5?	C	0	3
<i>Oxalis stricta</i>	Upright Yellow Wood-sorrel	Oxalidaceae	S5	C	0	3
<i>Panicum dichotomiflorum</i>	Fall Panicgrass	Poaceae	SNA	IU	0	-3
<i>Parthenocissus quinquefolia</i>	Virginia Creeper	Vitaceae	S4?	U	6	3
<i>Pastinaca sativa</i>	Wild Parsnip	Apiaceae	SNA	IU	0	5
<i>Penthorum sedoides</i>	Ditch-stonecrop	Crassulaceae	S5	C	4	-5
<i>Persicaria hydropiper</i>	Marshpepper Smartweed	Polygonaceae	SNA	IC	0	-5
<i>Persicaria hydropiperoides</i>	False Waterpepper	Polygonaceae	S5	R	4	-5
<i>Persicaria sagittifolia</i>	Arrow-leaved Smartweed	Polygonaceae	S4S5	C	5	-5
<i>Persicaria virginiana</i>	Virginia Smartweed	Polygonaceae	S4	C	6	0
<i>Plantago lanceolata</i>	English Plantain	Plantaginaceae	SNA	IC	0	3
<i>Plantago rugelii</i>	Rugel's Plantain	Plantaginaceae	S5	C	1	0
<i>Poa compressa</i>	Canada Bluegrass	Poaceae	SNA	IC	0	3
<i>Poa nemoralis</i>	Woods Bluegrass	Poaceae	SNA	IC	0	3
<i>Poa palustris</i>	Fowl Bluegrass	Poaceae	S5	C	5	-3
<i>Poa pratensis</i> ssp. <i>pratensis</i>	Kentucky Bluegrass	Poaceae	SNA	IC	0	3
<i>Podophyllum peltatum</i>	May-apple	Berberidaceae	S5	C	5	3
<i>Polygonatum pubescens</i>	Hairy Solomon's Seal	Liliaceae	S5	C	5	5
<i>Populus deltoides</i>	Eastern Cottonwood	Salicaceae	S5	C	4	0
<i>Populus grandidentata</i>	Large-toothed Aspen	Salicaceae	S5	C	5	5
<i>Populus tremuloides</i>	Trembling Aspen	Salicaceae	S5	C	2	0
<i>Potamogeton foliosus</i>	Leafy Pondweed	Potamogetonaceae	S5	R	4	-5
<i>Potentilla norvegica</i>	Norwegian Cinquefoil	Rosaceae	S5	C	0	0
<i>Potentilla simplex</i>	Old-field Cinquefoil	Rosaceae	S5	C	3	3
<i>Prunella vulgaris</i>	Heal-all	Lamiaceae	S5	C	0	0
<i>Prunus virginiana</i>	Choke Cherry	Rosaceae	S5	C	2	3
<i>Pyrus communis</i>	Common Pear	Rosaceae	SNA	IC	0	5
<i>Quercus alba</i>	White Oak	Fagaceae	S5	C	6	3
<i>Quercus bicolor</i>	Swamp White Oak	Fagaceae	S4	C	8	-3
<i>Quercus macrocarpa</i>	Bur Oak	Fagaceae	S5	U	5	3
<i>Quercus palustris</i>	Pin Oak	Fagaceae	S4	C	9	-3
<i>Quercus rubra</i>	Northern Red Oak	Fagaceae	S5	C	6	3
<i>Ranunculus abortivus</i>	Kidney-leaved Buttercup	Ranunculaceae	S5	C	2	0
<i>Ranunculus acris</i>	Tall Buttercup	Ranunculaceae	SNA	IC	0	0
<i>Ranunculus pennsylvanicus</i>	Pennsylvania Buttercup	Ranunculaceae	S5	C	3	-5
<i>Ranunculus recurvatus</i> var. <i>recurvatus</i>	Hooked Buttercup	Ranunculaceae	S5	C	4	-3
<i>Rhamnus cathartica</i>	Common Buckthorn	Rhamnaceae	SNA	IC	0	0
<i>Rhus typhina</i>	Staghorn Sumac	Anacardiaceae	S5	C	1	3
<i>Ribes aureum</i>	Golden Currant	Grossulariaceae	SNA	IO	0	3
<i>Ribes cynosbati</i>	Prickly Gooseberry	Grossulariaceae	S5	C	4	3

Scientific Name	Common Name	Family	S-Rank (per NHIC)	Local Rank (per Oldham 2017)	Coefficient of Conservatism	Coefficient of Wetness
<i>Ribes rubrum</i>	Northern Red Currant	Grossulariaceae	SNA	IC	0	5
<i>Ribes triste</i>	Swamp Red Currant	Grossulariaceae	S5	R	6	-5
<i>Rosa canina</i>	Dog Rose	Rosaceae	SNA	IR	0	5
<i>Rosa carolina</i>	Carolina Rose	Rosaceae	S4	C	6	3
<i>Rosa multiflora</i>	Multiflora Rose	Rosaceae	SNA	IC	0	3
<i>Rubus allegheniensis</i>	Allegheny Blackberry	Rosaceae	S5	C	2	3
<i>Rubus flagellaris</i>	Northern Dewberry	Rosaceae	S4	U	4	3
<i>Rubus idaens</i> ssp. <i>strigosus</i>	Wild Red Raspberry	Rosaceae	S5	C	2	3
<i>Rubus occidentalis</i>	Black Raspberry	Rosaceae	S5	C	2	5
<i>Rumex crispus</i>	Curly Dock	Polygonaceae	SNA	IC	0	0
<i>Rumex verticillatus</i>	Swamp Dock	Polygonaceae	S4	R	7	-5
<i>Sagittaria latifolia</i>	Broad-leaved Arrowhead	Alismataceae	S5	C	4	-5
<i>Salix alba</i>	White Willow	Salicaceae	SNA	IU	0	-3
<i>Salix atrocinerea</i>	Rusty Willow	Salicaceae	SNA	IR	0	-3
<i>Salix cinerea</i>	European Gray Willow	Salicaceae	SNA	IR	0	-3
<i>Salix discolor</i>	Pussy Willow	Salicaceae	S5	C	3	-3
<i>Salix eriocephala</i>	Heart-leaved Willow	Salicaceae	S5	C	4	-3
<i>Salix interior</i>	Sandbar Willow	Salicaceae	S5	C	1	-3
<i>Salix matsudana</i>	Corkscrew Willow	Salicaceae	SNA	IR	0	0
<i>Salix nigra</i>	Black Willow	Salicaceae	S4	C	6	-5
<i>Salix x fragilis</i>	(<i>Salix alba</i> X <i>Salix euxina</i>)	Salicaceae	SNA	hyb	0	0
<i>Sanguinaria canadensis</i>	Bloodroot	Papaveraceae	S5	C	5	3
<i>Sanicula marilandica</i>	Maryland Sanicle	Apiaceae	S5	C	5	3
<i>Sanicula odorata</i>	Clustered Sanicle	Apiaceae	S5	U	6	0
<i>Sceptridium dissectum</i>	Cutleaf Grapefern	Ophioglossaceae	S4S5	U	6	0
<i>Schoenoplectus tabernaemontani</i>	Soft-stemmed Bulrush	Cyperaceae	S5	C	5	-5
<i>Scirpus atrovirens</i>	Dark-green Bulrush	Cyperaceae	S5	C	3	-5
<i>Scirpus cyperinus</i>	Cottongrass Bulrush	Cyperaceae	S5	C	4	-5
<i>Scutellaria galericulata</i>	Hooded Skullcap	Lamiaceae	S5	U	6	-5
<i>Scutellaria lateriflora</i>	Mad Dog Skullcap	Lamiaceae	S5	C	5	-5
<i>Securigera varia</i>	Common Crown-vetch	Fabaceae	SNA	IC	0	5
<i>Sisyrinchium montanum</i>	Strict Blue-eyed-grass	Iridaceae	S5	C	4	0
<i>Sium suave</i>	Hemlock Water-parsnip	Apiaceae	S5	C	4	-5
<i>Smilax herbacea</i>	Herbaceous Carrionflower	Smilacaceae	S4?	C	5	0
<i>Smilax tammoides</i>	Hispid Greenbrier	Smilacaceae	S5	C	6	0
<i>Solanum dulcamara</i>	Bittersweet Nightshade	Solanaceae	SNA	IC	0	0
<i>Solidago altissima</i> var. <i>altissima</i>	Eastern Tall Goldenrod	Asteraceae	S5	C	1	3
<i>Solidago caesia</i>	Blue-stemmed Goldenrod	Asteraceae	S5	IC	5	3
<i>Solidago gigantea</i>	Giant Goldenrod	Asteraceae	S5	C	4	-3
<i>Solidago juncea</i>	Early Goldenrod	Asteraceae	S5	C	3	5
<i>Solidago nemoralis</i> ssp. <i>nemoralis</i>	Gray-stemmed Goldenrod	Asteraceae	S5	C	2	5
<i>Solidago rugosa</i> subsp. <i>rugosa</i>	Northern Rough-stemmed Goldenrod	Asteraceae	S5	C	4	0

Scientific Name	Common Name	Family	S-Rank (per NHIC)	Local Rank (per Oldham 2017)	Coefficient of Conservatism	Coefficient of Wetness
<i>Sonchus asper</i>	Prickly Sow-thistle	Asteraceae	SNA	IC	0	3
<i>Sparganium eurycarpum</i>	Broad-fruited Burreed	Sparganiaceae	S5	C	3	-5
<i>Sphenopholis intermedia</i>	Slender Wedge Grass	Poaceae	S4S5	C	6	0
<i>Spiraea alba</i>	White Meadowsweet	Rosaceae	S5	C	3	-3
<i>Sporobolus vaginiflorus</i>	Sheathed Dropseed	Poaceae	S5	U	1	5
<i>Stellaria graminea</i>	Grass-leaved Starwort	Caryophyllaceae	SNA	IU	0	5
<i>Streptopus lanceolatus</i> var. <i>lanceolatus</i>	Eastern Rose Twisted-stalk	Liliaceae	S5?	O	7	3
<i>Symphotrichum ericoides</i> var. <i>ericoides</i>	White Heath Aster	Asteraceae	S5	C	4	3
<i>Symphotrichum lanceolatum</i> var. <i>lanceolatum</i>	White Panicked Aster	Asteraceae	S5	C	3	-3
<i>Symphotrichum lateriflorum</i> var. <i>lateriflorum</i>	Calico Aster	Asteraceae	S5	C	3	0
<i>Symphotrichum novae-angliae</i>	New England Aster	Asteraceae	S5	C	2	-3
<i>Symphotrichum ontarionis</i> var. <i>glabratum</i>	Smooth Ontario Aster	Asteraceae	S5	R	6	0
<i>Symphotrichum puniceum</i> var. <i>puniceum</i>	Swamp Aster	Asteraceae	S5	C	6	-5
<i>Teucrium canadense</i>	Canada Germander	Lamiaceae	S4S5	R	6	-3
<i>Thalictrum dioicum</i>	Early Meadow-rue	Ranunculaceae	S5	C	6	3
<i>Thelypteris palustris</i> var. <i>pubescens</i>	Eastern Marsh Fern	Thelypteridaceae	S5	C	5	-3
<i>Tilia americana</i>	American Basswood	Tiliaceae	S5	C	4	3
<i>Toxicodendron radicans</i> var. <i>radicans</i>	Eastern Poison Ivy	Anacardiaceae	S5	C	2	0
<i>Trifolium hybridum</i>	Alsike Clover	Fabaceae	SNA	IC	0	3
<i>Trifolium pratense</i>	Red Clover	Fabaceae	SNA	IX	0	3
<i>Trifolium repens</i>	White Clover	Fabaceae	SNA	IX	0	3
<i>Triosteum aurantiacum</i>	Orange-fruited Horse-gentian	Caprifoliaceae	S4S5	U	7	5
<i>Typha angustifolia</i>	Narrow-leaved Cattail	Typhaceae	SNA	IC	0	-5
<i>Typha latifolia</i>	Broad-leaved Cattail	Typhaceae	S5	C	1	-5
<i>Ulmus americana</i>	American Elm	Ulmaceae	S5	C	3	-3
<i>Urnularia sessilifolia</i>	Sessile-leaved Bellwort	Liliaceae	S4	C	7	3
<i>Verbascum thapsus</i>	Common Mullein	Scrophulariaceae	SNA	IC	0	5
<i>Veronica arvensis</i>	Corn Speedwell	Scrophulariaceae	SNA	IU	0	5
<i>Veronica scutellata</i>	Marsh Speedwell	Scrophulariaceae	S5	U	7	-5
<i>Viburnum lentago</i>	Nannyberry	Caprifoliaceae	S5	C	4	0
<i>Viburnum opulus</i> ssp. <i>opulus</i>	Cranberry Viburnum	Caprifoliaceae	SNA	IC	0	-3
<i>Viburnum rafinesquianum</i>	Downy Arrowwood	Caprifoliaceae	S5	U	7	5
<i>Viburnum recognitum</i>	Smooth Arrowwood	Caprifoliaceae	S4	C	7	0
<i>Viola affinis</i>	Le Conte's Violet	Violaceae	S4?	R	6	-3
<i>Viola sororia</i>	Woolly Blue Violet	Violaceae	S5	C	4	0
<i>Vitis riparia</i>	Riverbank Grape	Vitaceae	S5	C	0	0
<i>Zanthoxylum americanum</i>	Common Prickly-ash	Rutaceae	S5	C	3	3

Appendix 7. Wildlife List

Common Name	Scientific Name	Nature of Species Records within the Study Area based on 2019 Fieldwork	Local Status per Niagara NAI
Amphibians			
American Bullfrog	<i>Lithobates catesbianus</i>	Recorded vocalizing during anuran calling surveys.	Widespread
American Toad	<i>Anaxyrus americanus</i>	Recorded vocalizing during anuran calling surveys and observed incidentally.	Widespread
Green Frog	<i>Lithobates clamitans</i>	Recorded vocalizing during anuran calling surveys and observed incidentally.	Widespread
Grey Treefrog	<i>Hyla versicolor</i>	Recorded vocalizing during anuran calling surveys.	Widespread
Leopard Frog	<i>Lithobates pipiens</i>	Recorded vocalizing during anuran calling surveys and observed incidentally.	Widespread
Spring Peeper	<i>Pseudacris crucifer</i>	Recorded vocalizing during anuran calling surveys.	Widespread
Western Chorus Frog	<i>Pseudacris triseriata</i>	Recorded vocalizing during anuran calling surveys and observed incidentally.	Widespread
Birds			
Alder Flycatcher	<i>Empidonax alnorum</i>	Recorded during breeding bird surveys.	Uncommon resident
American Crow	<i>Corvus brachyrhynchos</i>	Recorded during breeding bird surveys.	Common resident
American Goldfinch	<i>Spinus tristis</i>	Recorded during breeding bird surveys.	Common resident
American Redstart	<i>Setophaga ruticilla</i>	Recorded outside the breeding season only.	Uncommon resident
American Robin	<i>Turdus migratorius</i>	Recorded during breeding bird surveys.	Very common resident
American Woodcock	<i>Scolopax minor</i>	Recorded during breeding bird surveys.	Uncommon resident
Baltimore Oriole	<i>Icterus galbula</i>	Recorded during breeding bird surveys.	Common resident
Barn Swallow	<i>Hirundo rustica</i>	Recorded during breeding bird surveys.	Very common resident
Belted Kingfisher	<i>Megasceryle alcyon</i>	Recorded outside the breeding season only.	Uncommon resident

Common Name	Scientific Name	Nature of Species Records within the Study Area based on 2019 Fieldwork	Local Status per Niagara NAI
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	Recorded during breeding bird surveys.	Uncommon resident
Blackburnian Warbler	<i>Setophaga fusca</i>	Recorded outside the breeding season only.	Uncommon transient
Black-capped Chickadee	<i>Poecile atricapillus</i>	Recorded during breeding bird surveys.	Common permanent resident
Blue Jay	<i>Cyanocitta cristata</i>	Recorded during breeding bird surveys.	Very common permanent resident
Blue-gray Gnatcatcher	<i>Poliophtila caerulea</i>	Recorded during the breeding season but not during formal breeding bird surveys.	Uncommon resident
Blue-winged Warbler	<i>Vermivora cyanoptera</i>	Recorded during breeding bird surveys.	Uncommon resident
Brown-headed Cowbird	<i>Molothrus ater</i>	Recorded during breeding bird surveys.	Very common resident
Canada Goose	<i>Branta canadensis</i>	Recorded during breeding bird surveys.	Very common permanent resident
Carolina Wren	<i>Thryothorus ludovicianus</i>	Recorded during the breeding season but not during formal breeding bird surveys.	Uncommon permanent resident.
Cedar Waxwing	<i>Bombycilla cedrorum</i>	Recorded during breeding bird surveys.	Common resident
Chestnut-sided Warbler	<i>Setophaga pensylvanica</i>	Recorded outside the breeding season only.	Uncommon resident
Chimney Swift	<i>Chaetura pelagica</i>	Recorded during breeding bird surveys but not expected to breed on the Subject Property given lack of suitable nesting sites.	Uncommon resident
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	Recorded outside the breeding season only.	Uncommon resident
Common Grackle	<i>Quiscalus quiscula</i>	Recorded during breeding bird surveys.	Very common resident
Common Raven	<i>Corvus corax</i>	Flyover.	Extremely rare visitor
Common Yellowthroat	<i>Geothlypis trichas</i>	Recorded during breeding bird surveys.	Common resident
Cooper's Hawk	<i>Accipiter cooperii</i>	Recorded incidentally.	Uncommon resident
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	Recorded during breeding bird surveys.	Very common resident

Common Name	Scientific Name	Nature of Species Records within the Study Area based on 2019 Fieldwork	Local Status per Niagara NAI
Downy Woodpecker	<i>Dryobates pubescens</i>	Recorded during breeding bird surveys.	Common permanent resident
Eastern Phoebe	<i>Sayornis phoebe</i>	Recorded outside the breeding season only.	Common resident
Eastern Towhee	<i>Pipilo erythrophthalmus</i>	Recorded outside the breeding season only.	Uncommon resident
Eastern Wood-pewee	<i>Contopus virens</i>	Recorded during breeding bird surveys.	Common resident
European Starling	<i>Sturnus vulgaris</i>	Recorded during breeding bird surveys.	Very common permanent resident
Field Sparrow	<i>Spizella pusilla</i>	Recorded during breeding bird surveys.	Uncommon resident
Golden-crowned Kinglet	<i>Regulus satrapa</i>	Recorded outside the breeding season only.	Extremely rare resident
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	Recorded during breeding bird surveys.	Common and local resident
Gray Catbird	<i>Dumetella carolinensis</i>	Recorded during breeding bird surveys.	Common resident
Great Crested Flycatcher	<i>Myrarchus crinitus</i>	Recorded during breeding bird surveys.	Common resident
Green Heron	<i>Butorides virescens</i>	Recorded outside the breeding season only.	Uncommon resident
Great Horned Owl	<i>Bubo virginianus</i>	Adult and recently fledged young recorded.	Uncommon permanent resident
Hairy Woodpecker	<i>Dryobates villosus</i>	Recorded during the breeding season but not as part of formal breeding bird surveys.	Uncommon permanent resident
House Finch	<i>Haemorhous mexicanus</i>	Recorded outside the breeding season only.	Common permanent resident
House Sparrow	<i>Passer domesticus</i>	Recorded during breeding bird surveys.	Very common permanent resident
House Wren	<i>Troglodytes aedon</i>	Recorded during breeding bird surveys.	Common resident
Indigo Bunting	<i>Passerina cyanea</i>	Recorded during breeding bird surveys.	Common resident
Killdeer	<i>Charadrius vociferus</i>	Recorded during breeding bird surveys.	Common resident
Least Flycatcher	<i>Empidonax minimus</i>	Recorded during breeding bird surveys.	Uncommon resident

Common Name	Scientific Name	Nature of Species Records within the Study Area based on 2019 Fieldwork	Local Status per Niagara NAI
Magnolia Warbler	<i>Setophaga magnolia</i>	Recorded outside the breeding season only.	Common transient
Mallard	<i>Anas platyrhynchos</i>	Recorded outside the breeding season only.	Common resident
Mourning Dove	<i>Zenaida macroura</i>	Recorded during breeding bird surveys.	Very common resident
Northern Cardinal	<i>Cardinalis cardinalis</i>	Recorded during breeding bird surveys.	Common permanent resident
Northern Flicker	<i>Colaptes auratus</i>	Recorded during breeding bird surveys.	Common resident
Northern Parula	<i>Setophaga americana</i>	Recorded outside the breeding season only.	Uncommon transient
Osprey	<i>Pandion haliaetus</i>	Recorded during breeding bird surveys but not expected to breed within the Study Area.	Occasional transient
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	Recorded during breeding bird surveys.	Uncommon permanent resident
Red-eyed Vireo	<i>Vireo olivaceus</i>	Recorded during breeding bird surveys.	Common resident
Red-tailed Hawk	<i>Buteo jamaicensis</i>	Adult and young documented.	Uncommon resident
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Recorded during breeding bird surveys.	Very common resident
Ring-billed Gull	<i>Larus delawarensis</i>	Recorded during breeding bird surveys (flyover).	Very common resident
Rose-breasted Grosbeak	<i>Phenictus ludovicianus</i>	Recorded during breeding bird surveys.	Common resident
Ruby-crowned Kinglet	<i>Regulus calendula</i>	Recorded outside the breeding season only.	Extremely rare resident
Rusty Blackbird	<i>Euphagus carolinus</i>	Recorded outside the breeding season only.	Uncommon transient
Song Sparrow	<i>Melospiza melodia</i>	Recorded during breeding bird surveys.	Very common resident
Spotted Sandpiper	<i>Actitis macularius</i>	Recorded during breeding bird surveys (nesting documented).	Common resident
Swamp Sparrow	<i>Melospiza georgiana</i>	Recorded during the breeding season but not during formal breeding bird surveys.	Uncommon resident
Tree Swallow	<i>Tachycineta bicolor</i>	Recorded outside the breeding season only.	Very common resident

Common Name	Scientific Name	Nature of Species Records within the Study Area based on 2019 Fieldwork	Local Status per Niagara NAI
Turkey Vulture	<i>Cathartes aura</i>	Recorded during breeding bird surveys.	Uncommon resident
Warbling Vireo	<i>Vireo gilvus</i>	Recorded during breeding bird surveys.	Common resident
White-breasted Nuthatch	<i>Sitta carolinensis</i>	Recorded during breeding bird surveys.	Uncommon resident
Wild Turkey	<i>Meleagris gallopavo</i>	Adults and young documented.	Uncommon permanent resident
Willow Flycatcher	<i>Empidonax traillii</i>	Recorded during breeding bird surveys.	Uncommon resident
Wood Duck	<i>Aix sponsa</i>	Recorded outside the breeding season only.	Uncommon resident
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Recorded during breeding bird surveys.	Uncommon resident
Yellow-rumped Warbler	<i>Setophaga coronata</i>	Recorded outside the breeding season only.	Very common transient
Yellow Warbler	<i>Setophaga petechia</i>	Recorded during breeding bird surveys.	Common resident
Butterflies			
Acadian Hairstreak	<i>Satyrrium acadica</i>	Observed incidentally.	Rare
Black Swallowtail	<i>Papilio polyxenes</i>	Observed incidentally.	Common
Common Wood-nymph	<i>Ceryonis pegala</i>	Observed incidentally.	Common
Eastern Comma	<i>Polygonia comma</i>	Observed incidentally.	Common
Monarch	<i>Danaus plexippus</i>	Observed incidentally.	Common
Mourning Cloak	<i>Nymphalis antiopa</i>	Observed incidentally.	Common
Viceroy	<i>Limenitis archippus</i>	Observed incidentally.	Common
Mammals			
Big Brown Bat	<i>Eptesicus fuscus</i>	Recorded by ultrasonic acoustic monitor.	n/a
Coyote	<i>Canis latrans</i>	Recorded incidentally (scat).	n/a
Eastern Cottontail	<i>Sylvilagus floridanus</i>	Observed incidentally.	n/a

Common Name	Scientific Name	Nature of Species Records within the Study Area based on 2019 Fieldwork	Local Status per Niagara NAI
Eastern Red Bat	<i>Lasiurus borealis</i>	Recorded by ultrasonic acoustic monitor.	n/a
Grey Squirrel	<i>Sciurus carolinensis</i>	Observed incidentally.	n/a
Hoary Bat	<i>Lasiurus cinereus</i>	Recorded by ultrasonic acoustic monitor.	n/a
Myotis Bat	<i>Myotis</i> sp. or spp.	Recorded by ultrasonic acoustic monitor.	n/a
Raccoon	<i>Procyon lotor</i>	Observed incidentally.	n/a
Short-tailed Shrew	<i>Blarina brevicauda</i>	Observed incidentally (beneath cover board).	n/a
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	Recorded by ultrasonic acoustic monitor.	n/a
Virginia Opossum	<i>Didelphis virginiana</i>	Observed incidentally.	n/a
White-tailed Deer	<i>Odocoileus virginianus</i>	Observed incidentally.	n/a
Odonates			
Black Saddlebags	<i>Tramea lacerata</i>	Observed incidentally.	Common
Blue Dasher	<i>Pachydiplax longipennis</i>	Observed incidentally.	Common
Calico Pennant	<i>Celithemis elisa</i>	Observed incidentally.	Uncommon
Common Green Darner	<i>Anax junius</i>	Observed incidentally.	Common
Common Whitetail	<i>Plathemis lydia</i>	Observed incidentally.	Common
Dot-tailed Whiteface	<i>Leucorrhinia intacta</i>	Observed incidentally.	Uncommon
Eastern Amberwing	<i>Perithemis tenera</i>	Observed incidentally.	Common
Eastern Pondhawk	<i>Erythemis simplicicollis</i>	Observed incidentally.	Common
Twelve-spotted Skimmer	<i>Libellula pulchella</i>	Observed incidentally.	Common
White-faced Meadowhawk	<i>Sympetrum obtrusum</i>	Observed incidentally.	Uncommon to Common
Widow Skimmer	<i>Libellula luctuosa</i>	Observed incidentally.	Common

Common Name	Scientific Name	Nature of Species Records within the Study Area based on 2019 Fieldwork	Local Status per Niagara NAI
Reptiles			
Eastern Garter Snake	<i>Thamnophis sirtalis</i> ssp. <i>sirtalis</i>	See Figure 5 for locations of all observations.	Widespread
Eastern Milksnake	<i>Lampropeltis triangulum</i>	See Figure 5 for locations of all observations.	Localized

Appendix 8. Anuran Calling Survey Results

Station ID ¹	Bearing (°)	Survey #1 – 7 April 2019 ²	Survey #2 – 9 May 2019 ²	Survey #3 – 12 June 2019 ²	Comments ²
AN-1	342	Western Chorus Frog (3)	Western Chorus Frog (1-2) Spring Peeper (1-2)	No calling anurans.	<p>Survey #1: Calls principally emanating from vernal pools north/northwest. American Woodcock vocalizing and aerially displaying to the southwest.</p> <p>Survey #2: Chorus Frog and Spring Peeper calls emanating from vernal pools north/northwest. American Toad calls emanating greater than 100 m from the southeast in wet meadows (see station AN-13). American Woodcock vocalizing to the south.</p> <p>Survey #3: Limited habitat for late-season breeding anurans.</p>
AN-2	10	Western Chorus Frog (3)	Leopard Frog (1-1) Western Chorus Frog (2-5)	No calling anurans.	<p>Survey #1: Calls emanating from vernal pools east and west. Approximately 10 individuals calling from the west; too many to count calling from the east. American Woodcock vocalizing to the north.</p> <p>Survey #2: Leopard Frog and Chorus Frog calls emanating from vernal pools due west. Spring Peeper and American Toad calls emanating from the east (see station AN-3).</p> <p>Survey #3: Limited habitat for late-season breeding anurans.</p>
AN-3	200	Western Chorus Frog (3)	American Toad (1-3) Western Chorus Frog (2-8) Spring Peeper (1-2) Leopard Frog (1-2)	No calling anurans.	<p>Survey #1: Calls emanating from vernal pools to the south. Wall of Chorus Frog calls; far too many individuals to count.</p> <p>Survey #2: Greatest calling frequency emanating from vernal pools to the southeast.</p> <p>Survey #3: Limited habitat for late-season breeding anurans.</p>
AN-4	76	Western Chorus Frog (3)	Western Chorus Frog (2-6; northwest of station) Western Chorus Frog (1-4; southeast of station)	Gray Treefrog (1-2)	<p>Survey #1: Calls emanating from vernal pool immediately east of the trail. Approximately 20 individuals. A few scattered calls (call code 1) in scrubby habitats west of the trail.</p> <p>Survey #2: Calls emanating to northwest and southeast of station in various (mostly open) areas with standing water.</p> <p>Survey #3: Limited habitat for late-season breeding anurans.</p>
AN-5	278	Western Chorus Frog (3)	Western Chorus Frog (2-7) American Toad (1-2)	Gray Treefrog (1-1)	<p>Survey #1: Limited calling (a couple individuals) within 50 m of station. Call code 3 in vernal pools to the northwest (mostly surveyed from AN-3). Call code 2 in narrow extension of swamp due west.</p> <p>Survey #2: Chorus Frog calls emanating from woodland vernal pools northwest of station. American Toad calls emanating from the southeast.</p> <p>Survey #3: Limited habitat for late-season breeding anurans.</p>
AN-6	82	Western Chorus Frog (1-3)	Western Chorus Frog (2-8) American Toad (1-1)	Gray Treefrog (1-1)	<p>Survey #1: Limited calling on east side of trail. A couple scattered individuals calling to the northeast and southeast. American Woodcock vocalizing to the east.</p> <p>Survey #2: All calls emanating southeast of station.</p> <p>Survey #3: Limited habitat for late-season breeding anurans.</p>
AN-7	180	Western Chorus Frog (3)	Spring Peeper (1-1) Leopard Frog (1-1) Western Chorus Frog (1-4) American Toad (1-2)	Gray Treefrog (1-1)	<p>Survey #1: Wall of Chorus Frog calls from vernal pools in swamp to the south/southwest. Limited calling to the east/southeast where vernal pools in the swamp/woodland are limited.</p> <p>Survey #2: All calls emanating southeast of station from woodland vernal pools except Leopard Frog, which vocalized from the watercourse to the northeast of station.</p> <p>Survey #3: Limited habitat for late-season breeding anurans.</p>
AN-8	37	Western Chorus Frog (3)	Western Chorus Frog (1-1) Leopard Frog (1-1)	Gray Treefrog (1-1) American Bullfrog (1-1) Green Frog (1-1)	<p>Survey #1: Small number of individuals (approximately 5) calling from the northeast. More calling (call code 3) due north.</p>

Station ID ¹	Bearing (°)	Survey #1 – 7 April 2019 ²	Survey #2 – 9 May 2019 ²	Survey #3 – 12 June 2019 ²	Comments ²
					<p>Survey #2: Chorus Frog calling from woodland vernal pools to the east. Leopard Frog calling from watercourse directly adjacent to station. American Toads and Spring Peepers calling from woodland to the south (see AN-7). Three American Woodcocks vocalizing.</p> <p>Survey #3: Green Frog and Bullfrog vocalizing from the pond west of station.</p>
AN-9	117	Western Chorus Frog (3)	Western Chorus Frog (2-7)	No calling anurans.	<p>Survey #1: Wall of Chorus Frog calls from the northeast to the southeast.</p> <p>Survey #2: Chorus Frog calls emanating from woodland vernal pools to the east. American Toad calls >150 m to the south (see AN-10).</p>
AN-10	81	Western Chorus Frog (3)	American Toad (2-7) Western Chorus Frog (1-1)	No calling anurans.	<p>Survey #1: Wall of Chorus Frog calls from the northeast to the southeast.</p> <p>Survey #2: American Toad calls emanating due east of station.</p> <p>Survey #3: Limited habitat for late-season breeding anurans.</p>
AN-11	354	Leopard Frog (1-2)	Leopard Frog (1-1)	Green Frog (3)	<p>Survey #1: Leopard Frog vocalizations emanating from pond to the north. Same number of individuals (2) were heard vocalizing during the day.</p> <p>Survey #2: In addition to Leopard Frog, Spring Peeper (call code 2) calls emanating from west side of Canal Bank Street.</p> <p>Survey #3: Green Frog vocalizations emanating from pond to the north.</p>
AN-12	43	Western Chorus Frog (3)	Western Chorus Frog (1-4)	No calling anurans.	<p>Survey #1: Approximately 20 Chorus Frogs calling from vernal pools to the northeast approximately 50-100 m away.</p> <p>Survey #2: Chorus Frog calls emanating from woodland pool to the northeast. Spring Peeper and American Toad calls emanating from west side of Canal Bank Street.</p> <p>Survey #3: Limited habitat for late-season breeding anurans.</p>
AN-13	350	n/a (see comments under Survey #1)	Western Chorus Frog (2-5) Spring Peeper (1-4) American Toad (1-2)	Green Frog (1-1)	<p>Survey #1: no data available (station was not surveyed on 7 April 2019); however, Chorus Frogs (call code 3) were documented vocalizing during the day on 18 April 2019.</p> <p>Survey #2: Spring Peeper and Chorus frog calls emanating from woodland vernal pools to the north of station. Additional Chorus Frogs and American Toads calling from wet meadows surrounding station. Several American Woodcocks vocalizing.</p> <p>Survey #3: Green Frog appeared to be vocalizing from the mapped watercourse.</p>

¹ Locations of Anuran Calling Stations are shown in **Figure 3**.

² **Call Code 1** = Individuals can be counted; calls not simultaneous; **Call Code 2** = Calls distinguishable; some simultaneous calling; **Call Code 3** = Full chorus; calls continuous and overlapping. Second number after the call code indicates the estimated number of individuals calling; no estimate of individuals is provided for Call Code 3.

Appendix 9. Breeding Bird Survey Results

Common Name	Scientific Name	Breeding Bird Stations ¹ and Breeding Status ²																
		BI-1	BI-2	BI-3	BI-4	BI-5	BI-6	BI-7	BI-8	BI-9	BI-10	BI-11	BI-12	BI-13	BI-14	BI-15	BI-16	
Alder Flycatcher	<i>Empidonax alnorum</i>					Po	Pr	Po										
American Crow	<i>Corvus brachyrhynchos</i>	O	O		O												O	
American Goldfinch	<i>Spinus tristis</i>	Po	Po	Pr	Pr	Po		Pr		Pr	Po	Pr	Pr	Po	Pr	Pr	Pr	
American Robin	<i>Turdus migratorius</i>	Pr	Po	Po		Po	Po	Pr	Po		Po		Co	Po	Po	Po	Po	
American Woodcock	<i>Scolopax minor</i>											Po				Pr		
Baltimore Oriole	<i>Icterus galbula</i>						Po			Po		Po	Po	Po				
Barn Swallow	<i>Hirundo rustica</i>	O										O	O			O	O	Po
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>				Po	Pr	Po											
Black-capped Chickadee	<i>Poecile atricapillus</i>		Po		Po					Po								
Blue Jay	<i>Cyanocitta cristata</i>		Po	Pr	Po	Po			Pr		Po			Po				
Blue-winged Warbler	<i>Vermivora cyanoptera</i>			Po	Pr													Po
Brown-headed Cowbird	<i>Molothrus ater</i>	Po			Po	Pr	Po	Po			Po			Pr				Po
Canada Goose	<i>Branta canadensis</i>	O	O	O														O
Cedar Waxwing	<i>Bombycilla cedrorum</i>						Po											
Chimney Swift	<i>Chaetura pelagica</i>																	O
Common Grackle	<i>Quiscalus quiscula</i>	Po	Po			Po											Po	
Common Yellowthroat	<i>Geothlypis trichas</i>		Po		Pr		Po	Po	Po		Po		Pr	Pr	Pr	Po		
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	O										O						O
Downy Woodpecker	<i>Dryobates pubescens</i>			Po	Po		Po											
Eastern Wood-pewee	<i>Contopus virens</i>		Po	Pr					Po	Pr								
European Starling	<i>Sturnus vulgaris</i>	Pr											Po			Pr	Pr	
Field Sparrow	<i>Spizella pusilla</i>				Po	Po		Pr		Po	Co			Po				
Grasshopper Sparrow	<i>Ammodramus savannarum</i>																	Po
Gray Catbird	<i>Dumetella carolinensis</i>	Po	Co	Po	Po	Pr	Po	Pr			Pr		Pr	Pr				
Great Crested Flycatcher	<i>Myiarchus crinitus</i>			Po	Po	Po												
House Sparrow	<i>Passer domesticus</i>	Po																
House Wren	<i>Troglodytes aedon</i>				Po													
Indigo Bunting	<i>Passerina cyanea</i>			Pr	Pr		Po		Pr	Pr			Po	Pr				Po
Killdeer	<i>Charadrius vociferus</i>	Po											Po			Po		
Least Flycatcher	<i>Empidonax minimus</i>											Po						
Mourning Dove	<i>Zenaidura macroura</i>	Pr							Po									
Northern Cardinal	<i>Cardinalis cardinalis</i>	Po	Pr		Pr	Po		Po					Po	Po				Po
Northern Flicker	<i>Colaptes auratus</i>	Po				Pr	Po	Po	Pr					Po	Pr	Po		
Osprey	<i>Pandion haliaetus</i>		O															
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>		Po		Po					Po				Pr				
Red-eyed Vireo	<i>Vireo olivaceus</i>			Po	Po													
Red-tailed Hawk	<i>Buteo jamaicensis</i>									Co							Co	
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Pr	Pr	Po	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Pr	Po	Po	Pr	Pr	Pr	Po
Ring-billed Gull	<i>Larus delawarensis</i>	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>			Po														
Song Sparrow	<i>Melospiza melodia</i>	Po	Pr	Pr	Po	Pr	Pr	Pr	Pr	Pr	Po	Co	Co	Pr	Po	Pr	Pr	Pr
Spotted Sandpiper	<i>Actitis macularia</i>											Po	Po					
Turkey Vulture	<i>Cathartes aura</i>												O					
Warbling Vireo	<i>Vireo gilvus</i>					Po		Po						Po	Po			
White-breasted Nuthatch	<i>Sitta carolinensis</i>		Po															
Wild Turkey	<i>Meleagris gallopavo</i>		Pr											Po				
Willow Flycatcher	<i>Empidonax traillii</i>	Po	Po			Po	Po	Po				Po	Po	Po	Po			
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>			Po														
Yellow Warbler	<i>Setophaga petechia</i>				Po	Pr	Pr	Co	Pr	Po		Po	Pr	Po	Pr	Pr	Pr	Po

¹ Locations of breeding bird survey stations are indicated on **Figure 3**.

²**Co** = Confirmed Breeder; **Pr** = Probable Breeder; **Po** = Possible Breeder; **O** = Observed (no evidence of breeding). Breeding status determined based on the results of the formal breeding bird surveys; where a higher level of breeding status was documented incidentally (i.e., during other field surveys), this is noted in **Appendix 7** and within the main body of the report (where applicable). Additional bird species recorded within the Study Area outside of the formal breeding bird surveys are noted in **Appendix 7**.

Appendix 10. Significant Wildlife Habitat Assessment

Table 1. Results of the Significant Wildlife Habitat Assessment.

Ecoregion 7E	Do any Features, Habitats, or Areas on the Subject Property or Adjacent Lands meet relevant criteria (Ecoregion 7E Criteria Schedule) as Candidate SWH?	Do any Features, Habitats, or Areas on the Subject Property or Adjacent Lands meet relevant criteria (Ecoregion 7E Criteria Schedule) as Confirmed SWH?	Likelihood that Negative Effects to SWH (i.e., “degradation that threatens the health and integrity” as defined in the 2014 PPS) will occur based on the Proposed Development Plan and any related Site Alteration Activities.
Seasonal Concentration Areas of Animals			
Waterfowl Stopover and Staging Areas (Terrestrial)	Yes. Certain thicket swamp communities and terrestrial open areas contain standing water during spring and could support congregations of migrating waterfowl.	No. Staging and congregating waterfowl were absent from flooded terrestrial areas of the Study Area based on incidental observations in April 2019.	--
Waterfowl Stopover and Staging Areas (Aquatic)	Yes. Several open water features that could support migrating waterfowl (e.g., Stormwater Pond, Southern Pond, vernal pools) are present.	No. A Mallard and Wood Duck pair were flushed from vernal pools within the Slough Forest in April 2019. Neither species is considered an indicator of this SWH type.	--
Shorebird Migratory Stopover Areas	Yes. Features that could support migrating shorebirds (e.g., unvegetated shorelines, seasonally flooded areas) are present.	No. Migrating shorebirds were not documented during any field activities within the Study Area in 2019.	--
Raptor Wintering Areas	Yes. A complex of forest and meadow communities greater than 20 ha occurs within the eastern portion of the Study Area.	Unlikely. Although wintering raptor surveys were not undertaken as part of this study, for this SWH to be present either a Short-eared Owl or Bald Eagle would need to be documented during winter, or at least 10 individuals of two of the following species: Rough-legged Hawk, Red-tailed Hawk, Northern Harrier, American Kestrel, and Snowy Owl. While it is likely that overwintering by individuals of some of the indicator species noted above would occur in an average year, it is unlikely that the criteria for establishing SWH would be met. In particular, wintering Short-eared Owls are very rare anywhere in Niagara in recent years while 10 individuals of the indicator hawks is a high threshold for the amount of habitat available.	--
Bat Hibernacula	No. Natural features and habitats that could support hibernating bats (e.g., caves, mine shafts, crevices, karsts, etc.) are absent.	--	--
Bat Maternity Colonies	Yes. Mature deciduous and mixed forests with a high-density (i.e., >10/ha) of large-diameter (i.e., ≥25 cm DBH) trees or snags containing cracks/cavities are present.	Unknown. Ultrasonic acoustic monitoring revealed that bats (particularly Big Brown Bat and/or Silver-haired Bat) may be relatively abundant in the Southern Slough Forest. Notwithstanding this, based on the time stamp of the bat recordings no confirmed maternity roosts were identified at the four (4) monitoring stations.	Possible. Portions of the narrow, southern extension of the Significant Woodland through the centre of the Study Area is proposed to be developed and may contain potential bat maternity roosting sites. Mitigation measures are required to demonstrate no negative impacts to this SWH feature and its functions. See report for greater details.
Turtle Wintering Areas	Yes. Open water and wetland communities are present.	No. Turtles were not documented within the Study Area based on targeted visual encounter surveys from April to June 2019.	--
Reptile Hibernaculum	Yes. Features (e.g., small mammal burrows, rock crevices, etc.) and/or habitats (e.g., certain wetlands with a fluctuating water table, etc.) that could provide snakes with access below the frost line are present.	No. Three snake emergence surveys (7, 18, and 30 April 2019) were undertaken to identify potential snake emergence sites; none were located. Notwithstanding this, snake overwintering somewhere within the Study Area is anticipated given the number and location of snakes documented in May/June 2019.	--
Colonially - Nesting Bird Breeding Habitat (Bank and Cliff)	No. Features that could support nesting by Cliff Swallow and Northern Rough-winged swallow (e.g., eroding banks, sandy hills, borrow pits, steep slopes, cliff faces, etc.) are absent. Neither of these species were recorded during formal breeding bird surveys.	--	--

Ecoregion 7E	Do any Features, Habitats, or Areas on the Subject Property or Adjacent Lands meet relevant criteria (Ecoregion 7E Criteria Schedule) as Candidate SWH?	Do any Features, Habitats, or Areas on the Subject Property or Adjacent Lands meet relevant criteria (Ecoregion 7E Criteria Schedule) as Confirmed SWH?	Likelihood that Negative Effects to SWH (i.e., “degradation that threatens the health and integrity” as defined in the 2014 PPS) will occur based on the Proposed Development Plan and any related Site Alteration Activities.
Colonially - Nesting Bird Breeding Habitat (Tree/Shrubs)	Yes. Swamp communities are present.	No. Stick nests associated with colonially nesting water birds are absent.	--
Colonially - Nesting Bird Breeding Habitat (Ground)	No. Rocky islands or peninsulas along lakes or large rivers are absent.	--	--
Migratory Butterfly Stopover Areas	No. A mixture of fields and forests within 5 km from the shoreline of Lake Erie or Lake Ontario are absent.	--	--
Landbird Migratory Stopover Areas	No. While migrating landbirds likely temporarily stopover to feed and rest, the Study Area is unlikely to support significant congregations of migrating landbirds as it is greater than 5 km from the shoreline of Lake Erie.	--	--
Deer Winter Congregation Areas	Yes. Portions of the Study Area and Adjacent Lands have been identified as a deer wintering area by MNRF.	Yes. While no wintering surveys have been undertaken as part of this study, it is assumed that deer wintering areas are present given existing MNRF mapping available through LIO.	Possible. Maintenance of a connective corridor to facilitate deer access to the Southern Slough Forest through Linear Park Block 66 is required. See report for greater details.
Rare Vegetation Communities or Specialized Habitats for Wildlife			
Cliffs and Talus Slopes	No. Cliffs and talus slope communities are absent.	--	--
Sand Barren	No. Sand barren communities are absent.	--	--
Alvar	No. Flora characteristic of alvars are absent.	--	--
Old Growth Forest	Yes. Mature forest is present.	Yes. Based on a review of historical aerial photographs dating back to 1934 the Southern Slough Forest appears to be at least 90 years old and may represent a pre-settlement feature. The composition of this forest is late-successional in certain areas, and overall the forest is floristically rich, contains abundant snags and woody debris, and exhibits limited evidence of recent human disturbance (apart from the abandoned railway spur and drainage modifications). Western portions of the Northern Slough Forest also exhibit old-growth attributes such as mature trees and abundant downed woody debris, but this feature appears to have been partially removed (harvested?) at some point based on the 1934 aerial photograph. Both Slough Forests contain undulating topography (i.e., slough vernal pools separated by slight rises in topography) are therefore are unlikely to have been tilled.	Negligible. All portions of wooded areas with Old Growth Forest characteristics are to be retained in Open Space Blocks 72-73.
Savannah	No. Flora characteristic of savannahs are absent.	--	--
Tallgrass Prairie	No. Flora characteristic of tallgrass prairies are absent.	--	--
Other Rare Vegetation Community	Yes. Pin Oak, Bur Oak, and Swamp White Oak dominated swamps are each individually considered provincially rare vegetation communities by NHIC. The SWDM1-a and portions of the SWDM1-b are dominated by Pin Oak and Bur Oak, with lesser amounts of Swamp White Oak.	Yes. Pin Oak and Swamp White Oak dominated deciduous swamps are each individually considered provincially rare vegetation communities by NHIC (S2S3) while Bur Oak dominated swamps are also considered provincially rare (S3). SWDM1-a and portions of SWDM1-b are generally dominated by Pin Oak and to a lesser extent Bur Oak with occasional Swamp White Oak in the canopy. Pin Oak and Bur Oak dominated deciduous swamps are also considered globally rare (G2 and G2G3, respectively) per NHIC.	Negligible. All provincially rare vegetation communities to be retained in Open Space Blocks 72-73.

Ecoregion 7E	Do any Features, Habitats, or Areas on the Subject Property or Adjacent Lands meet relevant criteria (Ecoregion 7E Criteria Schedule) as Candidate SWH?	Do any Features, Habitats, or Areas on the Subject Property or Adjacent Lands meet relevant criteria (Ecoregion 7E Criteria Schedule) as Confirmed SWH?	Likelihood that Negative Effects to SWH (i.e., “degradation that threatens the health and integrity” as defined in the 2014 PPS) will occur based on the Proposed Development Plan and any related Site Alteration Activities.
Waterfowl Nesting Area	Yes. Wetland communities that could support nesting waterfowl are present.	No. Evidence of waterfowl nesting (i.e., adults accessing probable nest sites, presence of young, etc.) was not documented during targeted breeding bird surveys nor incidentally. Standing water within the treed swamps and vernal pools elsewhere were generally observed to be small and shallow (i.e., lack a sufficient hydroperiod) to support rearing waterfowl.	--
Bald Eagle and Osprey Nesting, Foraging and Perching Habitat	No. Forest communities adjacent to large surface water features are absent.	--	--
Woodland Raptor Nesting Habitat	Unlikely. While both breeding Great Horned Owl and Red-tailed Hawk were documented in the Northern Slough Forest, none of the indicator species for this SWH type (i.e., certain woodland hawks and Barred Owl) nor stick nests were documented. While nocturnal owl surveys to confirm the presence/absence of Barred Owl were not employed, the Study Area contains somewhat limited interior forest habitat and Barred Owl often avoids habitats occupied by Great Horned Owl. Note that a detailed inventory for stick nests within the Southern Slough Forest was not undertaken (this area is not proposed for development).	--	--
Turtle Nesting Areas	No. Exposed mineral soils adjacent to surface water features that support turtles (e.g., marshes, ponds, etc.) are absent.	--	--
Seeps and Springs	No. Seeps/springs that could support feeding and drinking by wildlife during winter appear to be absent as the hydrogeologic setting of the Study Area (i.e., clay plain) typically lacks areas with an upward hydraulic gradient.	--	--
Amphibian Breeding Habitat (Woodland)	Yes. Treed swamps and vernal pools are present.	Yes. The southeastern portion of the Northern Slough Forest contains significant breeding habitat for woodland Anurans based on the presence of large congregations of Western Chorus Frog and Northern Leopard Frog. Many other wetlands and vernal pools within the Study Area contain abundantly breeding Western Chorus Frog but lack significant congregations of other Anuran species. No mole salamanders or egg masses were documented; however, no minnow traps or other methods to capture mole salamanders were employed as part of this study. If present, the most likely location for breeding mole salamanders within the Study Area overlaps with the confirmed Significant Anuran breeding habitat.	Negligible. The southeastern portion of the Northern Slough Forest where significant Anuran breeding was documented will be maintained (with a suitable buffer) in Open Space Block 73.
Amphibian Breeding Habitat (Wetlands)	Yes. Wetlands are present.	No. While the Stormwater Pond contained one vocalizing American Bullfrog, this feature is subject to an active Environmental Compliance Approval and is not considered appropriate for designation as SWH.	--
Woodland Area-Sensitive Bird Breeding Habitat	Yes. Interior forest interior conditions (i.e., >200 m from edge) are present in the Southern Slough Forest.	No. Woodland area-sensitive indicator species were absent from the Slough Forests based on the 2019 breeding bird surveys. Ovenbird may be breeding at nearby Mud Lake Conservation Area and could conceivably breed in the Southern Slough Forest; however, two additional woodland area-sensitive indicators would also need to breed on-site for this area to be considered Significant.	--

Habitat for Species of Conservation Concern

Ecoregion 7E	Do any Features, Habitats, or Areas on the Subject Property or Adjacent Lands meet relevant criteria (Ecoregion 7E Criteria Schedule) as Candidate SWH?	Do any Features, Habitats, or Areas on the Subject Property or Adjacent Lands meet relevant criteria (Ecoregion 7E Criteria Schedule) as Confirmed SWH?	Likelihood that Negative Effects to SWH (i.e., “degradation that threatens the health and integrity” as defined in the 2014 PPS) will occur based on the Proposed Development Plan and any related Site Alteration Activities.
Marsh Bird Breeding Habitat	Yes. Wetlands with robust emergent vegetation are present.	No. While playback surveys were not employed as part of this study, areas with robust emergent vegetation (e.g., cattails) are considered too small to support significant congregations of marsh birds. No marsh birds were documented during targeted breeding bird surveys or incidentally in 2019.	--
Open Country Bird Breeding Habitat	Yes. Open-country habitats of sufficient size may be present.	No. While Grasshopper Sparrow was documented as a possible breeder at BA-16, confirmation of this SWH type requires the presence of two open country indicator species.	--
Shrub/Early Successional Bird Breeding Habitat	No. Shrub/early-successional habitats of sufficient size are absent.	No. While Willow Flycatcher was documented as a possible breeder at several different locations within the Study Area (and is probably breeding at some locations based on abundance), confirmation of this SWH type requires the presence of additional shrub/early successional indicator species.	--
Terrestrial Crayfish	Yes. Marsh and swamp communities and/or wet fields are present	Yes. One (1) terrestrial crayfish chimney was documented along the Designated Watercourse.	Possible. The location of the terrestrial crayfish chimney is proposed to be developed. Mitigation required to demonstrate no negative impacts to this SWH feature and its functions. See report for greater details.
Special Concern and Rare Wildlife Species	Yes. See Table 2 below.	Yes. See Table 2 below.	Possible. See Table 2 below.
Animal Movement Corridors			
Amphibian Movement Corridors	Yes. Significant Anuran breeding habitat is present (for woodland breeding Anurans) in the southeastern portion of the Northern Slough Forest.	Yes. Significant Anuran breeding habitat is present (for woodland breeding Anurans) in the southeastern portion of the Northern Slough Forest.	Possible. Certain anticipated Anuran movement corridors are proposed to be developed. Maintenance of a connective corridor to facilitate Anuran movement between the Southern Slough Forest and wetlands to the north through Linear Park Block 66 is required. See report for greater details.

Table 2. Results of the Special Concern and Provincially Rare Species Assessment.

Species	Status per O. Reg. 230/08 under the ESA and/or NHIC	Rationale for Consideration in this Study	General Description of Habitats and Features which the Species is Known to Occupy or Use within the Ecoregion in which this Study is Located	Likelihood that the Species Occupies the Area within or adjacent to proposed Development or Site Alteration ¹	Likelihood that Negative Effects to the Species or its Habitat (i.e., “degradation that threatens the health and integrity” as defined in the 2014 PPS) will occur based on the Proposed Development Plan and any related Site Alteration Activities.
Birds					
Black Tern (<i>Chlidonias niger</i>)	SC	MNRF SAR List for Welland	<ul style="list-style-type: none"> Forages and nests in freshwater marshes with floating vegetation mats. 	Negligible. Suitable breeding and foraging habitat is absent.	--
Canada Warbler (<i>Cardellina canadensis</i>)	SC	MNRF SAR List for Welland	<ul style="list-style-type: none"> Breeds and forages in a wet thickets, swamps, and mature deciduous forest. 	Negligible. Species not documented during formal breeding bird surveys nor incidentally during 2019 fieldwork.	--
Common Nighthawk (<i>Chordeiles minor</i>)	SC	MNRF SAR List for Welland	<ul style="list-style-type: none"> Breeds and forages in a variety of open habitats with sparse cover of woody vegetation. Also occupies urban areas and nests on flat roof tops. 	Negligible. Species not documented during 2019 fieldwork.	--
Eastern Wood-pewee (<i>Contopus virens</i>)	SC	MNRF SAR List for Welland; documented on-site	<ul style="list-style-type: none"> Breeds and forages in relatively open, deciduous and mixed forests of various sizes (including urban forest fragments) and along forest edges. 	Confirmed: Species considered a probable breeder in the Slough Forests.	Negligible. Areas where species was documented will be contained within Open Space Blocks 72-73.
Golden-winged Warbler (<i>Vermivora chrysoptera</i>)	SC	MNRF SAR List for Welland	<ul style="list-style-type: none"> Breeds and forages in thickets and early-successional forests/thickets adjacent to deciduous or mixed forest. 	Negligible. Species not documented during formal breeding bird surveys nor incidentally during 2019 fieldwork.	--
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	SC	MNRF SAR List for Welland; OBBA; documented on-site	<ul style="list-style-type: none"> Breeds and forages in hayfields, savannahs, pastures, meadows, grasslands, and prairies. 	Confirmed: Species considered a possible breeder at BA-16 and is known to breed in the local landscape.	Negligible. While the location in which this species was documented is proposed to be developed, it is only considered a possible breeder. A separate individual was also documented north of the Study Area on Adjacent Lands. There is a relatively robust population of Grasshopper Sparrow in the local landscape (i.e., fields between the Welland Canal, Highway 140, and the railway lands).
Red-headed Woodpecker (<i>Melanerpes erythrocephalus</i>)	SC	MNRF SAR List for Welland; OBBA;	<ul style="list-style-type: none"> Breeds and forages in open forests, savannahs, and forest edges that tend to contain large, mature trees. 	Negligible. Species not documented during formal breeding bird surveys nor incidentally during 2019 fieldwork.	--
Short-eared Owl (<i>Asio flammeus</i>)	SC	MNRF SAR List for Welland	<ul style="list-style-type: none"> Breeds and forages in a variety of open habitats. Overwinters in similar habitats as breeding and foraging areas. 	Negligible. Species not documented during 2019 fieldwork. Recent records of potentially breeding individuals are very rare in Niagara Region.	--
Wood Thrush (<i>Hylocichla mustelina</i>)	SC	MNRF SAR List for Welland; OBBA;	<ul style="list-style-type: none"> Breeds and forages in second-growth and mature deciduous and mixed forests with a well-developed understory. 	Negligible. Species not documented during formal breeding bird surveys nor incidentally during 2019 fieldwork.	--
Fish					
Grass Pickerel (<i>Esox americanus vermiculatus</i>)	SC	MNRF Information Request	<ul style="list-style-type: none"> Occupies wetlands, ponds, slow-moving streams and shallow bays of larger lakes with warm, shallow, clear water and an abundance of aquatic plants. 	Negligible. Suitable habitat is absent.	--
Insects					

Species	Status per O. Reg. 230/08 under the ESA and/or NHIC	Rationale for Consideration in this Study	General Description of Habitats and Features which the Species is Known to Occupy or Use within the Ecoregion in which this Study is Located	Likelihood that the Species Occupies the Area within or adjacent to proposed Development or Site Alteration ¹	Likelihood that Negative Effects to the Species or its Habitat (i.e., “degradation that threatens the health and integrity” as defined in the 2014 PPS) will occur based on the Proposed Development Plan and any related Site Alteration Activities.
Monarch <i>(Danaus plexippus)</i>	SC	MNRF SAR List for Welland; documented on-site	<ul style="list-style-type: none"> Oviposits on Milkweeds (<i>Asclepias</i> spp.). Generalist foraging that nectars in most areas with wildflowers. 	Confirmed. Ovipositing documented via observation of a caterpillar.	Negligible. Open portions of the Open Space Blocks, Stormwater Block, and landscape surrounding the Study Area provide sufficient nectaring and ovipositing sites for this species.
Yellow Banded Bumble Bee <i>(Bombus terricola)</i>	SC	Range Map	<ul style="list-style-type: none"> Occupies a range of open areas with nectaring sites. Nests underground in abandoned rodent burrows or decomposing logs. 	Possible. Species is a habitat generalist and occupies a wide range of areas.	Negligible. Open portions of the Open Space Blocks, Stormwater Block, and landscape surrounding the Study Area provide sufficient nectaring and overwintering sites for this species.
West Virginia White <i>(Pieris virginiensis)</i>	SC	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies moist, deciduous woodlands. Oviposits on Toothworts (<i>Cardamine</i> spp.). 	Negligible. Host plant (<i>Cardamine</i> spp.) is absent.	--
Plants					
Broad Beech Fern <i>(Phegopteris hexagonoptera)</i>	SC	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies mature, moist to wet deciduous woodlands. 	Negligible. Species was not documented during the vascular plant surveys.	--
Swamp Rose Mallow <i>(Hibiscus moscheutos)</i>	SC	MNRF SAR List for Welland, NHIC	<ul style="list-style-type: none"> Occupies marshes and open wetlands. 	Negligible. Species was not documented during the vascular plant surveys.	--
Honey Locust <i>(Gleditsia triacanthos)</i>	S2	NHIC	<ul style="list-style-type: none"> Occupies river banks and floodplains, but escaped individuals (from plantings, etc.) found in a wide variety of habitats including roadsides and disturbed areas. 	Negligible. Species was not documented during the vascular plant surveys.	--
Tapered Rush <i>(Juncus acuminatus)</i>	S3	Documented on-site	<ul style="list-style-type: none"> Occupies moist fields and marshes in the Carolinian Zone. 	Confirmed. Species documented during vascular plant surveys.	Possible. Some populations situated within proposed development areas. Mitigation measures are required to demonstrate no negative impacts to this species and its habitat. See report for greater details.
Yellow-fruited Sedge <i>(Carex annectens)</i>	S2	Documented on-site	<ul style="list-style-type: none"> Occupies fields (sometimes disturbed) and meadow marshes in the Carolinian Zone. 	Confirmed. Species documented during vascular plant surveys.	Possible. Portions of population to be contained in the southwest corner of Open Space Block 73. Unknown how population has responded to regular maintenance (mowing) since summer 2019. See report for greater details.
Reptiles					
Eastern Ribbonsnake <i>(Thamnophis saurita)</i>	SC	MNRF SAR List for Welland; Ont. Reptile and Amph. Atlas	<ul style="list-style-type: none"> Occupies edges of shallow ponds, streams, marshes, swamps, or bogs bordered by dense vegetation. 	Unlikely. While suitable habitat is present, no individuals were documented during the snake visual encounter and active hand surveys. Based on information contained in NPCA’s Natural Areas Inventory (NAI), the nearest location this species may occur to the Study Area is Mud Lake Conservation Area.	--
Northern Map Turtle <i>(Graptemys geographica)</i>	SC	MNRF SAR List for Welland; Ont. Reptile and Amph. Atlas	<ul style="list-style-type: none"> Occupies lakes and large rivers with slow moving currents. Nests in exposed, usually coarse, friable substrate. 	Negligible. Suitable habitat is absent. Individuals may be present in the Welland Recreational Waterway to the west.	--

Species	Status per O. Reg. 230/08 under the ESA and/or NHIC	Rationale for Consideration in this Study	General Description of Habitats and Features which the Species is Known to Occupy or Use within the Ecoregion in which this Study is Located	Likelihood that the Species Occupies the Area within or adjacent to proposed Development or Site Alteration ¹	Likelihood that Negative Effects to the Species or its Habitat (i.e., “degradation that threatens the health and integrity” as defined in the 2014 PPS) will occur based on the Proposed Development Plan and any related Site Alteration Activities.
Snapping Turtle <i>(Chelydra serpentina)</i>	SC	MNRF SAR List for Welland; Ont. Reptile and Amph. Atlas	<ul style="list-style-type: none"> • Occupies a variety of aquatic habitats with slow moving water. • Nests in exposed, usually coarse, friable substrate. • Known to make long-distance overland movements (i.e., several kilometers) between habitats. 	<p>Negligible. Though difficult to state with absolute certainty that this species is absent from the Study Area, no turtles were documented during 2019 visual encounter surveys. The Southern Pond is surrounded on the west and south side by a tall fence that appears to be trenched into the ground, restricting access by turtles that may occur in the Welland Recreational Waterway.</p>	--

¹ Likelihood categories should be interpreted as follows:

Negligible: so limited that the assessed species can be assumed absent.

Unlikely: while theoretically conceivable, species presence very improbable or temporary based on available information (e.g., habitat conditions, range, abundance in local landscape, etc.).

Possible: species presence plausible based on available information; no convincing evidence suggesting species could not occur on-site.

Probable: while not confirmed, available information suggests species has a high likelihood of being present.

Confirmed: species observed and/or evidence of occupation (e.g., tracks, etc.) documented.

**Appendix 11. Endangered and Threatened Species
Assessment**

Species	Status per O. Reg. 230/08 of the ESA	Rationale for Consideration in this Study	General Description of Habitats and Features which the Species is Known to Occupy within the Ecoregion in which this Study is Located	Likelihood that the Species Occupies the Area within or adjacent to proposed Development or Site Alteration ¹	Likelihood that Negative Effects to the Species or its Habitat (i.e., “Damage” or “Destruction” as defined in the ESA) will occur based on the Proposed Development Plan and any related Site Alteration Activities
Birds					
Acadian Flycatcher (<i>Empidonax vireescens</i>)	END	MNRF SAR List for Welland; OBBA	<ul style="list-style-type: none"> Breeds and forages in mature, relatively undisturbed deciduous forest and swamps, often in valleys/ravines. 	Negligible. Species not documented during formal breeding bird surveys nor incidentally during 2019 fieldwork.	--
Bank Swallow (<i>Riparia riparia</i>)	THR	MNRF SAR List for Welland; OBBA	<ul style="list-style-type: none"> Nests in natural or anthropogenically derived exposed, sandy substrates on vertical or steep surfaces. Forages in a variety of open areas including agricultural lands, meadows, prairies, woodland clearings, marshes, and above waterbodies. 	Negligible. Species not documented during formal breeding bird surveys nor incidentally during 2019 fieldwork.	--
Barn Swallow (<i>Hirundo rustica</i>)	THR	MNRF SAR List for Welland; OBBA	<ul style="list-style-type: none"> Nests in barns, bridge/culvert undersides, awnings/overhangs on sides of buildings, and (historically) tree cavities. Forages in a variety of open areas including agricultural lands, meadows, prairies, woodland clearings, marshes, and above waterbodies. 	Confirmed. Species documented in several locations during formal breeding bird surveys and incidentally.	Negligible. Suitable breeding sites are absent from the Study Area. Species likely breeds in the local landscape surrounding the Study Area.
Bobolink (<i>Dolichonyx oryzivorus</i>)	THR	MNRF SAR List for Welland; OBBA	<ul style="list-style-type: none"> Breeds and forages in hayfields, pastures, meadows, grasslands, and prairies which are often (but not always) greater 4 ha. May be found in more marginal habitats (e.g., shrubby fields, smaller fields, etc.) during migration or following disturbance to breeding habitats (e.g., hay cutting). 	Negligible. Species not documented during formal breeding bird surveys nor incidentally during 2019 fieldwork.	--
Cerulean Warbler (<i>Setophaga cerulea</i>)	THR	MNRF SAR List for Welland	<ul style="list-style-type: none"> Breeds and forages in mature and second-growth deciduous forest with a relatively open understory. 	Negligible. Species not documented during formal breeding bird surveys nor incidentally during 2019 fieldwork.	--
Chimney Swift (<i>Chaetura pelagica</i>)	THR	MNRF SAR List for Welland; OBBA	<ul style="list-style-type: none"> Nests in large uncapped chimneys and (historically) tree cavities. May forage above a wide variety of anthropogenic (e.g., cities, towns) and natural (e.g., fields, forests) areas. 	Confirmed. Species documented at BA-15 during breeding bird surveys.	Negligible. Suitable breeding sites are absent from the Study Area. Species likely breeds in the local landscape (e.g., older sections of Welland and/or Port Colborne where uncapped chimneys are present).
Eastern Meadowlark (<i>Sturnella magna</i>)	THR	MNRF SAR List for Welland; OBBA; NHIC	<ul style="list-style-type: none"> Breeds and forages in hayfields, savannahs, pastures, meadows, grasslands, prairies, and shrubby fields. 	Negligible. Species not documented during formal breeding bird surveys nor incidentally during 2019 fieldwork.	--
Eastern Whip-poor-will (<i>Caprimulgus vociferus</i>)	THR	MNRF SAR List for Welland; OBBA	<ul style="list-style-type: none"> Breeds and forages in semi-open deciduous forests and thickets, and their edges. 	Negligible. Species not documented during 2019 fieldwork. Closest known breeding location is Wainfleet Bog, otherwise breeding individuals are very rare in Niagara Region.	--
Henslow’s Sparrow (<i>Ammodramus henslowii</i>)	END	MNRF SAR List for Welland; OBBA	<ul style="list-style-type: none"> Breeds and forages in hayfields, pastures, meadows, and wet meadows. 	Negligible. Species not documented during formal breeding bird surveys nor incidentally during 2019 fieldwork.	--
Least Bittern (<i>Ixobrychus exilis</i>)	THR	MNRF SAR List for Welland; OBBA	<ul style="list-style-type: none"> Breeds and forages in marshes dominated by robust emergent vegetation containing areas of open water (i.e., interspersed). 	Negligible. Suitably sized breeding habitat is absent.	--

Species	Status per O. Reg. 230/08 of the ESA	Rationale for Consideration in this Study	General Description of Habitats and Features which the Species is Known to Occupy within the Ecoregion in which this Study is Located	Likelihood that the Species Occupies the Area within or adjacent to proposed Development or Site Alteration ¹	Likelihood that Negative Effects to the Species or its Habitat (i.e., “Damage” or “Destruction” as defined in the ESA) will occur based on the Proposed Development Plan and any related Site Alteration Activities
Yellow-breasted Chat (<i>Icteria virens</i>)	END	MNRF SAR List for Welland	<ul style="list-style-type: none"> Breeds and forages in prefer dense thickets around wood edges, riparian areas, and in overgrown clearings 	Negligible. Species not documented during formal breeding bird surveys nor incidentally during 2019 fieldwork.	--
Fish					
Lake Chubsucker (<i>Erimyzon sucetta</i>)	THR	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies marshes and lakes with clear, still, warmwater and abundant aquatic vegetation. 	Negligible. Current DFO mapping does not designate the mapped watercourse within the Study Area as habitat for this species.	--
Insects					
Rusty-patched Bumble Bee (<i>Bombus affinis</i>)	END	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies a range of open areas with nectaring sites. Nests underground in abandoned rodent burrows or decomposing logs. 	Negligible. While potential nesting and nectaring sites are present within the Study Area, recent observations in Ontario are exceptionally rare and confined to Pinery Provincial Park.	--
Mammals					
Eastern Small-footed Myotis (<i>Myotis leibii</i>)	END	MNRF SAR List for Welland	<ul style="list-style-type: none"> Maternal roosting sites include exposed rock outcrops, crevices, and cliffs. Overwinters in caves and mines that maintain temperatures above 0°C. 	Unlikely. While species may migrate through or feed above open habitats within the Study Area or Adjacent Lands, potential maternal roosting habitat (e.g., rock outcrops, cliffs, etc.) is absent.	--
Little Brown Myotis (<i>Myotis lucifugus</i>)	END	MNRF SAR List for Welland	<ul style="list-style-type: none"> Maternity roosts sites most often include buildings and large diameter trees with cracks, crevices, and/or exfoliating bark. Overwinters in caves and mines that maintain temperatures above 0°C. 	Confirmed. A Myotis species (likely either Little Brown Myotis or Northern Myotis) was documented within the Northern and Southern Slough Forests during ultrasonic acoustic monitoring. It is unknown if this species roosted within the Study Area (either maternity colonies or individuals) in 2019.	Possible. Portions of the narrow, southern extension of the Significant Woodland through the centre of the Study Area is proposed to be developed and may contain potential bat maternity roosting sites. Mitigation measures are required to demonstrate no negative impacts to this SWH feature and its functions. See report for greater details.
Northern Myotis (<i>Myotis septentrionalis</i>)	END	MNRF SAR List for Welland	<ul style="list-style-type: none"> Maternity roosts most often include large diameter trees with cracks, crevices, and/or exfoliating bark (buildings rarely used). Overwinters in caves and mines that maintain temperatures above 0°C. 	Confirmed. A Myotis species (likely either Little Brown Myotis or Northern Myotis) was documented within the Northern and Southern Slough Forests during ultrasonic acoustic monitoring. It is unknown if this species roosted within the Study Area (either maternity colonies or individuals) in 2019.	Possible. Portions of the narrow, southern extension of the Significant Woodland through the centre of the Study Area is proposed to be developed and may contain potential bat maternity roosting sites. Mitigation measures are required to demonstrate no negative impacts to this SWH feature and its functions. See report for greater details.
Tri-colored Bat (<i>Perimyotis subflavus</i>)	END	MNRF SAR List for Welland	<ul style="list-style-type: none"> Maternal roosting sites include Maple (<i>Acer</i> spp.) and Oak (<i>Quercus</i> spp.) with dead/dying leaf clusters. Overwinters in caves and mines that maintain temperatures above 0°C. 	Unlikely. This species was not documented as part of ultrasonic acoustic monitoring.	--
Mussels					
Mapleleaf Mussel (<i>Quadrula quadrula</i>)	THR	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies medium to large rivers with firmly packed substrate. 	Negligible. Suitable habitat is absent.	--
Plants					

Species	Status per O. Reg. 230/08 of the ESA	Rationale for Consideration in this Study	General Description of Habitats and Features which the Species is Known to Occupy within the Ecoregion in which this Study is Located	Likelihood that the Species Occupies the Area within or adjacent to proposed Development or Site Alteration ¹	Likelihood that Negative Effects to the Species or its Habitat (i.e., “Damage” or “Destruction” as defined in the ESA) will occur based on the Proposed Development Plan and any related Site Alteration Activities
American Chestnut (<i>Castanea dentata</i>)	END	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies dry deciduous forests. 	Negligible. Species was not documented during vascular plant surveys.	--
Butternut (<i>Juglans cinerea</i>)	END	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies a variety of treed habitats including mature forests, early-successional forests, and hedgerows. 	Negligible. Species was not documented during vascular plant surveys.	--
Eastern Flowering Dogwood (<i>Cornus florida</i>)	END	MNRF SAR List for Welland	<ul style="list-style-type: none"> Dry (usually with Oak) to rich deciduous forests, often on hillsides and river banks. 	Negligible. Species was not documented during vascular plant surveys.	--
Round-leaved Greenbrier (<i>Smilax rotundifolia</i>)	THR	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies open moist to wet woodlands, often growing on sandy soil. 	Negligible. Species was not documented during vascular plant surveys.	--
Spoon-leaved Moss (<i>Bryoandersonia illecebra</i>)	END	Documented on-site.	<ul style="list-style-type: none"> Occupies low-lying areas that are seasonally flooded under trees or shrub thickets. Also occupies moist cultural thickets that lack seasonal inundation by standing water. 	Confirmed. Two clumps of this species were documented east of the Southern Slough Forest in WODM5-c.	Possible. While the proposed development limit is restricted from the Southern Slough Forest and contiguous woodlands, a future trail may be aligned in the general vicinity of this species. Site alteration activities must consider this species and its habitat to avoid the need for an ESA authorization. See report for greater details.
White Wood Aster (<i>Eurybia divaricata</i>)	THR	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies open, dry deciduous forests. 	Negligible. Species was not documented during vascular plant surveys.	--
Reptiles					
Five-lined Skink (Carolinian) (<i>Plestiodon fasciatus</i>)	END	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies generally open environments along or near the Great Lakes including dunes, fields, and deciduous forest edges. 	Negligible. Suitable habitat is absent.	--
Massasauga (<i>Sistrurus catenatus</i>)	THR	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies generally open habitats including tallgrass prairies, peatlands, and shorelines. Two (2) extant populations in Ecoregion 7 (Ojibway Prairie and Wainfleet Bog). 	Negligible. Suitable habitat is absent. Nearest population occurs in Wainfleet Bog.	--
Blanding's Turtle (<i>Emydoidea blandingii</i>)	THR	MNRF SAR List for Welland	<ul style="list-style-type: none"> Occupies freshwater lakes, permanent or temporary pools, slow-flowing streams, marshes, and swamps. <ul style="list-style-type: none"> Nests in exposed, usually coarse, friable substrate. Known to make long-distance overland movements (i.e., several kilometers) between habitats. 	Negligible. No turtles (any species) were documented during visual encounter surveys.	--

¹ Likelihood categories are to be interpreted as follows:

Negligible: so limited that the assessed species can be assumed absent.

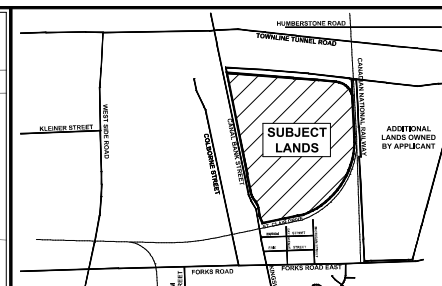
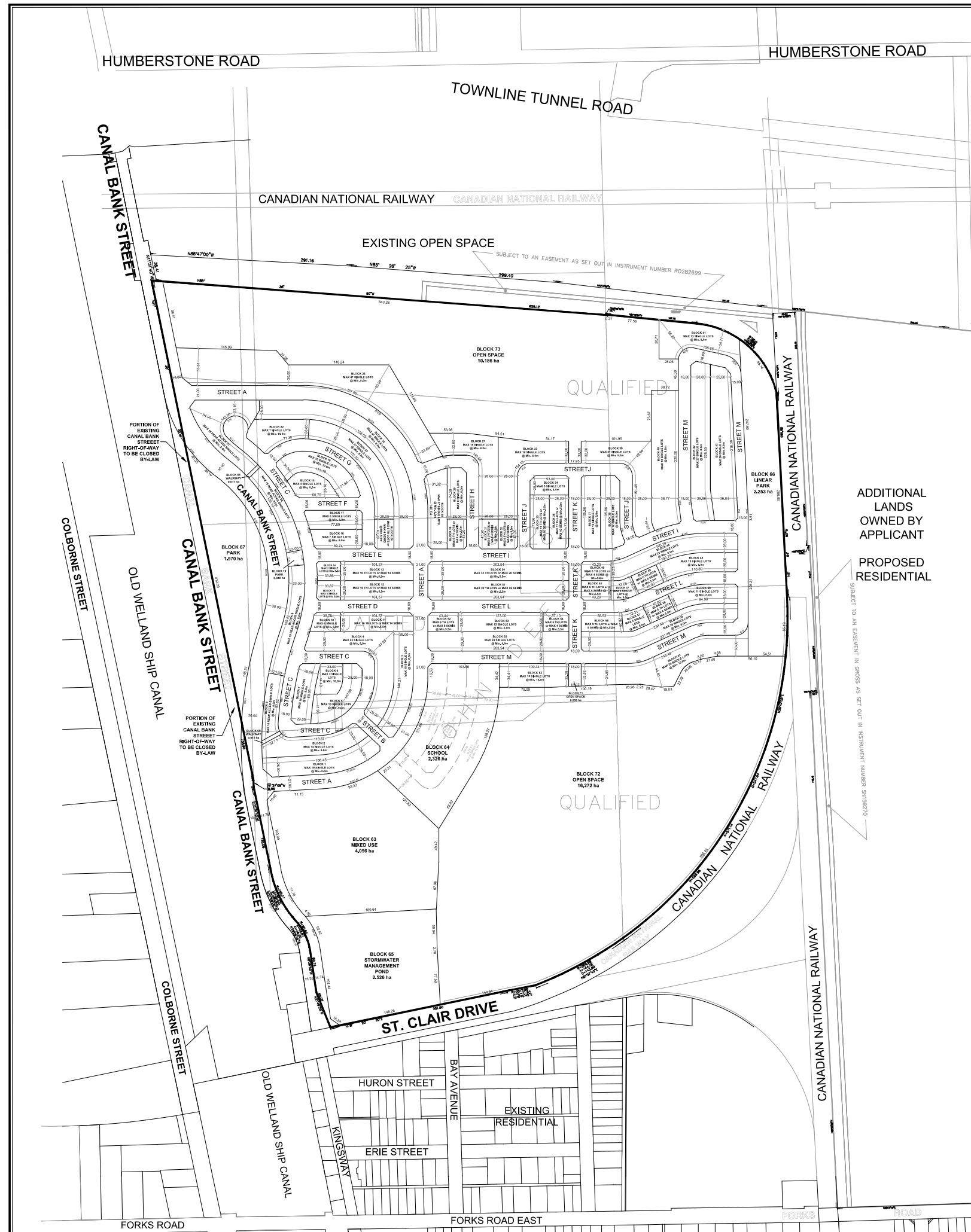
Unlikely: while theoretically conceivable, species presence very improbable or temporary based on available information (e.g., habitat conditions, range, abundance in local landscape, etc.).

Possible: species presence plausible based on available information; no convincing evidence suggesting species could not occur on-site.

Probable: while not confirmed, available information suggests species has a high likelihood of being present.

Confirmed: species observed and/or evidence of occupation (e.g., tracks, etc.) documented.

Appendix 12. Draft Plan of Subdivision



KEY PLAN N.T.S.

ADDITIONAL INFORMATION
 Required Under Section 51(17)
 Of The Planning Act R.S.O. 1990 c.P.13

a. SHOWN ON DRAFT PLAN
 b. SHOWN ON DRAFT AND KEY PLANS
 c. SHOWN ON KEY PLAN
 d. LAND TO BE USED IN ACCORDANCE WITH LAND USE SCHEDULE
 e. SHOWN ON DRAFT PLAN
 f. SHOWN ON DRAFT PLAN

g. SHOWN ON DRAFT PLAN AND KEY PLAN
 h. MUNICIPAL PIPED WATER TO BE PROVIDED
 i. SOIL IS SILTY CLAY
 j. SHOWN ON DRAFT PLAN
 k. ALL MUNICIPAL SERVICES TO BE PROVIDED
 l. SHOWN ON DRAFT PLAN

SCHEDULE OF LAND USE

Proposed Land Use	Units	Reference	Area (Ha.)
Residential Singles 10.0m	54	Blocks 6,19,22,61-62	2.052
Residential Singles 8.0m	554	Blocks 1-5,7,10,14-18,23,25-29,33,34,37-45,47,53,55,57,59,60	15.429
Residential Rear Access Singles 8.0m	60	Blocks 8,9,20,21	1.308
Residential Townhomes 5.5m	202	Blocks 11-13,24,30,31,32,35-36,46,48,49,50,51,52,54,56,58	3.791
Mixed Use		Block 63	4.056
School		Block 64	2.326
Stormwater Management Pond		Block 65	2.526
Park / Linear Park		Blocks 66-67, 70	4.271
Walkway		Blocks 68-69	0.026
Open Space		Blocks 71-73	26.518
ROADS			
30m R.O.W. (Canal Bank Street)			2.475
21m R.O.W. (Street A)			2.108
15m R.O.W. (Streets B-M)			7.753
TOTAL	870		74.729

Proposed Summary Yield

Proposed Unit Mix	Unit Count with Alternate 5.50m Townhouse Units	Unit Count with Alternate 5.50m Semi-Detached Units
Residential Singles 10.0m	54	54
Residential Singles 8.0m	554	554
Residential Rear Lane Access Singles 8.0m	60	60
Residential Townhomes 5.5m	202	60
Residential Semi-Detached 5.5m		164
TOTAL	870	832

5		
4		
3		
2		
1		
No.	REVISION	DATE

REVISIONS

OWNER'S CERTIFICATE
 WE, BEING THE REGISTERED OWNER OF THE SUBJECT LANDS HEREBY AUTHORIZE ARMSTRONG PLANNING AND PROJECT MANAGEMENT TO PREPARE AND SUBMIT A DRAFT PLAN OF SUBDIVISION FOR APPROVAL.

SIGNED _____ DATE _____

SURVEYOR'S CERTIFICATE
 I HEREBY CERTIFY THAT THE BOUNDARIES OF THE SUBJECT LANDS AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN ON THIS PLAN.

SIGNED _____ DATE _____

DAIN CITY WEST
DRAFT PLAN OF SUBDIVISION

PART LOTS 21, 22 AND 23, CONCESSION 5,
 PART OF THE ROAD ALLOWANCE BETWEEN
 LOTS 22 AND 23, CONCESSION 5,
 (CLOSED BY BY-LAW 855, INST NO. HU8243)
 GEOGRAPHIC TOWNSHIP OF HUMBERSTONE)
 THE CITY OF WELLAND
 REGIONAL MUNICIPALITY OF NIAGARA

armstrong
 planning | project management

DESIGN:	DRAWN:	SCALE:	1: 2000
APPROVED:	DATE:	PROJECT No.:	20.2699.00
DRAFTING No.:		Doin City West Subdivison.dwg	
		PHASES 1-2	