SAVANTA

Riverfront Residential EIS

Addendum to March 2018 EIS

JANUARY 2019

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REPORT PREPARED FOR

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1.0 INTRODUCTION

1.1 Report Purpose

This report was requested by the City of Niagara Falls (City), the Region of Niagara (Region), the Niagara Peninsula Conservation Authority (NPCA) and addresses aspects related to the Ministries of Natural Resources and Forestry (MNRF) and Environment, Conservation and Parks (MECP). It addresses what those municipalities and agencies deemed to be additional natural heritage data and interpretations that were required to support development applications related to the Draft Plan of Subdivision and Zoning By-law Amendment for the Riverfront Residential Area within the GR(CAN) Investment Co. Ltd. land holdings in Niagara Falls, Ontario.

This EIS is an addendum to the 2017 EIS and responds to a Terms of Reference (ToR) developed by the GR(CAN) consulting team in conjunction with those same municipalities and agencies. The ToR required additional technical work be completed in 2018, in response to requests from agencies following submission of the March 2018 EIS Addendum. That work was undertaken to meet Savanta's understanding of expected requirements, which were later fully defined in the accepted ToR. Those requirements are summarized below (section 1.2).

Information in this EIS is also informed by data and analyses presented in previous environmental reporting (e.g., Dougan & Associates 2015, 2016; Savanta Inc. 2017, 2018). The location of the Riverfront Residential Area subject to the current Draft Plan of Subdivision and the overall GR(CAN) Investment Co. Ltd (GR Can) land holdings are shown on **Figure 1** (**Appendix A**).

1.2 Scope of the Riverfront Residential EIS

On May 8, 2018, Niagara Falls City Council approved the Official Plan Amendment Application submitted by GR(CAN) Investment Co. Ltd., subject to the recommendations contained within the staff report dated May 8, 2018. Some of the recommendations contained within that staff report referenced additional natural heritage study requirements that needed to be satisfied prior to subsequent project approvals. The natural heritage related recommendations in the staff report focused on the following key issues:

- Wetlands and their proposed buffers;
- Endangered Species Act permitting;
- Significant wildlife habitat; and
- Woodlands.

A primary purpose of this Riverfront Residential EIS is to address the natural heritage recommendations contained within the City staff report and to provide updated information on issues that have been discussed with regulatory agencies since the submission of the March 2018 EIS Addendum. This Riverfront Residential EIS has been scoped by the proponent's consulting team and agencies to focus on key issues that were not already addressed in previous EIS documents.

The agency group, comprised of the City, the Region and NPCA, provided input to the content of the Riverfront Residential EIS through pre-consultation meetings at City Hall, Niagara Falls, on July 19, October 4, and November 21, 2018 along with a technical discussion completed by phone between Savanta and Regional staff on November 19, 2018. The working versions of the ToR provided clear guidance regarding the scope of this EIS. The EIS ToR is attached in **Appendix E**.

2.0 NATURAL HERITAGE PLANNING CONSIDERATIONS

2.1 Provincial Policy Statement and Associated Guideline Documents

The Provincial Policy Statement (PPS; MMAH 2014) provides direction on matters of provincial interest related to land use planning and development. It, "...supports a comprehensive, integrated and long-term approach to planning..." The PPS is to be read in its entirety and land use planners and decision-makers need to consider all relevant policies and how they work together.

This report addresses those policies that are specific to Natural Heritage (section 2.1) with reference to other policies with relevance to Natural Heritage and impact assessment considerations and areas of overlap (e.g., those related to Efficient and Resilient Development and Land Use Patterns, section 1.1; Sewage, Water and Stormwater, section 1.6.6; Water, section 2.2; Natural Hazards, section 3.1).

Eight types of significant natural heritage features are defined in the PPS, as follows:

- Significant wetlands;
- Significant coastal wetlands;
- Significant woodlands;
- Significant valleylands;
- Significant wildlife habitat;
- Fish habitat;
- Habitat of endangered and threatened species; and
- Significant areas of natural and scientific interest (ANSIs).

Development and site alteration shall not be permitted in significant wetlands or significant coastal wetlands. Development and site alteration shall not be permitted in significant woodlands, significant valleylands, significant wildlife habitat or significant ANSIs, unless it is demonstrated that there will be no negative impacts on the natural features or their ecological functions.

Development and site alteration shall not be permitted in the habitat of endangered and threatened species or in fish habitat, except in accordance with provincial and federal requirements. Development and site alteration may be permitted on lands adjacent to significant natural heritage features (i.e., within 120 m of the Subject Lands, as identified in the NHRM; MNR 2010) provided it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

2.2 Niagara Region Policy Plan

The Region of Niagara Official Plan (consolidated version 2014) provides guidance and direction pertaining to natural heritage features and associated functions. The Subject Lands contain elements of the Region's Core Natural Heritage System (the Regional NHS). Policy 7.B.1.1. summarizes the components of the Regional Core NHS as follows:

- Environmental Protection Areas (EPA) or Environmental Conservation Areas (ECA);
- Potential Natural Heritage Corridors connecting the Core Natural Areas;
- Greenbelt Natural Heritage and Water Resource Systems; and
- Fish Habitat.

The Region's (2014) EPA designation includes:

- Provincially significant wetlands;
- Provincially significant life science Areas of Natural and Scientific Interest (ANSIs);
- Significant habitat of endangered and threatened species (not mapped by the Region, where identified this habitat will be subject to EPA policies); and
- Greenbelt Natural Heritage System (wetlands, significant valleylands, significant woodlands, SWH, habitat of species of concern, publicly owned conservation lands, savannahs, tallgrass prairies, alvars).

The Region's (2014) ECA designation includes:

- Significant woodlands;
- Significant wildlife habitat;
- Significant habitat of species of concern;
- Regionally significant life science ANSIs;
- Other evaluated wetlands;
- Significant valleylands;
- Savannahs, tallgrass prairie and alvars; and
- Publicly owned conservation lands.

Potential Natural Heritage Corridors include:

- Areas that maintain and, where possible, enhance the ecological functions of the corridor in linking the core natural areas.

The Region's (2014) Chapter 7.B NHS policies that apply to Regional NHS elements on the Subject Lands are summarized below:

- Only minor adjustments to EPA boundaries will be permitted without amendment to the Regional Official Plan (Plan);
- Development and site alteration may be permitted without amendment to the Plan in ECAs and on adjacent land to EPA and ECAs outside the Greenbelt NHS if it has been demonstrated over the long term, that there will be no significant negative impact on the Regional NHS or adjacent lands and the proposed development or site alteration is not prohibited by other policies;
- Where it is demonstrated that all, or a portion of, an ECA does not meet the criteria for designation under this Plan, the restrictions on development and site alteration do not apply;
- Where development or site alteration is proposed in or near a potential natural heritage corridor (shown conceptually on Schedule C), 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; and
- Where development or site alteration is approved in or adjacent to the Regional NHS, new lots shall not extend into the area to be retained in a natural state as part of the NHS or the buffer zone identified through an EIS.

2.3 City of Niagara Falls Official Plan

On May 8, 2018, Niagara Falls City Council approved Official Plan Amendment (OPA) 128. The application submitted by GR(CAN) Investment Co. Ltd., is subject to the recommendations contained within the City staff report dated May 8, 2018. OPA 128 provides policy direction for development of the Subject Lands, which are situated within Special Policy Area #56. OPA 128 also includes modification of the boundaries of lands identified as PSW that lie outside the boundaries of the Subject Lands and overall Riverfront Community.

The City's Official Plan Land Use Plan (Schedule A) was amended to:

- Illustrate the Riverfront Community Plan Area (which contains the Riverfront Residential Area);
- Apply EPA, Open Space, Tourist Commercial and Minor Commercial designations; and
- Modify the lands designated EPA that lie outside of the Subject Lands to reflect MNRF mapping of PSWs.

The recommendations contained within the City staff report dated May 8, 2018, which accompanied the approved OPA, that are relevant to the Riverfront Residential Area, are addressed within this EIS.

2.4 Niagara Peninsula Conservation Authority

NPCA administers the *Development, Interference with Wetlands, Alterations to Shorelines and Watercourses* Regulation, (O. Reg.) 155/06, which defines the areas of interest that allow NPCA to:

- Prohibit, regulate, or provide permission for straightening, changing, diverting or interfering in any way with the existing channel of a river, creek, stream, watercourse or changing or interfering with a wetland; and
- Prohibit, regulate, or provide permission for development if the control of flooding, erosion, dynamic beaches, pollution or the conservation of land may be affected by the development.

NPCA implements its authority under O.Reg. 155/06 in accordance with the *NPCA Policy Document: Policies for the Administration of Ontario Regulation 155/06 and the Planning Act* (NPCA 2018).

2.5 Ontario Endangered Species Act, 2007

The provincial Endangered Species Act (ESA 2007) was developed to:

- Identify species at risk, based upon best available science;
- Protect species at risk and their habitats and to promote the recovery of Species at Risk; and
- Promote stewardship activities that would support those protection and recovery efforts.

The ESA 2007 protects all threatened, endangered and extirpated species listed on the Species at Risk in Ontario (SARO) list. These species are legally protected from harm or harassment and their associated habitats are legally protected from damage or destruction, as defined under the ESA 2007.

2.6 Migratory Bird Convention Act, 1994

This federal legislation protects the nests and offspring of listed migratory bird species from destruction or disturbance. In its application, it requires best management practices to detect and avoid disturbance to active nests during development activities.

3.0 DATA COLLECTION APPROACH & METHODS

3.1 Background References

Background information from prior reporting provided information regarding the physiography and existing ecological conditions on the Subject Lands. The prior reports also considered information accessed from the MNRF Land Information Ontario natural features database/mapping; Natural Heritage Information Centre database; and provincial wildlife atlases (i.e., Ontario Breeding Bird Atlas, etc.). Previous reports that have been relied upon and which inform this EIS are:

- Preliminary Natural Heritage Characterization (Draft), Thundering Waters Secondary Plan, Dougan & Associates November 2015;
- Characterization and Environmental Impact Study, Thundering Waters Secondary Plan, Dougan & Associates June 2016;
- Response to Peer Review Comments, Dougan & Associates July 2016;
- Environmental Impact Study, Savanta Inc. September 2017; and
- Environmental Impact Study Addendum, Riverfront Community OPA, Savanta Inc. March 2018.

3.2 Agency Discussions

Agency (NPCA, Region, City, MNRF) comments and associated responses from Savanta regarding the Riverfront Residential Area are provided in **Appendix F**.

3.2.1 Ministry of Natural Resources and Forestry

The MNRF Information Gathering Form (IGF) pertaining to Species at Risk on, and adjacent to, the Subject Lands was submitted on January 23, 2018. The IGF identified several species that could have the potential to occur in the overall GR(Can) Land Holdings, including:

- Acadian Flycatcher (*Empidonax virescens*) – Endangered in Ontario and Canada;
- Dense Blazing Star (*Liatris spicata*) – Threatened in Ontario and Canada;
- Kentucky Coffeetree (*Gymnocladus dioicus*) – Endangered in Ontario and Threatened in Canada;
- Eastern Small-footed Myotis (*Myotis leibii*) - Endangered in Ontario and Canada;
- Little Brown Myotis (*Myotis lucifugusi*) - Endangered in Ontario and Canada;
- Northern Myotis (*Myotis septentrionalis)* - Endangered in Ontario and Canada; and

- Tri-coloured Bat (*Perimyotis subflavus*) - Endangered in Ontario and Canada.

Results from the 2018 bat acoustic monitoring program were required to update the IGF, which will be re-submitted in early 2019. Due to the sensitive nature of this information, Species at Risk precise data/locations will remain with MNRF and will not be included within public reporting.

3.2.2 Municipality (City and Region)

The City of Niagara Falls adopted OPA 128 on July 10, 2018, which outlines specific policies for development on GR(CAN) owned lands where the Riverfront Residential Community is proposed. This EIS addresses environmental policies included in OPA 128. Niagara Region is responsible for ensuring conformity with provincial and regional policies and to assist the City of Niagara Falls in their consideration of the application from a provincial and regional perspective.

As described in section 1.2, the agency group, which includes the City and Region, requested an EIS Terms of Reference that is provided in **Appendix E**. This EIS addresses the content requirements outlined in the EIS ToR.

3.2.3 Niagara Peninsula Conservation Authority

The NPCA administers the *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Permit* process, under Ontario Regulation 155/06. The NPCA no longer has a Memorandum of Understanding with Niagara Region regarding review for conformity with natural heritage components of the Regional Policy Plan. The NPCA indicated in a letter dated April 5, 2018, that their staff did not object to OPA 128 for the Riverfront Residential Area, subject to comments regarding significant wetlands. This EIS addresses NPCA comments contained within the letter dated April 5, 2018, that pertain to significant wetlands.

3.3 Technical Methods and Field Studies

A number of technical investigations were completed in 2018 to update analyses regarding baseline character and significance assessments. Each of the following are discussed further in this section of the EIS:

- Woodland Canopy Cover Surveys;
- Ecological Land Classification Updates;
- Vegetation & Wetland Hydroperiod Surveys;
- Woodland Breeding Amphibian SWH Refinements;
- Rare Vegetation Community SWH Refinement;

- Rare Species SWH Refinement;
- Bat Habitat Assessment;
- Bat Acoustic Monitoring Surveys;
- Wildlife Movement Surveys;
- Candidate Turtle Nesting SWH Refinement; and
- Rare Species SWH Refinement (Eastern Wood-Pewee and Wood Thrush).

3.3.1 Vegetation Survey Methods

Woodland Canopy Cover Surveys

Woodland canopy cover/stem density surveys examined all communities identified as either cultural woodland (CUW1) or cultural thicket (CUT1) to determine if they met the Ecological Land Classification (ELC) woodland definition (according to live canopy cover) and the Forestry Act definition of woodland. The Forestry Act definition requires a woodland to have at least:

- 1,000 trees of any size per hectare;
- 750 trees measuring over five centimetres in diameter per hectare;
- 500 trees measuring over 12 centimetres in diameter per hectare; or
- 250 trees measuring over 20 centimetres in diameter per hectare.

All trees that had attained a height of over 1.37 m were included in the inventory. At the request of the Region, Hawthorn shrubs were also included in this analysis (*Crataegus* species). Fruit trees (e.g., *Malus*, *Pyrus*) were inventoried but were excluded from stem density calculations. There were no orchards or plantation established on the Subject Lands for the purpose of producing Christmas trees.

The stem density assessment was completed using circular plots with a radius of 15 m or 5 m, depending on the size/shape of the vegetation community. For woodland or thicket communities that occurred within the proposed development area and also extended outside of this limit, the portion occurring within the footprint was assessed and imagery interpretation was used to delineate outside the footprint. This ensured the calculation of stem densities was representative of the ELC community as a whole, rather than just the area within the proposed development footprint. ELC live canopy cover was also determined within each plot and for the overall ELC polygon as a whole.

Ecological Land Classification Updates

Within each stem density plot (described above), data was also collected for Ecological Land Classification and appropriate forms were completed. Methods for

this revised ELC followed the standard requirements outlined in the ELC Manual for Southern Ontario (Lee et al. 1998). When determining appropriate ELC community codes, consideration was given to live canopy density and species composition within the canopy.

ELC community codes were also updated within select PSW units to reflect current conditions (i.e., species composition and community type). The boundaries of the PSW units applied in these analyses continue to match those approved by the MNRF. Wetland files are open files in Ontario and may be updated as new/additional information becomes available.

Vegetation & Wetland Hydroperiod Surveys

Several candidate significant wildlife habitat types were previously identified (2016 EIS; 2017 EIS) within the retained NHS based on ELC type and aerial interpretation. Targeted vegetation and wetland surveys were conducted in 2018 that informed some further technical refinements to: significant wildlife habitat mapping for woodland calling amphibian SWH; rare vegetation community SWH and rare species SWH within several PSW units on the Subject Lands. Each is discussed further below.

Woodland Breeding Amphibian SWH Refinement

Staff gauges were installed in seven wetlands on the Subject Lands and monitored from summer through autumn 2018 to assist with the more detailed characterization of these wetlands. Staff gauges were installed in pools holding water or, where a wetland held no apparent water at the time of installation, within a depression. One of these instrumented wetlands was previously identified as woodland breeding amphibian SWH (the Green Ash Mineral Deciduous Swamp (SWD2-2) PSW unit located south of the railway and west of the central SWD1). The staff gauge was installed in this SWD2-2 unit on July 12, 2018 (the feature was noted to be dry at that time) and was monitored generally on a biweekly basis through November 2018. As a result of site visits to this wetland and the collection of staff gauge data, this wetland was found to lack suitable amphibian breeding habitat (i.e., lacked suitable depressions).

Rare Vegetation Community SWH Refinement

Previous reporting (2016 EIS; 2017 EIS) identified candidate rare vegetation community SWH within and adjacent to the Subject Lands. The candidate rare vegetation community SWH layer includes older growth forest. Older growth forest delineation was updated using Google Earth historical aerial imagery from 1934. In addition, a targeted survey was conducted within the PSW (CUT1/SWT2) in the

southwest corner of the Subject Lands to confirm the presence/absence of a candidate rare vegetation community polygon shown within this PSW in prior reports.

Rare Species SWH Refinement

Surveys were conducted in September 2018 to document/update the abundance of Milkweed plants within the Riverfront Residential Area. Milkweed is the host plant of Monarch, which is a butterfly that is Special Concern in Ontario and Endangered in Canada. Concentrations of abundant Milkweed within a suitable ELC polygon may warrant the identification of candidate SWH – which would then need to be confirmed through surveys for the target butterfly.

The 2016 EIS (Dougan and Associates) reported the presence of a provincially rare tree, Honey-locust (*Gleditsia triacanthos*) (S2?, G5; NHIC 2016). Two specimens were recorded by Dougan and Associates in the wooded floodplain of the eastern tributary (retained NHS) and one stem was recorded north of the Subject Lands within adjacent lands. A targeted survey was conducted by Savanta to determine whether any stems of this species occur within the proposed development area.

During the course of 2018 ecological surveys on the Subject Lands, Great Plains Ladies'-tresses (*Spiranthes magnicamporum*) (S3? G4; NHIC 2016), a provincially rare plant was recorded on-site. Two targeted surveys were conducted during the blooming period (mid to late-September) to confirm the extent of this species within the proposed development area. This orchid species was not previously recorded on the Subject Lands during prior fall botany surveys conducted as part of the 2016 EIS; this orchid species does not bloom every year and may not be readily apparent some years (i.e., depending on growing conditions, etc.).

3.3.2 Wildlife Survey Methods

Bat Habitat Assessment

A bat habitat assessment, consisting of a cavity density survey, was completed within the overall GR(Can) Land Holdings, including the Subject Lands. The surveys were completed using a combination of MNRF survey guidelines as outlined in "Bats and Bat Habitats: Guidelines for Wind Power Projects" (MNR 2011) and "Survey Protocols for Species at Risk Bats within Treed Habitats: Little Brown Myotis, Northern Myotis, and Tri-Coloured Bat" (MNRF 2017), in conjunction with professional experience.

Areas to be surveyed were determined through the use of ELC mapping of the Subject Lands. Targeted ELC communities on the Subject Lands were Deciduous Forests (FOD) and Deciduous Swamp (SWD). For the purposes of these surveys,

Cultural Woodlands (CUW) were also targeted as they can provide SAR bat habitat. In certain instances, Cultural Thicket (CUT) communities were also included where there was a standing-dead canopy layer of Ash trees, which provide potential habitat for Species at Risk bats. Cultural Woodlands and Cultural Thickets are not eligible vegetation types for bat significant wildlife habitat. Surveys were conducted during the leaf-off period on days when visibility was good. Each community that was surveyed was assigned a unique polygon identification number.

ELC communities greater than 1 ha in size were surveyed using a plot-based approach, which consisted of randomly selecting 10 or more plots within the community. Each plot had a radius of 12.6 m (0.05 ha) and a GPS waypoint was recorded at each plot center. Within each plot, all trees greater than or equal to 10 cm diameter at breast height (DBH) were visually inspected using binoculars to document any suitable roosting features (such as cavities, crevices, loose bark) along the trunk or large branches. Each tree containing suitable roosting features had the following information recorded: UTM, species, DBH, approximate height, decay class, canopy cover, total number of cavities and height information for the top three cavities. Each vegetation community that was surveyed also was photographed to give a representation of the habitat potential.

For all vegetation communities less than 1 ha, the entire community was surveyed using a transect approach, where transects were 5 m to 20 m apart (depending on visibility).

The results were then used to assess the quality of the area for bat maternity roost SWH. A minimum density of >10 suitable roosting trees with >25 cm DBH/ha is required for a feature to be considered candidate bat SWH. MNRF suggests features with >10 suitable roosting trees with >10 cm DBH/ha be considered as potential SAR bat habitat.

Bat Acoustic Monitoring Surveys

Bat acoustic monitoring surveys enable, with reasonable certainty, the identification of bat species using analysis of sonographic characteristics from recordings of ultrasonic calls used by bat echolocate. Survey methods were developed based on professional experience and using a combination of MNRF survey guidelines as outlined in “Bats and Bat Habitats: Guidelines for Wind Power Projects” (MNR 2011) and “MNRF Survey Protocols for Species at Risks Bats within Treed Habitats: Little Brown Myotis, Northern Myotis, and Tri-Coloured Bat” (MNRF 2017).

Surveys to detect bat species were carried out for candidate bat SWH polygons (primary stations) on and adjacent to the Subject Lands in June 2018, with the

exception of one candidate bat SWH polygon that was surveyed in August 2018. The latter polygon was just at the threshold of meeting the SWH snag density requirement; surveys were completed as a conservative measure. Additional surveys were completed at secondary stations in July in wooded areas beyond the 120 m adjacent lands to the site. Surveys to detect bat species in candidate SAR bat habitat polygons occurred in June, July and extended into August. Surveys were completed using Wildlife Acoustics Song Meter SM3BAT/SM4BAT recording devices over a duration of ten consecutive evenings. Passive bat recording stations were located in areas inside and outside of the construction footprint to provide a complete understanding of the relative importance of the available habitats on the Subject Lands.

Survey stations were selected based on aerial interpretation, ELC vegetation community types, and ground-truthing for suitable bat micro-habitat such as clusters of ≥10 cm DBH trees with peeling bark, leaf clusters, and cavities. A total of 50 stations were identified on the Subject Lands. Stations were situated within and adjacent to the proposed development area as well as control stations in woodlands well beyond the Riverfront Residential Area, as requested by MNRF.

Passive acoustic recorders were programmed to begin recording at sunset and to end recording at sunrise. In addition, the SM3BAT/SM4BAT passive recorder microphones were elevated approximately 2 m above the ground to reduce background noise and echo.

All ultrasonic recordings were filtered to eliminate recordings with high levels of noise and that contained no bat calls, and then further analyzed using SonoBat's auto-classification tool. Any calls with a positive identification were manually vetted by a wildlife ecologist with training in bat species identification by sonogram.

All species of bats can make calls that range in frequencies and sonogram characteristics, depending on the behavior at the time of call recording (i.e., social calls, foraging calls, feeding buzzes). Calls recorded during a bat's search phase are the most reliable for an accurate species identification, and these calls were used preferentially to identify recorded species from the Subject Lands. Calls can be classified as not identifiable by the program due to the high level of confidence needed when classifying recordings, quality of the calls, overlap of multiple bat calls, and/or too much environmental background noise). High frequency calls that were not identifiable to species were manually reviewed by a wildlife ecologist with training in bat species identification by sonogram to identify those calls with characteristics of Species at Risk bats (i.e., calls with frequencies greater than 40kHz). The four species of bats listed on the SARO list all show characteristics of high frequency

calling within the search phase, and therefore are readily distinguished from most other species of bats.

Both the NHIC (2016) database and the SARO list (Ontario Regulation 230/08) were reviewed to determine the current provincial status for each bat species detected.

Wildlife Movement Surveys

Wildlife road-crossing surveys were conducted along the boundary roads that front the Subject Lands in April and May 2017, October 2017, and September 2018 to further understand wildlife movement on and immediately adjacent to the Subject Lands. The key animal movement periods are the early spring (April to May) when amphibians and reptiles move between overwintering and breeding/other habitats, and autumn (September to October) when amphibians and reptiles return to overwintering sites. These surveys were conducted on foot to document signs of wildlife/road interactions, such as dead specimens, live specimens and other evidence (tracks, scat, feathers, etc.). All observations were recorded with UTM coordinates.

Salamander movement surveys were also conducted on-site in late-February 2017 between Dorchester Road and the central portion of the NHS (i.e., large Oak Mineral Deciduous Swamp that contains suitable amphibian breeding habitat). This survey effort assisted with the identification of potential east-west movement patterns across the proposed western development area. The results of these salamander movement surveys were provided in the 2017 EIS. A summary of the latter is reiterated in this EIS for context and to aid in discussion regarding potential natural heritage corridors (i.e., ecological linkages).

Candidate Turtle Nesting SWH Refinement

Potentially suitable turtle nesting SWH is present on City lands located off-site, south of Chippawa Parkway. Candidate turtle nesting SWH was mapped in this area in the March 2018 EIS Addendum. Targeted surveys were conducted within the City lands during the hatchling turtle emergence period (mid-August through September). The objectives of the surveys were to document any evidence of turtle hatchling emergence or nest predation, and to assess the suitability of nesting habitat (i.e., through completion of field observations and soil auger samples).

Rare Species SWH Refinement (Eastern Wood-Pewee and Wood Thrush)

The rare species SWH layer for Wood Thrush and Eastern Wood-Pewee previously identified in the 2016 EIS was refined to match more accurately with ELC boundaries

and the occurrence data for each bird species (latter from the breeding bird surveys completed as part of the 2016 EIS).

4.0 SURVEY RESULTS

Table 1 (**Appendix B**) provides a summary of the ecological studies conducted in 2018, including field dates, survey type and surveyors.

4.1 Vegetation Community Refinements

The 2018 woodland stem density studies (section 3.3.1) resulted in the refinement of ELC boundaries and vegetation community types within the proposed development areas and in the adjacent, retained NHS. Updated ELC cards are provided in **Appendix C** and were provided directly to the MNRF, as requested. Revised vegetation community mapping (**Figure 2**, **Appendix A**) is based on ELC methods with supportive data derived from the stem density survey results. In rare instances where the treed canopy cover appeared to satisfy the percent-cover requirement for ELC, yet the stem density results suggested woodland designation was not met, the ELC percent-cover was used and woodland designation was applied.

The boundaries of PSW units were maintained as staked by Dougan and Associates (at the request of MNRF) and as reviewed in the field with the NPCA and MNRF staff. Additional wetland technical information was collected in 2018 (i.e., updated botanical inventory, soil cores, and staff gauge/hydroperiod observations); this information contributed to ELC refinements (**Figure 2**, **Appendix A**).

4.2 Bat Survey Results

Based on the bat habitat assessments, suitable bat maternity roosting habitat is present for SWH and SAR species within several vegetation types within the GR(Can) Land Holdings, including the Subject Lands. The results of the bat habitat assessment, regarding SWH screening, are provided in **Table 3** (**Appendix B**). The results of the habitat assessments regarding SAR habitat screening are provided to MNRF through the IGF process.

Seven bat species were confirmed to be present through acoustic call surveys on the Subject Lands: Big Brown Bat *(Eptesicus fuscus),* Silver-haired Bat *(Lasionycteris noctivagans),* Hoary Bat *(Lasiurus cinereus*), Eastern Red Bat (*Lasiurus borealis*), Little Brown Myotis *(Myotis lucifugus),* Northern Myotis (*Myotis septentrionalis*) and Eastern Small-footed Myotis (*Myotis leibii).*

The three Myotis species identified above are all listed as Endangered on the Species at Risk in Ontario list. Within the Riverfront Residential development areas, the majority of the surveyed polygons did not detect any SAR bats, while others only

recorded one or two calls. As a result, no significant SAR bat habitat is present within the proposed Riverfront Residential development areas. Species at Risk bats will be addressed with MNRF through the IGF. Bats are discussed in terms of SWH and Species at Risk in sections 5.3 and 5.4, respectively.

4.3 Wildlife Survey Results – Significant Habitat Refinement

Woodland Breeding Amphibian SWH

Seven wetlands within the Subject Lands were instrumented with staff gauges from summer through fall 2018 to assist with the characterization of these features (i.e., regarding drydown timing and fall re-wetting). Staff gauge data is provided in **Table 4** (**Appendix B**) and staff gauge locations are illustrated on **Figure 4a** (**Appendix A**). One SWD2-2 wetland, located south of the railway and west of the central SWD1, was found to be dry on July 12, 2018, and provided no suitable amphibian breeding habitat (i.e., lacked suitable depressions). This SWD2-2 was identified in prior reporting as woodland breeding amphibian habitat as a result of aerial image/ELC interpretation. The woodland breeding amphibian SWH layer was updated accordingly (section 5.3 and **Figure 4a**, **Appendix A**).

Rare Vegetation Community SWH

The rare vegetation community SWH layer regarding old growth forests was updated to reflect an understanding of woodland presence in 1934 aerial imagery (available through Google Earth). The targeted survey in the PSW unit (CUT1/SWT2) in the southwest corner of the Subject Lands confirmed the absence of old growth trees, rare vegetation communities, and rare plants. The rare vegetation community SWH layer was updated accordingly (section 5.3 and **Figure 4b**, **Appendix A**).

Rare Species SWH - Honey-locust

No Honey-locust specimens were found within the east development area or in the adjacent PSW unit (Green Ash Mineral Deciduous Swamp). Based on this targeted survey and botanical inventory data in the 2016 EIS, this species' occurrence was refined to the Oak Mineral Deciduous Swamp (SWD1) within a ravine east of the proposed development area. The rare species SWH layer was updated accordingly (section 5.3 and **Figure 4c**, **Appendix A**).

Rare Species SWH – Great Plains Ladies'-tresses

Great Plains Ladies'-tresses, a provincially rare plant, was detected in open, early-successional vegetation communities on disturbed soils within the west development

area. The main population on the Subject Lands is comprised of more than 100 stems with additional specimens scattered west of the main population. This species was not observed on the Subject Lands during previous studies; orchid species do not necessarily bloom during every year and abundance can vary considerably between suitable blooming years. Great Plains Ladies'-tresses is assessed as rare species SWH in section 5.3.2.

Rare Species SWH – Wood Thrush, Eastern Wood-Pewee, Schreber's Aster

The refinement of vegetation community boundaries and ELC types (section 4.1) to reflect existing conditions allowed for the delineation of SWH to be refined for three provincially rare woodland species: Wood Thrush, Eastern Wood-Pewee and Schreber's Aster. The Wood Thrush and Eastern Wood-Pewee SWH layers were updated to match with suitable habitat and where these bird species were detected during breeding bird surveys conducted as part of the 2016 EIS. The Schreber's Aster SWH layer, which was more general in prior reporting, has been updated to match the existing forest edge (this is an obligate woodland species). The rare species SWH layer was updated accordingly (section 5.3 and **Figure 4c**, **Appendix A**).

Rare Species SWH – Monarch

Surveys were conducted on September 14, 17 and 21, 2018, to document/update the abundance of Milkweed plants within the Riverfront Residential Area. Large concentrations of Milkweed within a suitable ELC polygon may warrant the identification of candidate rare species SWH for Monarch. Three targeted surveys found no concentrations of Milkweed within suitable ELC types in the proposed development areas. Where Milkweed was detected within ELC polygons in the proposed development area, it varied in abundance levels from rare to occasional. Since suitable habitat was not identified for Monarch, this SWH type is not present within the Riverfront Residential Area.

Amphibian Movement Corridor SWH

Surveys that targeted key amphibian movement periods were conducted on and adjacent to the Subject Lands: wildlife road-crossing surveys (2017 and 2018) and salamander movement surveys (2017). In addition to the amphibian call count data provided in the 2016 EIS, these amphibian movement surveys assisted with the identification of amphibian movement corridor SWH and potential natural heritage corridors (i.e., other ecological linkages).

Targeted wildlife road crossing surveys were conducted on the Subject Lands in spring and fall 2017 and fall 2018 during reptile/amphibian movement windows

(survey dates are provided in **Table 1**, **Appendix B**). Two transects were located south of the railway, one transect (RT1) fronts the Subject Lands along Dorchester Road and Chippawa Parkway, and the other transect (RT2) is located northeast of the Subject Lands. The results of the wildlife crossing surveys are provided in **Table 5** (**Appendix B**) and are illustrated on **Figure 5** (**Appendix A**).

A variety of wildlife was observed on RT1 (the existing roadways that front the outer western and southern boundaries of the Subject Lands). The species observed included; three reptile species (Eastern Gartersnake, Dekay's Brownsnake, and Midland Painted Turtle), six amphibian species (Blue-spotted Salamander, Green Frog, Northern Leopard Frog, American Toad, Western Chorus Frog, and Bullfrog), one bird species (American Goldfinch), and one mammal species (Coyote). The highest diversity and abundance of wildlife observations was recorded on Chippawa Parkway as shown on **Figure 5** (**Appendix B**). No species were recorded on RT2.

Targeted salamander movement surveys were conducted on the Subject Lands on rainy evenings in late February 2017 (survey dates are provided in **Table 1**, **Appendix B**). The survey included six transects on the Subject Lands as shown on **Figure 5** (**Appendix A**). The results of the salamander movement survey are provided in **Table 6** (**Appendix B**). Salamanders observed during these surveys were presumed to be Blue-spotted Salamanders (based on previous detailed salamander genetic work completed as part of the 2016 EIS in vernal pools northeast of the Subject Lands). Two salamanders were observed on the Subject Lands (**Figure 5**, **Appendix A**).

Amphibian movement corridor SWH is assessed in section 5.3.2.

Candidate Turtle Nesting SWH

The area shown as candidate turtle nesting SWH in the March 2018 EIS Addendum is located (off-site) on City lands south of Chippawa Parkway. The accessible portion of the City lands was surveyed on August 27 and September 14, 2018, during the turtle hatchling emergence period. The area was found to provide moderately suitable turtle nesting habitat. Soils were clay loam underlain with clay, based on soil auger samples. Some areas with gravel were present, likely from construction of a pedestrian pathway in this area. There were areas that could not be surveyed as they were fenced.

Turtle movement was recorded between the candidate turtle nesting SWH polygon on the City lands and the Subject Lands during spring road mortality surveys (March 2018 EIS Addendum). A road mortality survey was conducted along Chippawa Parkway and Dorchester Road on September 14, 2018, in case hatchling turtles were evident on the roadways. No turtles were recorded during the fall road mortality

survey. The candidate turtle nesting SWH polygon remains the same in this report as was shown in the March 2018 EIS Addendum.

5.0 ANALYSIS OF ECOLOGICAL AND NATURAL HERITAGE SIGNIFICANCE

Eight types of significant natural heritage features are defined in the PPS, as follows:

- Significant wetlands;
- Significant coastal wetlands;
- Significant woodlands;
- Significant valleylands;
- Significant wildlife habitat;
- Fish habitat;
- Habitat of endangered and threatened species; and
- Significant areas of natural and scientific interest (ANSIs).

The NHRM (MNR 2010), MNRF (2015) significant wildlife habitat eco-regional criteria schedules, and Niagara Regional Policy Plan (2014) were referenced to assess the potential significance of natural areas and associated functions. Prior EIS studies (2016 EIS; 2017 EIS; March 2018 EIS Addendum) addressed the absence/presence of significant natural heritage features in detail. The sections below provide an update for the following types of significant natural heritage features, as requested by the agencies through the approved ToR for the proposed Riverfront Residential EIS:

- Significant wetlands;
- Significant woodlands;
- Significant wildlife habitat; and
- Habitat of endangered and threatened species.

Fish habitat and significant valleylands were addressed in previous reporting (2016 EIS and 2017 EIS), the results of which are summarized below. No coastal wetlands or ANSIs are present on the Subject Lands or within 120 m adjacent lands.

5.1 Significant Wetlands

Significant wetlands are illustrated on **Figure 2** (**Appendix A**). The significant wetlands on the Subject Lands were staked, at the request of MNRF, by Dougan and Associates in 2015. The boundary was reviewed in the field with MNRF and NPCA staff. Subsequent adjustments to the PSW boundary delineation were approved by MNRF. The MNRF LIO database's provincially significant wetland layer reflects the PSW boundaries for the Subject Lands. Significant wetlands are regulated by NPCA under Ontario Regulation (O. Reg.) 155/06 (*Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*).

Potential impacts of development on significant wetlands are addressed in section 7.

5.2 Significant Woodlands

The PPS notes that, significant woodlands should be defined and designated by the planning authority using criteria established by the MNRF. The Niagara Region Policy Plan (2014) defines woodland as: ... *a treed area that provides environmental and economic benefits to both the private landowner and 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 tree*s."

Previous significant woodland mapping from the 2017 EIS was updated based on the results of ELC updates and canopy cover/stem density surveys (section 3.3.1). These updates were conducted in part because of the advancement of the Emerald Ash Borer infestation on the Subject Lands, which has resulted in considerable decline/die-back of Ash trees that once dominated a variety of vegetation communities. The *Forestry Act* (1990) tree density definitions were used to determine whether a given vegetation community met the woodland definition (for further detail refer to section 3.3.1). Contiguous woodland patches were then mapped and regional significance criteria (Region 2014) and provincial significance criteria (NHRM; MNR 2010) were applied for the entire GR(CAN) land holdings, including the Subject Lands.

Niagara Region Official Plan (Region 2014) – Significant Woodland Criteria

The Region (2014) defines a woodland as a treed area that provides environmental and economic benefits to both the private landowner and general public, such as ecosystem goods and services. It does not include a cultivated fruit or nut orchard, or a plantation used for the purpose of producing Christmas trees. In accordance with this definition, natural treed communities (FOC, FOD, FOM, SWC, SWD, SWM) and cultural forest/plantation communities (CUW, CUP) are considered woodlands (i.e., meet the *Forestry Act* (1990) tree density requirements). Woodland patches are considered part of the same continuous woodland if they are within 20 m of each other.

To be identified as significant, a woodland must meet one or more of the following criteria (Region 2014):

- Contain threatened or endangered species or species of concern (Special Concern in Ontario or Canada or provincially ranked S1-S3);
- Within the Urban Area, be 2 hectares or greater in size;

- Contain interior woodland habitat at least 100 m in from the woodland boundaries;
- Contain older growth forest and be 2 hectares or greater in area;
- Overlap or contain one or more of the other significant natural heritage features listed in Region (2014) policies 7.B.1.3 or 7.B.1.4 (i.e., EPA, ECA or fish habitat); and
- Abut or be crossed by a watercourse or water body and be 2 ha or more in size.

Natural Heritage Reference Manual (MNR 2010) – Significant Woodland Criteria

Woodland cover in the City of Niagara Falls is 25% (NPCA 2010). Table 7.2 of the NHRM (MNR 2010) summarizes evaluation criteria and thresholds for each criterion for significant woodland designation. For areas where woodland cover is between 15% to 30%, the significant woodland criteria are as follows (note: the minimum woodland size for woodland patches to be considered against the significant woodland criteria listed below is 4 ha):

- Size – woodlands that are 20 ha in size or larger.
- Ecological Functions
  a) Woodland Interior – woodlands that contain 2 ha or more of interior woodland habitat (>100 m from edge);
  b) Proximity to other woodlands or habitats – a portion of the woodland is located within 30 m of a significant natural feature or fish habitat and receives ecological benefit from the woodland;
  c) Linkages - woodlands that are within a defined natural heritage system or provide a connecting link between two significant features, each of which is within a specified distance of 120 m;
  d) Water Protection – woodlands that are within 50 m of a sensitive groundwater discharge, sensitive recharge, sensitive headwater area, watercourse or fish habitat; and
  e) Woodland diversity – woodlands with a naturally occurring composition of native forest species that have declined significantly south and east of the Canadian Shield, and woodlands with a high native diversity through a combination of composition and terrain (i.e., woodland extending from hilltop to valley bottom or to opposite slopes).
- Uncommon Characteristics – woodlands that are uncommon (i.e., S1, S2 or S3 ranked vegetation communities) in terms of species composition, cover type, age or structure and older woodlands (i.e., older than 100

years old and/or larger tree size structure, such as >10 trees/ha at least 50 cm in diameter, etc.).

- Economic and Social Functional Values – woodlands that have high economic or social values through particular site characteristics or deliberate management.

Significant Woodland Analysis Results

The revised significant woodland layer is shown on **Figure 3** (**Appendix A**); the results were the same when either the regional or provincial significance criteria were applied. In total, 47.8 ha of significant woodland is present on the Subject Lands. Much of the significant woodland overlaps with significant wetlands and will be retained within the NHS. A portion of significant woodland (7.27 ha), which is comprised of cultural woodland in severe/advancing decline due to loss of the tree canopy layer to Emerald Ash Borer and invasion of the understory by the exotic shrub Common Buckthorn, is proposed for removal. The proposed removal is discussed in section 7, along with potential impacts of development on retained significant woodlands.

5.3 Significant Wildlife Habitat

An assessment of each significant wildlife habitat (SWH) type in the MNRF (2015) SWH criteria schedule for eco-region 7E is provided in **Table 2** (**Appendix B**). SWH polygons relevant to each SWH type present on the Subject Lands are illustrated on **Figures 4a** to **4i** (**Appendix A**). An amalgamated SWH layer is provided on **Figure 6** (**Appendix A**).

5.3.1 Bat Maternity SWH

Bat SWH is confirmed when a suitable habitat polygon (as determined through the bat habitat assessment) contains >10 Big Brown Bats or >5 female Silver-haired Bats. Acoustic calls do not allow the confirmation of sex or the exact number of individuals present within an area. For example, 20 calls recorded in a given night could have been made by one individual passing the recorder 20 times, or by 20 individuals passing the recorder one at a time. Therefore, a minimum of 50 calls of either of the indicator species was used as the threshold to confirm presence of SWH. This threshold was set to establish regular use of a feature; it corresponds to an average use of around 5 calls per night within the feature.

Using this factor, bat maternity SWH was confirmed in the following polygons within the GR(CAN) land holdings (**Figure 4d**, **Appendix A**): E, P, T, U, V, and Z. All of the bat

maternity SWH polygons are located outside of the proposed development area. Polygons U and P are located within the proposed Riverfront Residential NHS and will be retained. These SWH polygons overlap with significant woodlands/significant wetlands; appropriate buffer width and buffer planting measures will be applied (section 7).

5.3.2 Rare Species SWH – Great Plains Ladies'-tresses

Rare species SWH was confirmed within the Subject Lands for the provincially rare plant Great Plains Ladies'-tresses (*Spiranthes magnicamporum*). GPS points were recorded around the perimeter of the main population and general transects were conducted within the polygon to estimate the population (~100 plants). The rest of this species' occurrence is scattered, in low numbers, across parts of the cultural meadow/thicket (CUM1/CUT1). The following methods were used to define significant wildlife habitat for this species.

A count of individual stems of this species was completed (about 174 specimens). Then a 20 m by 20 m grid was applied to the plant's occurrences and the quantity of stems within each 20 m by 20 m grid was tallied. Concentrations of the plant captured 76% (132 stems) of the total population. The remainder of the population is scattered in low numbers (one to three individuals per 20 m by 20 m grid square) across the site.

The rare species SWH polygons for Great Plains Ladies'-tresses are depicted on **Figure 4c** (**Appendix A**). The SWH polygons occur within the west development area and are proposed for removal and transplantation/propagation. The impact of the proposed removal and mitigation are assessed in section 7.

5.3.3 Amphibian Movement Corridor SWH

Animal movement corridors are required to connect wetland amphibian breeding SWH to suitable non-breeding (summer and winter) habitats. Animal movement corridors are areas that are traditionally used by wildlife to move from one habitat to another in response to different seasonal habitat requirements. Amphibian movement corridors are considered more permeable when associated with water features, wetlands, moist meadows or damp woods/swamps that provide appropriate micro-habitat (to avoid desiccation), refugia and potential residency opportunities while moving between primary habitats.

Amphibian call count surveys from the 2016 EIS along with targeted surveys conducted during key amphibian movement periods (i.e., wildlife road-crossing and

salamander movement surveys discussed in section 4.3), identified the following observations:

- Relatively higher density of amphibian breeding occurs in the more intact woodland vernal pools on the Subject Lands, including wetland breeding amphibian SWH within two open aquatic features situated within swamp communities (**Figure 4e**, **Appendix A**);
- The mix of sloughs and ridges in the central SWD1 includes suitable habitat for both breeding and non-breeding functions for woodland amphibians, including the regionally rare species Blue-spotted Salamander;
- Amphibian movement occurs broadly across the Subject Lands, including in low numbers across areas of disturbance;
- The relatively wet spring and summer seasons in 2017 seemed to be associated with the widespread amphibian use of temporary pools, including flooded ditches and ruts in paths;
- Observations of amphibian/reptile movement across Chippawa Parkway between the Subject Lands and City lands (off-site to the south), suggest the wetlands south of Chippawa Parkway may support life processes of amphibians and reptiles;
- Relatively higher densities and diversity of reptile and amphibian road-crossing observations were noted along Chippawa Parkway, at the southern boundary of the Subject Lands; and
- Wildlife road-crossing observations were not focused where culverts or watercourse crossings were present.

The two open aquatic features that support wetland amphibian SWH, turtle overwintering SWH and Snapping Turtle (rare species) SWH types are situated within the central portion of the proposed NHS and are passively connected by a 'spine' of natural features (including swamp vegetation and early successional vegetation). Amphibian movement corridor SWH is illustrated on **Figure 4e** (**Appendix A**) between these two ponds and correlates with the location of an amphibian/reptile movement 'hotspot' across Chippawa Parkway. The swamp units (i.e., SWD1 and SWD4-1) located between these two ponds are embedded in a matrix of upland, early successional vegetation (i.e., shrub thickets and declining cultural woodland) – the latter portion do not provide ideal movement conditions for amphibians and could be improved through targeted restoration.

Potential natural heritage corridors (i.e., ecological linkages) on and adjacent to the Subject Lands are discussed further in section 7.

5.3.4 Other SWH Refinements

A variety of other SWH mapping layers from the March 2018 EIS Addendum were refined based on updated aerial interpretation and 2018 site-specific studies. As described in section 4, the following SWH layers have been updated to reflect current conditions (i.e., in light of tree stem density surveys, updates to vegetation boundaries and ELC types, wetland hydroperiod monitoring, and targeted surveys):

- The woodland breeding amphibian SWH layer was revised to exclude a SWD2-2 PSW unit that was found through the course of 2018 summer-fall surveys and staff gauge readings (commencing July 12, 2018) not to provide suitable amphibian breeding habitat (i.e., lacked suitable depressions) (**Figure 4a**, **Appendix A**);
- Rare vegetation community SWH polygons were updated regarding old growth forests (based on 1934 historical aerial imagery) and confirmation, through a targeted survey, that old growth forest/rare vegetation types are not present in the PSW unit (CUT1/SWT2) in the southwest corner of the Subject Lands (**Figure 4b**, **Appendix A**);
- Rare species SWH polygons were updated for Wood Thrush, Eastern Wood-Pewee, Schreber's Aster, and Honey-locust (**Figure 4c**, **Appendix A**); and
- The candidate turtle nesting SWH polygon on (off-site) City lands, located south of Chippawa Parkway, remains unaltered from the March 2018 EIS Addendum.

5.4 Habitat of Endangered and Threatened Species

Five Species at Risk were found on or immediately adjacent to the proposed development area:

- Three endangered bat species (Little Brown Myotis, Northern Myotis and Eastern Small-footed Myotis);
- Acadian Flycatcher; and
- Dense Blazing Star.

Removal of significant habitat of Species at Risk is not proposed within the development area. Species at Risk are being addressed with MNRF through the *Information Gathering Form* (IGF) process. Precise locations of Species at Risk occurrences are shared only with MNRF through the IGF as this is sensitive information.

Bat species

Three bat species recorded on the Subject Lands are Endangered in Ontario and Canada: Little Brown Myotis, Northern Myotis and Eastern Small-footed Myotis. These individuals and their habitat are addressed under the provincial ESA 2007. In total, 45 confirmed Myotis species calls were recorded and an additional 333 calls showed Myotis characteristics (i.e., calls with frequencies greater than 40 kHz) but could not be confirmed to species. Large retained swamp/woodlands outside the proposed development area contained the majority of endangered bat call recordings. One vegetation polygon within the western development area contained two Myotis calls. This vegetation unit is located adjacent to large, woodland/swamp features and may have been used by bats for opportunistic foraging or calls may have been emitted while in transit between the main woodland/swamps and other foraging areas.

The woodland/swamp features containing the majority of the Myotis recordings would be considered significant endangered species habitat. Areas with low call numbers (one to two Myotis calls) do not provide significant endangered species habitat. Though bat habitat within the development area is not considered significant, consultation with MNRF is ongoing to ensure that any works within portions of the site identified as containing SAR bats will be completed in compliance with the ESA 2007. This will be confirmed with the MNRF through the Information Gathering Form process. Tabular data of the detailed bat call recordings will also be provided to the MNRF.

Acadian Flycatcher

Acadian Flycatcher is an Endangered bird species that occurs in some years within retained significant wetlands/woodlands within the NHS. The suitable habitat polygon for this species on the Subject Lands is retained within the NHS.

Dense Blazing Star

Dense Blazing Star, which is a Threatened plant species in Ontario and Canada, was recorded on the Subject Lands outside of the proposed development area. Populations of Dense Blazing Star in Niagara region are reported to be non-native or introduced (Oldham 2010) and are not included in the critical habitat mapping for this species by the MNRF (2016). The native populations and critical habitat of Dense Blazing Star are located in Windsor and on Walpole Island (MNRF 2016). The non-native status of Dense Blazing Star on the Subject Lands will be confirmed with the MNRF through the IGF process.

5.5 Fish Habitat

Fish Habitat, as defined in the federal *Fisheries Act*, c. F-14, means... spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly in order to carry out their life processes. Fish, as defined in S.2 of the *Fisheries Act*, c. F-14, includes parts of fish, shellfish, crustaceans marine animals and any parts of shellfish, crustaceans or marine animals, and the eggs, sperm, spawn, larvae, spat and juvenile stages of fish, shellfish, crustaceans and marine animals (DFO 2013).

There are no watercourses providing fish habitat within the proposed Riverfront Residential development area. There are two watercourses within the Riverfront Residential NHS (watercourse 1; WC1 and watercourse 2; WC2) and two watercourses in the 120 m adjacent lands (the Conrail Drain and the Welland River). Watercourses providing fish habitat are illustrated on **Figure 6** (**Appendix A**).

Watercourse 1 (WC1) is short (212 m) and originates at an old concrete culvert outfall, which is believed to convey flows from a network of legacy pipes that drain surface water, via inlets and broken sections, from the elevated south-central portion of the Subject Lands. This watercourse flows intermittently and drains south into the Welland River, south of Chippawa Parkway. Wetland vegetation is present at the upstream culvert outfall. Downstream, the channel, which exhibits signs of historical excavation, is generally 4 m to 5 m wide with fine substrate. The lower reach of the watercourse south of Chippawa Parkway is low gradient, contains abundant aquatic vegetation is generally backwatered by the Welland River.

WC1 was observed to be flowing in early April 2015, with a depth of approximately 10 cm and by June 11, 2015, the water level had decreased to several centimeters (Dougan and Associates 2016a). The feature was dry in October 2015. Fish community investigations completed by Dougan and Associates (2016a) in June 2015 found four Emerald Shiner (*Notropis atherinoides*) at the upstream end of the watercourse. Given that the watercourse is intermittently flowing, these fish likely moved upstream into the feature from the Welland River. Four unidentified baitfish were observed in the middle portion of the reach incidentally. Northern Pike (*Esox lucius*) spawning surveys completed in April 2015 found no evidence that this species was using the watercourse for spawning purposes, although the habitat appears potentially suitable (Dougan and Associates 2016a). Fish community investigations conducted by Dougan and Associates (2016a) in June and October 2015 in the lower reaches south of Chippawa Parkway found low numbers of several fish species including White Sucker (*Catostomus commersonii*), Central Mudminnow (*Umbra limi*), Yellow Perch (*Perca flavescens*), Brown Bullhead (*Ameiurus nebulosus*) and Bluntnose Minnow (*Pimephales notatus*). Twenty young-of-the-year (YOY) White

Sucker were found in this reach in October 2015. This lower reach remains backwatered and hydraulically connected and therefore provides access for fish from the Welland River. The low gradient reach appears to provide refuge habitat for juveniles and YOY, likely due to the slow flowing nature (compared to the swifter flowing main river) and an abundance of aquatic plants. Based on these overall observations, WC1 provides Type 2 (Important) fish habitat from its mouth at the Welland River upstream to the culvert outlet. Type 2 fish habitat is generally less sensitive than Critical Type 1 habitat and requires a moderate level of protection (MNR 2000).

Watercourse 2 (WC2; also referred to as the Eastern Tributary) is located east of the Subject Lands. The watercourse appears to originate within Thundering Waters Golf Club lands. An approximately 70 m long portion of the upper reach of the watercourse is piped, with a 100 m long reach downstream from the piped area having been previously channelized and protected with rip rap. However, the lower approximately 815 m of this watercourse, which drains to the Welland River is naturally meandering within a small, vegetated valley system. The watercourse was observed to be flowing during all site investigations completed by Dougan and Associates (2016a) in 2015. Aquatic habitat is generally uniform (consisting primarily of fine substrate), although some coarse substrate is present where the watercourse passes Don Murie Street. Instream cover is relatively limited, and the watercourse does not appear to be hydraulically connected to adjacent riparian wetlands. The feature does not appear to provide any suitable Northern Pike spawning habitat (Dougan and Associates 2016a). No fish were observed during visual investigations in the watercourse in April 2015 and no fish were captured during an electrofishing survey in June 2015 (Dougan and Associates 2016a). Low numbers of six species of fish, including White Sucker, Largemouth Bass (*Micropterus salmoides*), Central Mudminnow, Brown Bullhead, Bluntnose Minnow and Golden Shiner (*Notemigonus crysoleucas*) were recorded in this watercourse during an electrofishing survey in October 2015 (Dougan and Associates 2016a). The catch in October included 18 YOY White Sucker, although it is unknown if these fish were spawned in WC2 or if they moved in from the Welland River to find refuge from predators and higher velocity flows. Based on these overall observations, WC2 provides Type 2 (Important) fish habitat.

The Conrail Drain is a deep, straight, artificial channel, lined with rip-rap along its entire length. It originates from drainage north of McLeod Road north of the Subject Lands and ultimately discharges to the OPG Power Canal. The feature was observed to contain some flow during all field investigation periods in 2015, although in many sections, low flows were interstitial. Dougan and Associates (2016a) indicated that large fish from the Power Canal are unlikely to be able to move upstream into the Conrail Drain, based on the presence of potential barriers to movement (e.g., failing and thick gabion baskets, steeply sloped channel). Fish community investigations

completed in June 2015 at several locations by Dougan and Associates (2016a) found only five Brook Stickleback (*Culaea inconstans*). Based on the highly altered nature of this watercourse and limited potential fish productivity, it has been assessed as having Type 3 (Marginal) fish habitat. MNR (2000) notes that Type 3 fish habitats are typically degraded or artificial and do not contribute directly to fish productivity.

The lower reach of the Welland River is located within 120 m of the Subject Lands. Under natural conditions, the Welland River would have discharged to the upper Niagara River. However, this reach (also referred to as the Chippawa Channel) has been historically altered through dredging to divert flows from the Niagara River towards the adjacent Power Canal to supply downstream hydroelectric power generation facilities. The reach adjacent to the Subject Lands is wide (approximately 120 m) and generally swiftly flowing, when water is being diverted from the Niagara River. A total of 30 fish species have been observed within the Chippawa Channel portion of the Lower Welland River, including a number of native sportfish species (NPCA 2011). The MNRF has classified the lower reach of the Welland River adjacent to the Subject Lands, as well as the adjacent Power Canal as Type 2 (Important) fish habitat.

5.6 Significant Valleylands

Significant valleylands are defined and designated by the planning authority. General guidelines for determining significance of these features are presented in the NHRM (MNR 2010) for Policy 2.1 of the PPS (MMAH 2014). Recommended criteria for designating significant valleylands include prominence as a distinctive landform, degree of naturalness, and importance of its ecological functions, restoration potential, and historical and cultural values.

Although it has been historically re-aligned and is subject to reverse flows to feed the upstream Power Canal, the lower Welland River adjacent to the Subject Lands was deemed to meet thresholds suggested in the NHRM (MNR 2010) and has therefore been defined as significant valleyland (e.g., hydrologic functions, landform prominence). The Welland River does not flow within a defined valley system and therefore, for the purposes of this assessment, the regulatory floodplain was used to delineate the extent of the significant valleylands (**Figure 6**, **Appendix A**). The floodplain extends inwards to Chippawa Parkway and does not encroach into the Riverfront Residential Area.

The lower reaches of WC2, located within 120 m adjacent lands to the east of the Riverfront Residential Area, occur within a defined valleyland that would meet a number of the NHRM (MNR 2010) criteria for consideration as a significant valleyland. The valleyland provides a number of functions including surface water (e.g.,

permanently flowing stream channel, presence of geomorphological processes, wetland storage and attenuation), landform prominence (e.g., defined valley morphology with a width of more than 25 m), naturalized areas of woodland, wetland and riparian vegetation and general habitat for aquatic and terrestrial wildlife. However, the upper reaches of the feature are highly altered (i.e., piped, channelized, lined with erosion protection, excavated for golf course drainage) and the more naturalized reach of valley is relatively small. The valley contains low numbers (two individuals) of one provincially rare plant species (Honey-locust) and is not known to contain unique communities and/or high community or species diversity. Based on these characteristics, it has been identified as a candidate significant valleyland for the purposes of this assessment. More detailed studies within the off-site portions of the valleyland would assist in the confirmation of significance. The candidate significant valleylands have been delineated based on the limit of the top of slope identified by NPCA (**Figure 6**, **Appendix A**).

5.7 Summary of Natural Heritage System Components Subject to Impact Assessment

The analysis provided above (sections 5.1 to 5.6) determined that, as per the PPS, the following significant natural features are present on or adjacent to the Subject Lands, that require assessment in section 7:

- Significant wetlands;
- Significant woodlands;
- Significant wildlife habitat;
- Significant habitat of endangered and threatened species;
- Fish habitat; and
- Significant valleylands.

On overview of natural heritage features is provided on the following figures:

- **Figure 6** (**Appendix A**) depicts features considered significant under the Provincial Policy Statement (Section 2.1; MMAH 2014);
- **Figure 7** (**Appendix A**) depicts Niagara Region (2014) Core Natural Heritage Features (EPA, ECA and fish habitat) and Potential Natural Heritage Corridors;
- **Figure 8** (**Appendix A**) depicts NPCA regulated features; and
- **Figure 9** (**Appendix A**) provides an overall summary of these natural heritage features.

For all of the above figures, endangered and threatened species habitat polygon locations are not illustrated. The latter is considered sensitive information that is shared with MNRF through the IGF process.

6.0 DESCRIPTION OF PROPOSED DEVELOPMENT

The proposed residential subdivision is planned for densities that will accommodate up to 1045 units, providing a wide variety of residential housing forms. The proposed development will also contain parks/open space system and a private and public road network. The proposed Draft Plan of Subdivision development boundary, natural heritage system (NHS) and buffers applied to retained natural heritage features are shown on **Figure 10** (**Appendix A**).

As shown on **Figure 10** (**Appendix A**), all PSW units within the Subject Lands will be retained along with appropriate buffers (buffer width determination is described in detail in section 7). The PSW units overlap to a large degree with retained significant woodland, SWH, significant habitat of endangered species, significant valleylands and fish habitat.

The PSW buffers provide appropriate protection for overlapping, retained SWH, significant valleyland (which are well set back from the development edge), and fish habitat. Portions of the central NHS near WC1 do not contain EPA features/buffers and are identified as key ecological restoration areas. The latter areas do contain ECA features, namely significant woodland in the form of declining cultural woodlands and amphibian movement corridor SWH. The functions of these ECA features will be enhanced through the proposed restoration works (described further in section 7 and **Appendix D**).

The Functional Servicing Study (FSS; AMEC Foster Wheeler 2016) and Water Budget and Conceptual Grading Plan (Wood Group 2018) identify a variety of Low Impact Development (LID) measures for consideration to meet preliminary stormwater retention and infiltration targets and to sustain appropriate wetland water balance within the retained PSW units. LID options are outlined below and will be refined at the stormwater management plan stage to meet the specific hydroperiod requirements (including seasonal inundation/drawdown periods) of each retained PSW. The preliminary water balance assessment is discussed further in section 7 of this report.

Preliminary LID options identified in the FSS for use within natural heritage feature buffers include:

- Grassed swales;
- Buffer strips;
- Bioswales; and
- Rain gardens.

Preliminary LID options identified in the FSS for use within the development may comprise:

- Grassed swales;
- Buffer strips;
- Bioswales;
- Rain gardens;
- Permeable pavement; and
- Infiltration trenches.

The FSS (AMEC Foster Wheeler 2016) provides preliminary information, appropriate to this planning scale, on proposed servicing and stormwater management measures. Grading will be required for the proposed subdivision to accommodate proposed servicing requirements and to match existing grades at the edge of the NHS and adjacent property lines. Grading information was provided in Wood Group (2018) and will be refined during Site Planning for stormwater management.

A conceptual trail network is also identified (**Figure 11**, **Appendix A**) that includes trails along roadways and a 3 m wide trail (raised boardwalk with railings) in part of the NHS. The boardwalk trail will: provide a pedestrian connection between the east and west development areas; link to the proposed Riverfront Wetland Discovery Centre (public education facility; **Appendix D**); link to open space/parkland at the north end of the west development area; and provide residents with controlled access to the NHS.

Construction of the proposed development will commence in a phased manner. This will include:

- Installation of erosion and sedimentation control measures;
- Site-wide grading;
- Installation of buried services (e.g., water and sewer lines);
- Installation of municipal roads;
- Construction of residential units; and
- Landscaping throughout the development, including open space and parkland areas.

Erosion and sedimentation control (ESC) measures will be required during construction to minimize the potential for negative impacts on retained natural heritage features. ESC measures will be designed during the detailed design stage and an ESC control plan will be prepared for agency review and approval. The plan will identify the proposed erosion and sedimentation control measures, phasing of construction, and monitoring requirements.

7.0 IMPACT ASSESSMENT, MITIGATION AND ENHANCEMENT OPPORTUNITIES

This section of the EIS assesses potential effects on the previously identified natural heritage features that could occur over the short-term and long-term, following implementation of the development plan discussed in section 6. Appropriate mitigation measures to avoid or minimize negative impacts and/or to enhance features and functions are discussed. The impact assessment concludes with a discussion of net effects (also commonly referred to as residual effects) after all avoidance, mitigation and enhancement measures have been considered.

Impacts from a proposed land development application can generally be considered in two broad categories, direct and indirect. Direct impacts are normally associated with the physical removal or alteration of natural features that could occur based upon a land use application, and indirect impacts may be changes or impacts to less visible functions or pathways that could cause negative impacts to natural heritage features over time.

An impact assessment summary for the Riverfront Residential Draft Plan of Subdivision is provided in **Table 7** (**Appendix B**).

Section 7.1 explains the detailed assessment process that was used to identify: appropriate buffer widths for retained features; and mitigation measures where indirect impacts to retained features are predicted or where vegetation removals are proposed. The sections that follow outline key implications for the natural heritage features addressed in the scope of this EIS: significant wetlands, significant woodlands, SWH and significant habitat of endangered and threatened species.

7.1 Analysis of Ecological Sensitivity to Development

On the Subject Lands, retained significant wetlands overlap considerably with significant woodland, SWH polygons, significant valleylands and fish habitat (**Figure 9**, **Appendix A**). As such, potential impacts were considered cumulatively for retained natural heritage patches and the sensitive flora, fauna, vegetation communities, and wildlife habitat types that these features contain. To guide this assessment, the ELC polygon number labels from the 2016 EIS were used (while retaining updated 2018 ELC community type labels) to identify vegetation patches for assessment. The 2016 ELC polygons were utilized for this exercise since the original plant inventory lists prepared by Dougan and Associates are specific to each polygon. The coloured polygons on **Figures 12** and **13** (**Appendix A**) do not represent any measure of

interpretation, rather the colours simply serve to clearly depict where the individual Dougan & Associates ELC units occur.

Figure 12 (**Appendix A**) shows the west development area divided according to the 2016 ELC polygons. Each coloured polygon on this figure was assessed to prescribe appropriate buffers widths and associated buffer planting treatments to protect these retained features, and to identify impacts and appropriate mitigation for proposed vegetation removals. The detailed impact assessment and recommendations are provided for the west development area in **Table 8a** (flora/vegetation communities) and **Table 8b** (fauna/wildlife habitat) (**Appendix B**).

The following criteria were used to determine which species/communities were included in these tables for the purposes of impact assessment and buffer width determination:

- Sensitive flora: provincially rare species (S1-S3; NHIC 2016), locally rare species (Oldham 2010), and species with a moderate to high co-efficient of conservatism (CC 8 to 10);
- Sensitive vegetation communities: rare vegetation SWH (includes old growth forests and provincially rare S1-S3 vegetation communities);
- Sensitive fauna: provincially rare species (S1-S3; NHIC 2016), locally rare species (NPCA 2010; Black and Roy 2010);
- Sensitive wildlife habitats: significant wildlife habitat and indicator species as per the MNRF (2015) SWH ecoregional criteria for ecoregion 7E and fish habitat; and
- Significant valleylands.

Changes in surface water drainage to retained woodland/wetland features, as a result of development, could impact the moisture regime that some plants and vegetation communities rely on. This impact assessment assumed that the water balance needs of each wetland subcatchment area on the Subject Lands will be met. Preliminary water balance results are provided in section 7.2.1 for the wetland subcatchments on the Subject Lands along with some discussion regarding hydroperiod and seasonal water inundation needs. During the Site Plan stage, the stormwater management plans will need to confirm that these hydroperiod/seasonal water balance requirements can be met in the post-development condition (i.e., through implementation of LIDs and BMPs). Sustaining appropriate water balance conditions for the PSWs on the Subject Lands will also support the protection of other natural heritage features that overlap with the PSW units.

The same exercise, as detailed above, was completed for the east development area. **Figure 13** (**Appendix A**) shows the 2016 ELC polygons within the east development

area. Each coloured polygon on this figure was assessed to prescribe appropriate buffers widths and associated buffer planting treatments to protect these retained features, and to identify impacts and appropriate mitigation for proposed vegetation removals. The detailed impact assessment and recommendations (including buffer widths and mitigation measures) are provided for the east development area in **Table 9a** (flora/vegetation communities) and **Table 9b** (fauna/wildlife habitat) (**Appendix B**).

This assessment resulted in the identification of variable buffer widths, specific to retained natural heritage feature areas on the Subject Lands and their sensitivity to adjacent residential development. Proposed buffer widths vary from 10 m to 20 m and are illustrated on **Figure 10** (**Appendix A**). Details to support each buffer width are provided in **Tables 8a-b** and **9a-b** (**Appendix B**).

7.2 Significant Wetlands

Significant wetlands are present on and adjacent to the Subject Lands. All significant wetlands will be retained within and along the boundary of the Riverfront Residential Area. Since no development is proposed within significant wetlands, no direct impacts are expected. Potential indirect impacts to retained significant wetlands include damage or stress to tree rooting zones; edge effects (i.e., wind throw, sunscald and pest or invasive plant establishment due to thinned edge vegetation); increased noise, light and intrusion by people and pets; and changes to surface water drainage into these woodland/wetland features. As per the Region's Official Plan (2014) and the City's (2018) OPA 128, PSW units are considered Environmental Protect Areas (EPA).

Proposed buffer widths are illustrated on **Figure 10** (**Appendix A**) for each PSW unit that is located within or adjacent to the Riverfront Residential Area. The Conceptual Ecological Restoration Plan (**Appendix D**) outlines invasive species management and edge management recommendations within these buffers and provides tailored native planting prescriptions.

As explained in section 7.1, stormwater management planning will need to demonstrate that seasonal wetland characteristics (i.e., hydroperiod, inundation duration, storage) can be met in the post-development condition (i.e., through grading and implementation of LIDs and BMPs). Discussion regarding wetland water balance needs for each wetland subcatchment on the Subject Lands are provided in the following section.

7.2.1 Preliminary Wetland Water Balance

As discussed in prior reports, the wetlands on the Subject Lands rely on surface water inputs. There are eight main wetland catchments, as shown in the updated FSS (i.e., W1, W2, W3, W4, W5, W6, EWC and EWC-LF) (Wood Group 2018), that are located partially or entirely within the proposed residential development area. The wetland community types found within each catchment are summarized in **Table 10** (**Appendix B**).

The *Water Budget Assessment and Conceptual Grading Plan* (Wood Group 2018) summarizes the Draft Plan annual surface runoff volumes to each wetland catchment pre-development and post-development without mitigation. **Table 11** (**Appendix B**) summarizes for each wetland vegetation community the water inundation requirements for the dominant species, the percent change in annual surface runoff volumes post-development and the proposed Low Impact Development (LID) Best Management Practice (BMP) type (i.e., conveyance, infiltration) to meet the dominant vegetation's water inundation period.

Under the preliminary water balance analysis, nearly all of the existing wetlands will receive an annual surplus of water post-development without mitigation. The degree of change ranges from a 2% decrease to a 10% increase in annual surface water volume. Each wetland vegetation community has specific hydrological requirements with respect to the monthly variation in standing water depth, duration of standing water, and tolerance to frequency of flood events over the course of a year.

Certain wetlands/pools within the retained NHS would benefit from receiving additional water input compared to existing conditions, such as the two open aquatic features that were reported in the 2016 EIS to support several SWH types (turtle overwintering, open wetland breeding amphibian, and Snapping Turtle rare species SWH types). These two open aquatic features were observed to dry early in both 2017 and 2018, potentially impacting the suitability/productivity of these ponds for amphibians and turtles. In addition, targeted surveys and staff gauge data collection from mid-summer to fall 2018 found that few of the slough/wetland pools within 120 m of the western edge of the central Oak Mineral Deciduous Swamp (SWD1) sustained a sufficient hydroperiod to support woodland breeding amphibian habitat. Directing surface water away from wetlands that require a shorter/dryer hydroperiod in order to augment the water depth of specific wetlands/pools, such as those mentioned here, could improve the ecological productivity of these features. If pursued, a permit through NPCA would be required to purposefully augment water levels within certain wetlands/pools.

The treed swamp wetlands (SWD1, SWD2-2, SWD4-1) found within these wetland catchments have differing tolerance level to changes in standing water inundation

(duration, depth, and frequency) post-development, depending on the dominant species present. Willow species are more tolerant to frequent flood events and for longer durations of inundation than Green Ash, which can only tolerate inundation for about 40% of the growing season. Both Pin Oak (*Quercus palustris*) and Bur Oak (*Quercus macrocarpa*) tolerate flooding in the winter, when dormant, but are intolerant to intermittent flooding during the growing season. The Oak Mineral Deciduous Swamp (SWD1) and the Green Ash Mineral Deciduous Swamp (SWD2-2) units are the most susceptible to negative impacts from changes in either catchment size area and/or surface water runoff volumes due to their hydrological requirements. Hybrid Crack Willow (*Salix x rubens*) dominates the Willow Deciduous Swamp community (SWD4-1). This willow species is flood tolerant and can tolerate water levels that fluctuate throughout the year and requires a relatively short dry season (approximately 2 months).

At the site plan stage, a seasonal wetland water balance is needed for each individual wetland vegetation community (each polygon) to maintain pre-development seasonal surface water volumes (i.e., depth, duration, frequency) post development. During the site plan process, grading will be refined and the type and location of LID's to support pre-development seasonal surface water conditions identified for each individual wetland will be determined.

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7.3 Significant Woodlands

Significant woodland falls under the Region's (2014) Environmental Conservation Area (ECA) designation. As per policy 7.B.1.11 (Region 2014), development and site alteration are permitted within the ECA designation and on adjacent lands to EPAs and ECAs if it has been demonstrated that:

Over the longer term, there will be no significant negative impact on the Core Natural Heritage System component or adjacent lands and the proposed development or site alternation is not prohibited by other Policies in this Plan.

Regarding significant woodlands, OPA 128 section 2.5.12 (City 2018) states that an EIS must demonstrate no negative impact on significant natural features or their functions to the satisfaction of the City, in consultation with Niagara Region. City (2018) OPA section 2.5.12 states:

Woodlands that are shown on Schedule A-6(a) as "potential woodland removal area" will be subject to a holding provision in the implementing zoning by-law. A condition to be met prior to the lifting of the H-provision will be the submission of an updated EIS to the satisfaction of the City, in consultation with Niagara Region, as part of a complete Planning Act application which demonstrates no negative impact on significant natural features or their ecological function...

Significant woodlands on the Subject Lands overlap with significant wetlands to a large degree and will therefore be retained within the NHS. A portion of significant woodland (7.27 ha) is proposed for removal. It is comprised of cultural woodland patches in severe/advancing decline due to loss of the tree canopy layer to Emerald Ash Borer and invasion of the understory by the exotic shrub Common Buckthorn. The proposed woodland removal area meets the Region's ECA designation as it does not contain PSW units, significant SAR habitat or EPA buffers. Of the 7.27 ha area proposed for removal, 0.21 ha is proposed for removal along the utility corridor/easement between the east and west development areas. The utility easement corridor is shown on **Figure 3** (**Appendix A**). The majority of the remainder of the proposed significant woodland removal area is located in the west development area and a small portion is located in the east development area **Figure 3** (**Appendix A**).

The cultural woodland patches that comprise this 7.27 ha area will not meet significant woodland criteria in the near-term (e.g., two to five years) due to the loss of canopy cover/tree density in these ash-dominated, emerald ash borer affected areas. A restoration program is proposed to create new woodland and non-woodland habitats and to restore degraded and marginal features to increase functionality. The proposed restoration types and areas are discussed in more detail in **Appendix D**. Flexibility exists to alter the balance of features to achieve an optimal mix of vegetation types. A, 1:1 ratio of woodland removal and woodland replacement is achieved through a combination of newly created woodland and improvements to existing cultural thicket and cultural woodlands where woodland functions can be improved. Proposed woodland restoration is generally consistent with restoration areas shown on OPA 128 Map 4 of Schedule A-6(a).

Woodland restoration areas will include a diversity of native tree, shrub and groundcover plant species once invasive species management of Common Buckthorn is complete (as detailed in **Appendix D**). This will result in the creation of more diverse vegetation types/habitat types within the NHS. Over time, woodland restoration efforts will augment patch size and shape of retained treed features and will improve/provide habitat for a variety of fauna, including woodland birds and bat species. Woodland restoration will provide an overall gain in terms of area and functions, as proposed in **Appendix D**.

In accordance with the protocol between the Region and the NPCA relative to the transfer of natural heritage review to the Region, the NPCA reviewed and provided comments related to impacts on the natural environment regarding the OPA development areas. In a letter to the City of Niagara Falls dated April 5, 2018, NPCA confirmed that their staff "consider this rationale [regarding significant woodlands] to be reasonable for the planning horizon of the OPA and, therefore, consider it to be consistent with Section 2.1.5 of the PPS and Policy 7.B.1.11 of the Regional Official

Plan". Regional staff reviewed comments from the NPCA and concurred with the NPCA's regional and provincial natural heritage policy interpretations. The Region deferred to the NPCA comment letter (dated April 5, 2018) for any issues with the application from an environmental perspective, to address compliance with the PPS and the Region's environmental policies. As such, the Region and City are understood to be in agreement with the NPCA's determination that the proposed woodland removal in the approved OPA development areas and associated restoration measures result in overall no negative impact.

The proposed removal of 0.21 ha of significant woodland in a utility easement between the east and west development areas was identified after the NPCA comment letter (April 5, 2018) and OPA approval. This area, which meets the Region's ECA designation due to presence of significant woodland and amphibian movement corridor SWH, will be cleared to facilitate installation of utilities/servicing and will then be restored. As detailed in **Appendix D**, this area will contain restored native meadow and an enhanced wildlife linkage that will pass beneath a raised, boardwalk pedestrian trail that will connect the east and west development areas.

The proposed use and subsequent restoration within the utility easement area (shown on **Figure 3**, **Appendix A**) will meet the test of no negative impact over the longer term. Similarly, with regard to OPA 128 section 2.5.12, the proposed woodland restoration efforts will provide woodland enhancement within areas mapped on Schedule A-6(a) Map 4 and demonstrates no negative impact on significant natural features or their functions. Following woodland removal and creation, over the long-term, the amount of interior habitat will be 7.03 ha, an 0.96-ha gain over existing conditions. This will result in a net gain in woodland function for species that prefer interior forest habitat.

Removal of some woodland from the overall woodland is not anticipated to have a negative impact on the linkage function of the retained woodland. The retained and enhanced woodland will continue to provide a contiguous linkage from the Welland River to the woodlands and wetlands at the. Northern end of the Subject Lands. The linkage is anticipated to be enhanced by woodland restoration measures along with length, which will ultimately restore gaps in woodland coverage (e.g., gaps <20 m proposed to be restored to woodlands). Meadow restoration will also enhance the linkage function outside of existing and proposed wooded areas. The linkage functions will be strengthened and increased by the proposed concentration and restoration of functions in this north-south corridor.

Additional ecological restoration works (including native meadow and specialized wildlife habitat features) are proposed in **Appendix D** and will ensure that existing wildlife linkage functions through the utility easement area are enhanced in post-restoration.

Pre-stressing certain woodland edges is recommended to address potential indirect impacts to retained significant woodlands (e.g., wind throw, sun scald and pest or invasive plant establishment due to thinned edge vegetation). In the east development area, proposed woodland removal will create new west-facing edges that will be more susceptible to windthrow. Pre-stressing these edges is recommended to build the tolerance of the intended, new woodland edge to wind stress. In year one, 20% of the trees within the removal area and within the margins of the future edge should be cut (including any trees deemed to be hazard trees). The next year, full vegetation removal can be completed to establish the new woodland edge.

Proposed buffer widths are illustrated on **Figure 10** (**Appendix A**) for retained woodland/wetlands that are located within or at the boundary of the Riverfront Residential Area. The Conceptual Ecological Restoration Plan (**Appendix D**) outlines invasive species management/edge management recommendations within these buffers and provides tailored native planting prescriptions to be installed once invasive species management is complete. Tree and shrub plantings are to be concentrated against the woodland/wetland edge in order to mitigate potential edge effects.

A Tree Saving Plan should be completed by a qualified arborist, at the site plan stage, to survey the proposed vegetation removal area and to locate mid-age to mature trees with potential to be incorporated into the site plan. Trees selected for retention should be species that are relatively, tolerant of disturbance and that will limit risks to human life or property. If tree/woody vegetation outside the NHS is proposed for removal during the bat roosting season/bird nesting season (i.e., between March 30 and October 1), then due diligence screening must be conducted. This would entail evening bat acoustic surveys and daytime avian nest surveys, as described further in section 7.3.1

Given the proposed woodland creation, woodland restoration and a proposed increase in woodland function (e.g., increased diversity, improved health, minor increase in areas sensitive woodland), no negative impacts due to development on the Subject Lands are anticipated to occur to significant woodlands. Following OPA 128 section 2.5.12 (City 2018), woodland restoration with areas shown OPA Map 4 of Schedule A-6(a) shall be finalized and agreed upon through the conditions of a Resource Management Agreement entered into by the proponent and the City as a condition of draft plan approval, site plan approval or zoning by-law amendment.

7.3.1 Vegetation Clearing Screening Surveys

Tree removal is recommended to occur outside of the active season (i.e., tree clearing recommended from Oct 1 to Mar 30) to avoid potential contravention of the provincial *Endangered Species Act* and/or the *Migratory Birds Convention Act* (MBCA). If

clearing of vegetation located outside the NHS must occur between March 30 to October 1, due diligence screening will be conducted, namely: nighttime bat presence/absence surveys and daytime avian nest surveys. Bat surveys will be conducted during the evening focusing on trees to be cleared the following day. Point counts will be completed with handheld ultrasonic bat detectors to determine presence/absence of bats within suitable roosting habitat (recorded bat calls will be identified to species using appropriate software, such as *SonoBat*). Any area not cleared during the day following an evening bat survey will need to be re-surveyed. Bats may change their roost location every night, and therefore it is not possible to confidently confirm bat absence from a tree for longer than 24 hours. If a SAR bat is found in vegetation proposed for removal, then repeat bat surveys will be conducted each evening until bats are confirmed absent from the tree. If bats are recorded at the tree in question, the tree cannot be removed until they are confirmed absent. A minimum buffer will be applied around the tree that contains the SAR bat. Buffer size is determined with MNRF on a case by case basis depending on the exact species of bat and amount of tree cover in the vicinity.

Avian nest surveys will be conducted throughout treed areas, located outside the NHS, that are to be cleared. Area searches will be conducted for nesting birds as per the MBCA. Nest surveys will occur up to 48 hours before clearing; if clearing is not completed within 48 hours of a nest search another search must be conducted before clearing can continue. If an active bird nest is found within vegetation proposed for removal, then repeat daytime surveys will be conducted until the nest is no longer in use. While the nest is in use, a minimum buffer will be applied around the tree that contains the avian nest (determined on a case by case basis, dependent on species).

7.4 Significant Wildlife Habitat

As discussed in section 5, mapping layers for several SWH types have been updated, including: bat maternity SWH, woodland breeding amphibian SWH, amphibian movement corridor SWH, rare vegetation community SWH, and rare species SWH (**Figure 4** series, **Appendix A**). All other SWH types were presented in the March 2018 EIS Addendum and have not been altered. An amalgamated SWH layer for the Subject Lands is provided on **Figure 9** (**Appendix A**) that shows SWH polygons that were updated in this report along with the SWH polygons that have been carried forward from the March 2018 EIS Addendum.

All significant wildlife habitat polygons are located outside of the proposed development areas, with the exception of rare species SWH for the provincially rare plant Great Plains Ladies'-tresses (located within the west development area). This species is found in open meadow habitats, and in this case on disturbed soil

conditions. Left in place, the species will be shaded out through natural succession processes.

As detailed in the Conceptual Ecological Restoration Plan (**Appendix D**), sod mat/plug transplantation is proposed to move the identified SWH polygons for this species (approximately 76% of the on-site population of Great Plains Ladies'-tresses) to suitable, permanent native meadow restoration areas within the NHS.

Transplantation to a permanent native meadow restoration area will enable this species to be retained (in a managed meadow to prevent succession) and for the population size to be increased (i.e., root division propagation). Over the short term, direct impacts to this SWH type may include potential stress to or mortality of individual transplanted specimens. Monitoring will be implemented to validate the success of transplantation and propagation (section 8). The transplantation methods for Great Plains Ladies'-tresses are provided in section 7.4.1, below.

In terms of potential indirect impacts to the retained SWH polygons, development activities on the Subject Lands are not anticipated to result in any negative impacts to tree rooting zones as buffer widths extend beyond the rooting zone of the dominant tree species in each woodland/wetland unit. Edge management will be conducted within wetland/woodland buffers through the management of the highly invasive shrub Common Buckthorn and subsequent buffer planting with native species. These efforts are described in the Conceptual Ecological Restoration Plan (**Appendix D**). As discussed in section 7.2, pre-stressing certain future west-facing woodland edges (i.e., exposed to predominant westerly winds) is recommended adjacent to the east development area to reduce potential for tree windthrow.

The installation of an eco-passage associated with the WC1 culvert (or in the vicinity) is recommended as part of the Chippawa Parkway Class EA. Wildlife fencing is recommended to direct amphibians/wildlife towards the recommended eco-passage. Restoration efforts within the amphibian movement corridor SWH layer and surrounding NHS will improve the overall function of the amphibian/wildlife movement corridor, through installation of additional amphibian breeding pools, woody debris, invasive species management and native plantings to improve landscape permeability through this corridor area.

The preliminary trail location within the NHS (**Figure 11**, **Appendix A**) was selected to avoid impacts to SWH and Species at Risk habitat polygons. This trail is proposed to be a raised boardwalk with railings in order to provide residents with controlled access to the NHS while deterring informal trail creation, off-leashing of pets, etc. At detailed design, the exact trail location should be staked with a qualified biologist in the field to avoid mature trees, cavity trees, and other sensitive features/elements,

such as natural surface water drainage inlets into woodland/wetland areas. Any lighting associated with the trail should be downward-facing to minimize light pollution within retained natural areas.

OPA 128 (City 2018) sections 2.5.9 and 2.5.10 state that, "Development and site alteration may only be permitted if no negative impact has been demonstrated to the satisfaction of the City, in consultation with Niagara Region and the NPCA. The relocation of SWH will prevent negative impacts through a transplantation program, focussed on conserving and expanding the Great Plains Ladies'-tresses population (further detail is provided in section 7.4.1).

7.4.1 Great Plains Ladies'-tresses Mitigation

Great Plains Ladies'-tresses is an orchid species with a root system composed of tubers. Root tubers allow a single plant to produce multiple roots and can act as an additional storage area for nutrients. This orchid shares similarities with a number of horticultural species such as irises and gladiolas. Transplanting this root type typically involves digging around the root system, separating the tubers, and trimming the stem/foliage to allow more successful establishment of the root system.

Transplantation has been successfully conducted on other rare plant species with similar tuber root systems, such as Dwarf Lake Iris (*Iris lacustris*) where transplantation has been used in Ontario (between Manitoulin Island and Ottawa) and in Michigan (COSEWIC 2010). Blue Flag Iris (*Iris Versicolor*) has also been successfully propagated through seeding and transplanting of rooted stem cuttings (Karim 2009). The transplantation methods used for iris species, which share similar, tuberous root systems as *Spiranthes* orchids, informed the general method proposed for transplanting Great Plains Ladies'-tresses on the Subject Lands. The proposed transplant methodology was further refined by similar transplantation efforts conducted on species in the *Spiranthes* genus, as explained in detail below.

Great Plains Ladies'-tresses have physical characteristics that make this species suitable for plug or sod mat transplantation. This transplant method involves digging up both the orchid roots and intact surrounding soil and relocating it to suitable recipient sites. By transplanting intact soil plugs or mats containing the orchid roots, disturbance to the root structure and desiccation are minimized, and existing microbial and fungal relationships between the soil and plant are maintained to the extent possible. Orchid species commonly have mycorrhizal associations in the cells of roots, stems, or protocorms (Batty et al. 2002).

Spiranthes species, like many orchids, do not have extensive, fibrous root systems or deep tap roots; rather, they have short, tuber roots that are more easily transplanted

without significant root loss. The proposed plug/sod mat transplantation will be similar to that completed by Hammons et al. (2010), where the authors successfully transplanted Navasota Ladies'-tresses (*Spiranthes parksii*) via intact soil (and also bare root) methods. Navasota Ladies'-tresses and Great Plains Ladies tresses both belong to the *Spiranthes cernua* complex (Pace et al. 2017) and are expected to have similar responses to transplantation.

Proposed transplant locations are provided in the Conceptual Ecological Restoration Plan (**Appendix D**) along with complementary planting lists (i.e., appropriate associate species to be planted in groundcover seed mixes associated with the transplant locations).

Following OPA 128 section 2.5.11 (City 2018), transplantation into lands identified for restoration on Map 4 of Schedule A-6(a) will require a Work Permit issued by the NPCA and in accordance with the conditions of a Resource Management Agreement entered into by the proponent and the City.

7.5 Significant Habitat of Endangered and Threatened Species

7.5.1 Acadian Flycatcher and Bat Species

One endangered bird species that relies on woodland/swamp habitat was recorded on the Subject Lands: Acadian Flycatcher. Only possible breeding evidence was recorded for Acadian Flycatcher in 2015 in proximity to suitable habitat within the NHS (this species was not recorded in 2017 or 2018 despite survey effort). All suitable habitat for this species on the Subject Lands is located within the NHS and overlaps considerably with an existing PSW unit. Discussions are ongoing with MNRF, through the Information Gathering Form process, regarding whether there is significant SAR habitat on-site for Acadian Flycatcher.

Development on the Subject Lands will be set back 20 m from the Acadian Flycatcher habitat polygon and trails in the vicinity have been sited conceptually to avoid negative impacts to this species. The only trail proposed within the NHS will be constructed as a raised boardwalk with railings, to provide residents with controlled access to the NHS. At detailed design, the exact trail location should be staked with a qualified biologist to avoid mature trees and remain close to the western boundary of the central Oak Mineral Deciduous Swamp (SWD1). The preliminary NHS trail location is shown on **Figure 11** (**Appendix A**).

Acadian Flycatcher prefers wooded slough habitats that provide canopy level Pin Oak (*Quercus palustris*) and Red Oak (*Q. rubra*), Spicebush (*Lindera benzoin*) in the

understory, and a sufficient amount of open understory where this species nests and forages (Heagy 2010). Since this species requires relatively open understory, invasion by Common Buckthorn can reduce the viability of Acadian Flycatcher habitat. Though Common Buckthorn reaches maturity more slowly in shaded environments, it can still form dense shrub layers within swamp and forest communities. Management of Common Buckthorn, as proposed in the Conceptual Ecological Restoration Plan (**Appendix D**), over time, will increase native tree cover and help sustain suitable habitat for this endangered bird species.

Three endangered bat species that rely on woodland habitat were also recorded on the Subject Lands: Little Brown Myotis, Northern Myotis and Eastern Small-footed Myotis. Only low numbers were recorded within the Subject Lands (1-3 SAR bat calls per polygon) with the exception of one woodland/swamp located well outside the development area – the proposed Riverfront Residential development and conceptual trail system do not front this woodland/swamp and no direct impacts are expected. The delineation of SAR bat habitat on the Subject Lands is being confirmed with MNRF through the IGF process.

Management of Common Buckthorn (**Appendix D**) will also improve the potential for native tree seedlings to mature and provide bat habitat once the Common Buckthorn shrub layer is diminished. Over time, planted trees within buffer areas adjacent to existing bat habitat and natural regeneration will augment existing bat foraging habitat and, eventually, become roosting habitat.

7.5.2 Dense Blazing Star Mitigation and Enhancement

A local road is proposed within 120 m of the existing Dense Blazing Star population on-site (no removal of Dense Blazing Star is proposed); this species is being addressed with MNRF through the IGF process. As discussed in section 5, Dense Blazing Star populations in Niagara region are considered non-native or introduced (Oldham 2010) and are not mapped as critical habitat for this species by MNRF (2016). Pending agreement from MNRF through the IGF process, if the on-site population of Dense Blazing Star is not considered SAR habitat protected under the *Endangered Species Act* (2007) then transplanting a portion of this population into native meadow restoration areas is recommended to generate an overall increase in the local population and to guarantee the conservation of this species in a permanent meadow community (i.e., without succession impacts).

The introduced Dense Blazing Star population on the Subject Lands and the native populations within Windsor and Walpole Island are found in different ecoregions (7E-5 and 7E-1, respectively; MNR 2010). Future climate projections predict that, between 2011-2040, both of these sub-ecoregions will reach the same annual mean

temperature as well as fall into the same precipitation category (MNR 2010). In future years, the Subject Lands may provide suitable conditions for native Dense Blazing Star based on projected similarity to the 7E-1 sub-ecoregion where the native populations are presently found (subject to suitable soils/moisture, etc.).

Several techniques have been used to successfully transplant Dense Blazing Star, including sod mat transplantation in high quality sites, removal and planting of corms from low quality sites, and planting of plugs/seed from nurseries (MNRF 2016). For the Subject Lands, harvesting and re-planting corms from the on-site population is recommended. Transplantation should occur during dormancy (late October – April). In most cases, transplants of this species experience good survivorship with high recruitment rates. Dense Blazing Star is also included in nursery groundcover seed mixes that are to be applied within some buffer areas (**Appendix D**).

7.6 Fish Habitat

Fish habitat is illustrated on **Figure 9** (**Appendix A**), which provides an overview of the natural heritage features present on the Subject Lands and adjacent lands (120 m). Each of the four watercourses providing fish habitat (i.e., WC1, WC2, Conrail Drain and Welland River/Power Canal) are situated outside the proposed Riverfront Residential development area and will therefore not be subject to direct alteration due to the construction of the majority of the proposed development. NPCA typically requires a 15 m buffer from the top of bank of the watercourse channel to the adjacent development and site alteration for Type 2 and 3 fish habitats. With the exception of infrastructure works (described in paragraphs below), the proposed development will be situated at least 15 m from WC2, the Conrail Drain and the Welland River.

WC1 is located within a PSW unit that will be protected with a 10 m buffer. In several locations along its length, the watercourse comes in close proximity to the wetland boundary and therefore a minimum 10 m buffer would be provided. However, along the majority of its length, WC1 is located more than 15 m from the adjacent development limit. The 10 m buffer adjacent to the wetland will be restored per the recommendations in the Conceptual Ecological Restoration Plan (**Appendix D**) and this restored buffer is anticipated to provide suitable protection from adjacent development and site alteration. A pump house is proposed in proximity to WC1. Construction of this small structure should avoid alteration of the adjacent PSW/fish habitat 10 m wide buffer.

Restoration works are proposed in proximity to fish habitat associated with WC1 and WC2, although no restoration is proposed in the PSW units where either watercourse is located. Restoration is anticipated to include invasive species management, site

preparation, vegetation planting and creation of a dug pond for amphibians/turtles (near the upper reach of WC1). Restoration works will occur within the buffer adjacent to fish habitat. Best management practices (including sediment and erosion controls and spill prevention and response measures) are recommended to minimize the potential for indirect negative impacts on fish habitat. Given that disturbance within the buffer will be temporary, indirect impacts should be mitigated and the restoration will result in long-term enhancements to watercourse riparian areas, negative impacts on fish habitat are not anticipated due to restoration works.

A watermain crossing of WC2 is anticipated to be required to connect the proposed Riverfront Residential Area to an existing watermain on Don Murie Street. The design and construction methodology details have not been advanced at this stage of the development. Installation of the crossing could potentially occur by open-cut or directional drilling methods. Appropriate mitigation including sediment and erosion controls, spill prevention and response measures, in-water works timing restrictions, work site isolation and site rehabilitation will be required to minimize the potential for negative impacts on fish habitat in WC2. If open-cut installation methodology is used, short term impacts on fish and fish habitat would be anticipated. However, following completion of site restoration, no long-term negative impacts would occur. Additional regulatory review of the proposed watermain crossing may be required following completion of additional design and specification of a construction installation methodology.

Two SWM ponds are proposed within the Riverfront Residential Area and both will discharge flow to the Welland River. Designs for the discharge infrastructure have not been advanced at this stage in the development, although it is anticipated that an outlet headwall and discharge channel would be required within the riparian area to convey flows to the Welland River. Depending on the nature of the discharge infrastructure, there would be some alteration of fish habitat and temporary disturbance during installation. Additional regulatory review of the proposed SWM discharge infrastructure may be required following completion of additional design work.

In addition to these specific potential effects on fish habitat, general development and site alteration within the Riverfront Residential Area has the potential to result in indirect negative impacts on fish habitat in adjacent watercourses, potentially including:

- Impacts due to erosion and sedimentation (e.g., increased turbidity, sedimentation in watercourse channels) during construction;
- Impacts due to accidental spills of potentially toxic materials during construction; and

- Alterations in water balance and/or water quality during construction as well as over the long-term due to changes in surface water runoff and/or groundwater discharge to watercourses.

Impacts due to erosion and sedimentation during construction are anticipated to be prevented through the use of erosion and sedimentation controls to prevent sediment laden runoff leaving the construction areas and flowing into watercourses. A detailed sediment and erosion control plan should be prepared prior to construction and monitoring during construction is recommended to confirm that mitigation has been installed, is functioning as intended and to confirm if any remedial measures are necessary.

The potential for accidental spills during construction can be minimized through the use of spill prevention and response measures. Standard construction site spill prevention measures (e.g., use of appropriate fuel handling procedures, equipment inspections, refuelling and storage of hazardous materials in designated areas away from watercourses) should be implemented throughout construction. Appropriate response measures should be implemented in the event of an accidental spill, including any required notifications (e.g., Spills Action Centre).

The use of appropriate stormwater management and Low Impact Development measures is anticipated to be effective to maintain suitable water balance to wetlands and WC1 and WC2, which are located in relatively close proximity to the proposed development area. No impacts on water balance would be expected in WC3 (the Conrail Drain) based on distance from the Subject Lands and the Welland River/Power Canal (due to size of the feature and limited influence of the Subject Lands from a hydrological perspective).

Overall, some short-term impacts on fish habitat in WC2 and the Welland River may occur during installation of infrastructure, although no long-term negative impacts are anticipated following completion of site rehabilitation activities. Development and site alteration adjacent to WC1 and WC2 have the potential to result in indirect negative effects, but construction mitigation (e.g., erosion and sediment controls) and post-construction mitigation (e.g., SWM measures, Low Impact Development measures, buffers) are anticipated to be effective in preventing negative impacts on fish habitat. Long-term ecological enhancements are anticipated to result in indirect enhancements to fish habitats and watercourses.

7.7 Significant Valleyland

As noted previously, the Welland River (up to the limit of the regional floodplain which extends to Chippawa Parkway) is considered to be a significant valleyland and the

lower, naturalized reach of WC2 (to the top of slope identified by NPCA) is designated as a candidate significant valleyland.

Generally, development and site alteration will occur outside the delineated valleylands for the Welland River and WC2. Buffers from the wetlands in the WC2 valleyland, as well as any hazard setbacks are anticipated to be effective in preventing negative impacts on the WC2 valleyland due to adjacent development. The Welland River valleyland is situated south of Chippawa Parkway and will be protected from direct disturbance due to development on the Subject Lands. Implementation of construction site mitigation will also assist in preventing negative impacts on the valleylands.

Direct effects on the Welland River valleylands are anticipated to be required to install the SWM pond discharge infrastructure to convey stormwater from the proposed SWM ponds on the Subject Lands to the Welland River. However, the effects of this infrastructure are anticipated to be localized and mitigation will be implemented during construction to limit effects. The SWM discharge infrastructure is not anticipated to result in negative effects on the overall Welland River valleyland form and function.

Direct effects on the WC2 valleyland are anticipated to be required to install the watermain crossing. Mitigation will be required during installation of the watermain, with mitigation to be contingent upon the type of crossing installation methodology required (e.g., open-cut or directional drilling). Although the watermain will result in localized temporary effects on the valleylands, no long-term effects on the overall WC valleyland form and function are anticipated.

Additional assessment of the localized disturbances associated with SWM discharge infrastructure and watermain crossing requirements will be necessary during future design stages of the project, once additional details become available. Both of these project components may require regulatory review.

7.8 Other Natural Heritage Features

7.8.1 Potential Natural Heritage Corridors

The Region's (2014) natural heritage system includes the identification of Potential Natural Heritage Corridors, which are meant to connect key, core habitat features (EPA, ECA and fish habitat). The NPCA (2011) *Lower Welland River Study Characterization Report* identifies several potential corridor connections in the vicinity of the Subject Lands, including the Welland River/riparian area and watercourse 2. OPA section 2.5.17 (City 2018) provides additional guidance regarding the

identification of linkages and natural corridors on the Subject Lands. As per section 2.5.17, linkages on the Subject Lands:

- Should facilitate species movement and maintain biodiversity;
- May include anthropogenic corridors provided by parks and open space areas as well as natural corridors; and
- Are recommended to be 50 m wide.

As shown on **Figure 7** (**Appendix A**), two natural heritage corridors are identified within the Riverfront Residential NHS: (1) the north-south oriented ecological linkage identified as amphibian movement corridor SWH (this corridor also connects a variety of significant wildlife habitat types and significant wetlands); and (2) the WC2 valley (this corridor connects several SWH types and significant wetlands). Both of these corridors, which meet or exceed average width of 50 m, and both connect to the Welland River/riparian area (within the 120 m adjacent lands) which serves as a broader ecological linkage/corridor within the local and regional landscape.

An anthropogenic corridor is also identified along the open space designation that follows the southern boundary of the railway and spans from Dorchester Road to the central wooded swamp (SWD1). This open space area contains a retained PSW and associated buffer, along with two proposed native meadow restoration areas (**Appendix D**). This anthropogenic corridor provides passive, east-west wildlife movement opportunities between features west of Dorchester Road (off-site), PSW units located on other lands owned by the applicant east of Dorchester Road (outside of OPA 128), and the Riverfront Residential NHS. Wildlife movement surveys conducted by Savanta (as described previously) recorded only low numbers of amphibians (and other fauna) during road-crossing and salamander movement surveys in the area of the proposed east-west linkage. The PSW units located east of Dorchester Road (on other lands owned by the applicant) do not contain any significant wildlife habitat types that would provide rationale for a more robust ecological connection between Dorchester Road and the Riverfront Residential NHS. The anthropogenic corridor provided by the open space designation is on average 42 m wide.

7.9 Other Indirect Effects

Other indirect effects on the natural heritage features could potentially occur as a result of erosion and sediment, accidental spills or other long-term land use change issues. These indirect effects are discussed below.

7.9.1 Construction

During construction, erosion and sedimentation and accidental spills could potentially cause negative impacts on wetland features or the watercourse located at the east end of the Subject Lands. Erosion and sediment control measures (ESC) discussion in section 6 are anticipated to prevent or minimize potential impacts associated with erosion and sedimentation and accidental spills during construction. ESC measures are also proposed in the Conceptual Ecological Restoration Plan (**Appendix D**) to protect significant wetlands and other retained vegetation while Common Buckthorn control is underway. The proposed construction of two open wetlands, and associated grading to provide sufficient surface water drainage to these features, necessitates the use of ESC measures, including appropriate timing of wetland construction (i.e., outside typical summer storm event periods). These measures are anticipated to be effective to minimize potential effects on adjacent PSW units.

7.9.2 Post-Construction

Indirect impacts on the retained woodland/wetland features could potentially occur during the post-construction period as a result of change in adjacent land use. Feature-specific buffer widths have been assigned to mitigate long-term impacts on the retained NHS. The area within the buffer will be vegetated, either with existing vegetation or newly planted self-sustaining vegetation in areas where natural vegetation cover is poor or removed due to Common Buckthorn management (as detailed in **Appendix D**).

The feature-specific buffer widths vary from 10 m to 20 m in width. They relate to the sensitivity of the target woodland/wetland features (and the flora/fauna/communities contained therein), to adjacent proposed residential development and associated use. In addition to comments regarding role of buffers to mitigate indirect effects, buffers will also provide some quantity and quality control for stormwater runoff, which may originate from adjacent development areas (e.g., rear lots backing onto the limit of development) or within the buffer itself. The vegetated buffer will assist in managing surface water runoff quantity through the processes of storage (associated with micro-topography within the buffer), evaporation, infiltration and transpiration. The buffer will also function to maintain water quality in the wetland by trapping sediments and slowing the flow of surface water to promote uptake of nutrients or contaminants by vegetation.

In addition to the buffer, it is recommended that rear yards backing onto the buffer be fenced to prevent landowner encroachment into NHS buffers (e.g., mowing, dumping of refuse).

Overall, a variable 10 m to 20 m wide buffer combined with the proposed mitigation measures, is anticipated to provide sufficient buffering functions to prevent negative impacts on the retained woodlands/wetlands due to adjacent land uses.

Pedestrian use of natural areas in a post development setting presents the potential for impacts even with protective buffers. The proposed Riverfront development presents an opportunity to secure and conserve significant areas and associated functions, while managing and controlling user access. Significant positive effects are known to be derived from human interactions with nature. GR (CAN) is proposing to manage and focus significant education and outreach opportunities through the development of a Wetland Discovery Center.

The Riverfront Wetland Discovery Centre will serve as a destination for residents and visitors to:

- View restoration demonstration areas/gardens;
- Learn more about the Natural Heritage System and biodiversity conservation; and
- Afford access to the connected trail system.

This Center is discussed further in **Appendix D**.

7.10 Enhancements and Net Gain

The Riverfront Residential Draft Plan of Subdivision was designed to avoid impacts to significant wetlands and significant habitat of endangered and threatened species, and to avoid and minimize impacts to significant wildlife habitat and significant woodlands. The Conceptual Ecological Restoration Plan (CERP; **Appendix D**) presents an opportunity to achieve an increase in ecological and social benefits on the Subject Lands. The CERP includes implementation details for: woodland restoration areas, native meadow restoration areas, artificial turtle nesting beaches, created open wetlands designed to meet the life process requirements of turtle and open wetland amphibian species, buffer/edge vegetation treatments, wildlife movement corridor enhancement, and invasive species (Common Buckthorn) management.

Restoration works (**Appendix D**) are proposed within declining areas of significant woodlands that are identified as “potential woodland enhancement/restoration areas” on the City’s OPA Map 4 Schedule A-6(a), and within the buffers of retained natural heritage features. Restoration works will initially result in partial removal of existing vegetation in order to effectively manage the invasive species Common Buckthorn in preparation for subsequent restoration actions (i.e., native planting,

creation of turtle/amphibian ponds and turtle nesting beaches). This removal is required to effectively manage and control the ability for Buckthorn to continue to spread and to degrade adjacent natural features over time. Restoration, overall, will result in a net gain in ecological functionality and will provide a more diverse range of habitats and vegetation communities that will benefit a range of local flora and fauna.

In terms of mitigation for proposed direct removals and the enhancement of significant woodland and SWH:

- Given the proposed woodland creation, woodland restoration and a proposed increase in woodland function (e.g., increased diversity, improved health, minor increase in areas sensitive woodland) no negative impacts due to development on the Subject Lands are anticipated to occur to significant woodlands; and
- Permanent native meadow restoration areas will serve as recipient locations for the proposed relocation of rare species SWH (Great Plains Ladies'-tresses) and will benefit an array of other flora and fauna, including Dense Blazing Star (pending MNRF agreement), grassland associate plants, pollinators, butterflies, odonates, and amphibians that utilize terrestrial open areas for overwintering and/or foraging purposes.

The CERP proposes the creation of a specialized native plant nursery within the GR(Can) land holdings to assist with the propagation and conservation of those meadow species and other species that would benefit from population increases (e.g., Buttonbush). The native plant nursery will serve to responsibly collect and store seed from mature specimens and to propagate target tree, shrub and herbaceous species for use within restoration areas both on-site and, potentially, at future off-site restoration projects.

These initiatives are described further in **Appendix D**.

Table 7: Impact Assessment Summary - Predicted Effects, Mitigation, Enhancement and Net Effects

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY	IMPACTOR	PREDICTED EFFECTS	AVOIDANCE, MITIGATION AND/OR RESTORATION	NET EFFECTS	MONITORING AND MANAGEMENT
Significant Natural Heritage Features						
1. Significant Wetlands	• Significant wetlands present within and adjacent to the Subject Lands	• Development adjacent to significant wetlands (no removal proposed) • Potential disturbance due to increased presence of people, pets, lighting and noise • Minor creation of thinner edge conditions in some areas where invasive shrub (Common Buckthorn) management is proposed in the PSW buffer • Alteration to wetland drainage catchment size • Potential changes to wetland water balance due to alteration of the wetland catchment size and quantity/timing (seasonality) of water delivery to wetland units	• Minor creation of thinner edge conditions in some areas where invasive shrub (Common Buckthorn) management is proposed in the PSW buffer may increase potential for edge effects, such as wind throw, sun scald, and invasion by pests – the selective removal of Common Buckthorn will minimize such edge impacts and overall is expected to benefit the PSW (through reduced invasion by Common Buckthorn). Existing vegetation will be retained (aside from selective Common Buckthorn removal) within 7.5 m of all PSW units. • Wetland catchments that have a 10% or greater change in surface water drainage catchment size or 10% of greater change in average annual surface water runoff volume may have alterations to wetland water balance/hydroperiod. The latter could result in changes to the associated plant and animal communities within significant wetlands, including potential shift to a different vegetation community type over time depending on timing, quantity and quality of water delivered to the significant wetland.	• No removal of PSW units • Buffers are proposed that will be naturally vegetated/restored and sized to appropriately protect the ecological sensitivity of each PSW unit • Preliminary water balance information is provided in this report (section 7) regarding the expected annual change in surface water volume to each wetland subcatchment within the Subject Lands • For wetland catchments with >10% change in drainage area or average annual surface water runoff volume (as indicated in section 7), the stormwater management plan (at the site plan stage) should demonstrate that both quantity and seasonal timing of water inputs into the wetland units within these catchments will be appropriate to maintain the target vegetation community and amphibian breeding habitat (where the latter is present under existing conditions). General guidance is provided in this report (section 7) regarding the seasonal water requirements of wetland units within catchments where >10% change in drainage area or average annual surface water runoff volume are expected. • The Conceptual Ecological Restoration Plan (**Appendix D**) includes afforestation and invasive species management efforts within	• Provided that water balance needs are met, no negative impact to significant wetlands is predicted on the Subject Lands • Wetland features and functions will be better protected with implementation of planted buffers, invasive species management, and with control of random-access and associated disturbances	• Wetland hydrology monitoring and NHS buffer monitoring (EIS section 8) • NHS buffer monitoring should occur in years 3 and 5 following completion of buffer planting with native species. Monitoring will focus on planted stock survivorship, coverage and growth; and on documenting disturbance within the buffer (i.e., garbage, informal trails) and presence of any priority invasive species • For areas subject to Common Buckthorn management (**Appendix D**), annual monitoring is recommended for 4 years following the first treatment year. Follow-up interventions (i.e., cutting and herbicide application) will likely be required for 2-4 years depending on the particular area and severity of the infestation

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY	IMPACTOR	PREDICTED EFFECTS	AVOIDANCE, MITIGATION AND/OR RESTORATION	NET EFFECTS	MONITORING AND MANAGEMENT
				the PSW buffers on the Subject Lands. The latter will further help to ameliorate potential edge effects on the retained PSWs • Trails will be sited to minimize potential impacts to significant wetlands and associated plant and animal species/communities		
2. Significant Woodlands	• Significant woodland present within and adjacent to the Subject Lands	• Direct removal of 7.27 ha of significant woodland. This woodland area is recognized by the agency group to be in decline due to die-back of the mature Ash canopy and will no longer meet significance criteria in 2-5 years (due to the Emerald Ash Borer infestation). Removal of this woodland area does not constitute removal of significant woodland and does not require dedicated mitigation, i.e. to meet the requirements of the PPS for no negative impact to significant woodlands. • Development adjacent to retained significant woodlands • Potential disturbance due to increased presence of people, pets, lighting and noise • Minor creation of thinner edge conditions in some areas where invasive shrub (Common Buckthorn) management is proposed in the buffer	• Removal of some habitat of generalist and common species of plants and wildlife • Minor creation of thinner edge conditions in some areas where invasive shrub (Common Buckthorn) management is proposed in the buffer may increase potential for edge effects, such as wind throw, sun scald, and invasion by pests – the selective removal of Common Buckthorn will minimize such edge impacts and overall is expected to benefit the retained feature (through reduced invasion by Common Buckthorn). Existing vegetation will be retained (aside from selective Common Buckthorn removal) within 7.5 m of all PSW units. • Direct afforestation planting and invasive plant species management efforts in a variety of restoration areas within the Subject Lands (**Appendix D**)	• The Conceptual Ecological Restoration Plan (**Appendix D**) includes direct afforestation planting and invasive species management within and/or along the edge of retained natural features, which will further serve to reduce potential edge effects • Buffers established along retained significant woodlands will be subject to restoration plantings to mitigate potential impacts of the creation of a new edge, such as wind throw, sun scald, and invasion by pests • In many cases, significant woodland patches overlap with PSW units. Proposed buffer width varies (as described in EIS section 7) to reflect the ecological sensitivity of each wetland/woodland. Buffer width applied to the retained features varies from 10 m to 20 m • Trails will be sited to minimize potential impacts to significant woodlands • Completion of a tree saving plan is recommended as a condition of draft plan approval • Tree removals should occur outside of applicable migratory bird windows and the bat active season, where possible. Where	• Woodland restoration will result in >1:1 compensation for the proposed removal of 7.27 ha of significant woodland (7.4 ha of woodland restoration is proposed). No negative impact to significant woodlands predicted on the Subject Lands • Potential improvements to ecological functions within retained woodlands due to buffer plantings, invasive species management and other restoration measures detailed in the Conceptual Ecological Restoration Plan (**Appendix D**)	• NHS buffer monitoring should occur in years 3 and 5 following completion of buffer planting with native species. Monitoring will focus on planted stock survivorship, coverage and growth; and on documenting disturbance within the buffer (i.e., garbage, informal trails) and presence of any priority invasive species • For areas subject to Common Buckthorn management (**Appendix D**), annual monitoring is recommended for 4 years following the first treatment year. Follow-up interventions (i.e., cutting and herbicide application) will likely be required for 2-4 years depending on the particular area and severity of the infestation

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY	IMPACTOR	PREDICTED EFFECTS	AVOIDANCE, MITIGATION AND/OR RESTORATION	NET EFFECTS	MONITORING AND MANAGEMENT
				this is not possible, due diligence surveys should occur		
3. Significant Wildlife Habitat	• One significant wildlife habitat type (rare species SWH for the provincially rare plant Great Plains Ladies'-tresses) will be directly impacted by development • All other SWH polygons are located outside of the development area within the retained NHS	• A provincially rare plant, Great Plains Ladies'-tresses, occurs within the west development area and is proposed for relocation • Development adjacent to retained significant wildlife habitat (no significant wildlife habitat removal proposed) • Potential disturbance due to increased presence of people, pets, lighting and noise • Minor creation of thinner edge conditions in some areas where invasive shrub (Common Buckthorn) management is proposed in the buffer of retained features that contain SWH	• Potential for stress to and/or mortality of Great Plains Ladies'-tresses specimens that are transplanted to appropriate recipient locations (i.e., native meadow restoration areas) within the NHS • Minor creation of thinner edge conditions in some areas where invasive shrub (Common Buckthorn) management is proposed in the buffer of retained features may increase potential for edge effects, such as wind throw, sun scald, and invasion by pests – the selective removal of Common Buckthorn will minimize such edge impacts and overall is expected to benefit the retained feature (through reduced invasion by Common Buckthorn). Existing vegetation will be retained (aside from selective Common Buckthorn removal) within 7.5 m of all PSW units. • Potential for increased road mortality by amphibians, reptiles, and mammals due to proximity to new road network within the proposed development and increased traffic along existing boundary roads (i.e., Chippawa Parkway and Dorchester Road) • Potential change in wildlife movement patterns and behavior associated with development	• Retained SWH polygons overlap with significant wetland and/or significant woodland and will be effectively protected from the impacts of adjacent land use change by the buffers applied to the woodland/wetland edges • Trails will be sited to minimize potential impacts on SWH • Planting of visual barrier vegetation (such as bramble and thorny species) that deter off-trail access into retained features is recommended within the immediate edge area of retained wetlands/woodlands (described in detail in **Appendix D**) • If the Chippawa Parkway EA identifies the need for a wildlife eco-passage between the Subject Lands and the City lands alongside the Welland River, south of the roadway, then wildlife fencing is recommended extending 30 m to 100 m from the Riverfront NHS/roadway interface to direct amphibians, reptiles and small to medium sized mammals towards the ecopassage • The potential for wildlife road mortality can also be reduced through the protection/provision of habitat suiting the life processes of target wildlife within the NHS. The life processes of woodland and wetland breeding amphibians are met within the large woodland/wetland complexes that will be preserved on-site in addition to habitat creation in the proposed restoration areas (**Appendix D**).	• No negative impact on significant wildlife habitat predicted within the Subject lands provided that the proposed transplant program for Great Plains Ladies'-tresses is successful	• Monitoring (EIS section 8) pertinent to SWH will include amphibian call count surveys, breeding bird surveys, wetland hydrology surveys, turtle basking surveys, and vegetation surveys within select retained and restored portions of the NHS • Dedicated monitoring of the Great Plains Ladies'-tresses transplant locations in mid to late-September in years 1, 3 and 5 commencing one full growing season after the original transplant event

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY	IMPACTOR	PREDICTED EFFECTS	AVOIDANCE, MITIGATION AND/OR RESTORATION	NET EFFECTS	MONITORING AND MANAGEMENT
				The CERP (**Appendix D**) includes the creation of artificial turtle nesting beaches open wetlands - both of which are limited habitat types on the Subject Lands • The proposed Wetland Discovery Centre (**Appendix D**) will also aide in educating residents and visitors about the rare species and habitat types present within the Subject Lands and suggest citizen actions to help preserve local biodiversity		
4. Habitat of Endangered and Threatened Species	• Dense Blazing Star present outside of the proposed development area, however this species is not native to Niagara • Significant SAR bat habitat within the retained NHS • Potential presence of Acadian Flycatcher (unconfirmed) within the Subject Lands; the suitable habitat polygon for this species is protected within the NHS	• Development (vegetation removal) within 120 m adjacent to Dense Blazing Star specimens/habitat and suitable Acadian Flycatcher breeding habitat • Potential disturbance due to increased presence of people, pets, lighting and noise	• Potential disturbance on adjacent lands to Species at Risk due to increased presence of people, pets, lighting and noise	• Updated submission of the MNRF Information Gathering Form (IGF) to address potential impacts to Species at Risk • Develop mitigation measures for Dense Blazing Star, focused on transplantation/division and propagation to increase the population and distribute sub-populations throughout the broader Riverfront Community retained natural features (in suitable micro-habitat locations) • Trails will be sited to minimize potential impacts to Acadian Flycatcher, endangered bat species, Dense Blazing Star and their habitats • Planting of visual barrier vegetation and plants (such as bramble and thorny species) that deter off-trail access into retained features is recommended in targeted areas within the woodland/wetland buffers (described in detail in **Appendix D**)	• No negative impact to significant Species at Risk habitat or individuals predicted on the Subject Lands	• Conduct breeding bird surveys within the Acadian Flycatcher suitable habitat polygon in years 3 and 5 following planting of the buffers that border this woodland/wetland • Pending agreement from MNRF (through the IGF process) that Dense Blazing Star is non-native in Niagara and thus not subject to the ESA, monitoring of Dense Blazing Star transplants will occur concurrently as part of standard vegetation monitoring proposed within the select restoration areas in the NHS
5. Fish Habitat	• Two watercourses that provide fish habitat are present within Riverfront Residential NHS and two	• Construction, specifically earthworks (e.g., grading, filling) will occur in general proximity to WC1 and WC2	• No direct effects on fish habitat in WC1 or the Conrail Drain will occur during construction	• WC1 will be retained and protected with a 10 m buffer applied to the boundary of the PSW unit that the watercourse is situated in. In	• No direct net negative effects on fish habitat in WC1 or the Conrail Drain are anticipated as a result of development	• Construction monitoring to ensure adherence to and effectiveness of the proposed construction

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY	IMPACTOR	PREDICTED EFFECTS	AVOIDANCE, MITIGATION AND/OR RESTORATION	NET EFFECTS	MONITORING AND MANAGEMENT
	additional watercourses that provide fish habitat are located within the 120 m adjacent lands. • Watercourse 1 (WC1), consisting of a dug, intermittently flowing drainage ditch, is located at the southern end of the Subject Lands. It is approximately 212 m long, originating from a concrete outfall that appears to be the remnant of an historical stormwater drainage piping system. The lower reaches of the watercourse could provide potential spawning habitat for Northern Pike, although none were observed during baseline studies. A low number of Emerald Shiner were captured at the upstream end of the watercourse and unidentified small-bodied fish were observed approximately half-way down the feature on the Subject Lands (Dougan and Associates 2016a). The feature is located within a PSW unit • Watercourse 2 (WC2; or the Eastern Tributary), which is permanently flowing, is located on the eastern side of the Subject Lands and originates on the Thundering Waters Golf Course. The upper reaches of the watercourse are historically altered (e.g., piping, straightened, rip rap erosion protection) although the lower reaches (approximately 800	(outside established development limits) • During construction and invasive species management (herbicide use) there is the potential for spills from equipment and vehicles that could enter into the watercourses • Installation of a buried watermain across WC2 may be required to connect the Subject Lands to the existing watermain on Don Murie Street • Installation of SWM pond discharge infrastructure outletting to the Welland River will be required • Invasive species management (including use of herbicide) will occur adjacent to each watercourse • Potential for alterations in post-construction hydrology and water quality within the watercourses due to development on the Subject Lands (i.e., increased impervious surfaces, stormwater management measures, direct runoff from adjacent developed areas)	• Potential for negative effects on fish habitat in WC2 due to installation of buried watermain crossing. Installation could be via open cut or directional drilling, each of which could have different potential temporary effects on fish habitat, including disturbance to fish and temporary loss/alteration of habitat during installation. Following installation and site restoration, no permanent effects on fish habitat in WC2 are anticipated. Assessment during future design stages will be required and regulatory permits may be necessary depending on the nature of the proposed crossing • Potential for negative effects on fish habitat within the Welland River due to installation of SWM pond discharge infrastructure. No details on the discharge infrastructure outlet are available at this stage in the development. Assessment during future design stages will be required and regulatory permits may be necessary depending on the nature of the infrastructure • Erosion and sedimentation from the construction work area could result in indirect effects on fish habitat within the adjacent watercouses (e.g., increased turbidity, sediment deposition) • Accidental spills during construction could negatively affect water quality, vegetation and aquatic biota • Increased stormwater flows due to runoff or stormwater	several locations, the watercourse runs very close to the edge of the wetland, so a 10 m buffer would be the minimum buffer for this feature. In other locations, the watercourse is situated further into the wetland, therefore, it would be located 15 m or greater from the adjacent development limits. The 10 m buffer from the wetland boundary will be restored, as per the Conceptual Ecological Restoration Plan. The buffer will mitigate indirect potential effects to fish habitat and water quality in WC1 from adjacent construction activities and long-term land uses • All development and site alteration (excluding watermain installation) will be located greater than 15 m from the WC2, Welland River and Conrail Drain channel banks. • Erosion and sediment control measures will be implemented during construction to minimize the potential for negative effects on fish habitat in adjacent watercourses • Spill prevention and response measures will be implemented during construction to minimize the potential for an accidental spill and to minimize the potential for negative effects on fish habitat if spills do occur • Watermain crossing of WC2 will require implementation of standard mitigation for the proposed crossing installation methodology (e.g., open cut or directional drilling). Mitigation will include timing restrictions, erosion and sedimentation controls, work site isolation (i.e., if necessary, for	within the Riverfront Residential area, since no in-water work is required. Proposed buffer from WC1 and adjacent wetland will result in long-term protection for the feature. • Installation of the watermain crossing on WC2 may result in temporary disturbance to fish and fish habitat, but no long-term impacts are anticipated following site rehabilitation. Future assessment will be required, and regulatory review/permits may be necessary depending on the design and installation methodology. No other direct net negative effects on fish habitat in WC2 will occur. Buffers from adjacent natural features (e.g., PSWs adjacent to WC2) will provide long-term protection for WC2 • Some alteration of fish habitat may be required for the SWM Pond outlet structures to the Welland River. Future assessment will be required, and regulatory review/permits may be necessary depending on the nature of the outlet structures • Following implementation of mitigation, no net effects on fish habitat are anticipated due to potential indirect effects during construction (e.g., erosion and sedimentation)	mitigation measures (e.g., sediment and erosion controls, in-water work timing restrictions) • Monitoring of quality of any proposed SWM discharge flows to the Welland River (monitoring is anticipated to be a requirement of approvals necessary for the SWM Ponds) • Monitoring of invasive species management areas and buffer restoration areas to ensure success of management measures

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY	IMPACTOR	PREDICTED EFFECTS	AVOIDANCE, MITIGATION AND/OR RESTORATION	NET EFFECTS	MONITORING AND MANAGEMENT
	m upstream from the Welland River) meander naturally within a small valley. Low numbers of six common fish species, including YOY White Sucker, have been captured in this watercourse. It is unknown if the YOY White Sucker were spawned in the watercourse or if they moved in from the Welland River (Dougan and Associates 2016a) • The Welland River, located within 120 m south of the Subject Lands, provides permanent fish habitat, with a full range of life history functions for a diverse fish community. The Welland River is separated from the Subject Lands by Chippawa Parkway • The Conrail Drain (also referred to as Watercourse 3) is situated within 120 m north of the Subject Lands. It is separated from the Riverfront Residential Subject Lands by the adjacent railway line. It consists of a trapezoidal, channelized drainage feature, armoured with rip rap. The feature is generally permanent flowing, although low flows have been observed to be interstitial within the rip rap. The feature drains to the Power Canal. Low numbers of Brook Stickleback have been captured in the feature. The feature is considered to be Type 3 (Marginal) fish habitat, based on the observed		management feature discharge could result in erosion of the bed and banks of the watercourses adjacent to the development area. Increased erosion from the Subject Lands or within the watercourses could result in negative effects on fish habitat and fish mortality, health effects or altered behaviour of aquatic biota (benthic invertebrates and fish) • Potential for decreased surface water quantity and associated negative effects on fish habitat (e.g., decreased habitat availability) to the watercourses due to altered hydrology from the proposed SWM activities • Potential for negative effects on water quality due to runoff from adjacent developed areas • Potential for negative effects on fish and fish habitat due to disturbance and herbicide use during invasive species management activities	open-cut installation) and disturbed area restoration • Design and installation of SWM pond discharge infrastructure will be undertaken to minimize potential negative effects on fish habitat in the Welland River. Mitigation may include work site isolation and in-water work timing restrictions • SWM ponds will discharge to the Welland River with no direct effects on WC1 or WC2. Given the nature of the Welland River, no erosion control criteria are required for SWM ponds. • SWM measures will provide a Normal level of quality control to mitigate potential effects on water quality and associated fish habitat in the Welland River • The site plan will minimize changes in the post-development storm release rates to the watercourses within the Subject Lands. Low Impact Development measures will be used as necessary. • No Invasive species management is proposed in the floodplain watercourses. Use of approved herbicides will be conducted in accordance with all manufacturer's instructions and use appropriate precautions and best management practices associated with use in and around watercourses	• No net effects on fish habitat due to stormwater management within the Riverfront Residential lands are anticipated provided the SWM plan is effective in maintaining or enhancing existing watercourse hydrology • Watercourse and adjacent natural feature buffers (e.g., buffers to PSW units that contain watercourses) are anticipated to be effective in minimizing long-term effects on fish habitat due to adjacent land use • Long-term enhancements to fish habitat may result from proposed invasive species management and associated restoration in the vicinity of the watercourses, including within buffer areas • Provided existing hydrology within watercourses is maintained or enhanced, no long-term change in fish habitat within watercourses is anticipated due to development on the Riverfront Residential Subject Lands and associated stormwater management requirements	

NATURAL HERITAGE FEATURES AND ASSOCIATED FUNCTIONS	SIGNIFICANT CHARACTERISTICS AND SENSITIVITY	IMPACTOR	PREDICTED EFFECTS	AVOIDANCE, MITIGATION AND/OR RESTORATION	NET EFFECTS	MONITORING AND MANAGEMENT
	characteristics, including anthropogenic, highly altered conditions, barriers to movement and limited fish community (Dougan and Associates 2016)					
6. Significant Valleyland	• The Welland River valley, which is delineated by the Regional Floodline and not a defined valley in this area, merits consideration as significant valleyland. This feature (including the regulated floodplain) is located off the Subject Lands (i.e., south of Chippawa Parkway). This watercourse is significantly altered from its historical natural form (including reversed flows to facilitate hydroelectric power generation) but provides a number of important ecological and biophysical functions. • Watercourse 2 (WC2; Eastern Tributary), which is located on adjacent lands outside the proposed Riverfront Residential development area, is a candidate significant valleyland. This valleyland is historically altered by adjacent development and instream alterations within the watercourse, but continues to provide biophysical, fish habitat and wildlife habitat functions. • Note: some of these valleylands are not owned by GR(Can)	• Wood (2017) identifies a Wet Pond SWM facility in proximity to WC2. However, it is noted that discharge will be to the Welland River. • Wood (2017) identifies a watermain connection and/or "external works for the Subject Lands" which may affect WC2 during installation (as discussed in detail in the Fish Habitat row).	• No direct effects on the WC2 valleylands are anticipated to be required for the adjacent SWM pond. The SWM pond will adhere to the WC2 development limits and will discharge to the Welland River. • The SWM pond will discharge to the Welland River and therefore, may require installation of SWM discharge infrastructure within the valleyland. Design details are not available at this stage of the development and will require assessment at a future stage. Regulatory permits may be necessary depending on the nature of the proposed infrastructure. Any discharge infrastructure within the Welland River valleyland would be very localized in nature and would not be anticipated to have negative effects on the overall form and function of the valleyland. • Watermain crossing of WC2 could potentially result in localized negative effects on the valleyland, particularly depending on the nature of installation. Open cut installation would require substantially more temporary disturbance than directional drilling.	• Installation of the SWM pond adjacent to the WC2 valleylands will respect the development limits associated with the feature. • Mitigation measures (e.g., erosion and sedimentation controls and spill prevention and response measures) will be undertaken during installation of SWM infrastructure within the Welland River valleylands • Mitigation measures will be used during installation of the watermain crossing of WC2 and restoration will be completed following installation. • Invasive species management and native plant in-planting is proposed on the east and west tableland/slopes of WC2.	• To be determined; subject to more detailed assessment when detailed designs are developed. Provided infrastructure is designed and installed to prevent/minimize temporary and permanent net effects, no long-term negative effect on the overall form and function of the valleylands are anticipated to occur.	• Construction monitoring to ensure adherence to and effectiveness of the proposed construction mitigation measures (e.g., sediment and erosion controls, in-water work timing restrictions) • Post-construction monitoring to assess the effectiveness of site rehabilitation measures following construction

8.0 MONITORING

Monitoring will occur within retained and restored portions of the NHS. For all monitoring elements, unless noted otherwise, the assigned surveys will occur in years three and five following the completion of native plantings in the restoration areas. This time frame allows for plantings to establish and created wildlife habitat features to stabilize. Monitoring within retained vegetated areas and within restoration areas will occur during the same years. The NHS monitoring types, along with recommended monitoring frequency/duration, are summarized below:

- Vegetation surveys
    - Monitoring is recommended within select retained and restored portions of the NHS. Monitoring locations should be selected through dialogue with the Region/NPCA at detailed design (i.e., select six to eight areas for vegetation monitoring). Vegetation monitoring locations should include transplant locations of Great Plains Ladies'-tresses and Dense Blazing Star (latter pending MNRF agreement through the IGF process that Dense Blazing Star is non-native in Niagara and not subject to the ESA).
    - For vegetation monitoring within retained vegetated areas, spring and summer botany surveys are required in woodland areas and summer and fall botany surveys are required in non-woodland areas. Monitoring will focus on planted/transplanted stock survivorship, coverage, growth, and will document rare species and high priority invasive species (as per Urban Forest Associates 2002).
    - Vegetation monitoring within restoration areas will entail completing an updated botanical inventory and comparing it against the floristic quality index established during baseline monitoring in the same ELC unit.
    - For areas subject to Common Buckthorn management, annual monitoring for re-growth of Common Buckthorn is recommended for four years following the first treatment year. Follow-up interventions (i.e., cutting and herbicide application) will likely be required for two to four years.
    - Note: During summer vegetation surveys, any evidence of turtle nesting and turtle nesting beach maintenance needs should be documented (e.g., to remove weeds or woody vegetation, and to ensure suitable beach substrate remains).

- Calling amphibian surveys
    - Conduct three rounds of amphibian call count surveys (Marsh Monitoring Protocol) at four to six call count stations, which will be selected through dialogue with the Region/NPCA during detailed design.

- Turtle basking surveys
    - Conduct one survey (April-May) at the two retained open aquatic features and at the two created open wetlands.

- Breeding bird surveys:
    - Conduct two rounds of breeding bird call count surveys (OBBA protocol) that target Acadian Flycatcher, Eastern Wood-Pewee, Wood Thrush, and woodland area-sensitive breeding birds. The selection of point count station locations will be confirmed with the Region/NPCA during detailed design.

- Wetland hydrology surveys
    - Conduct three rounds of wetland hydrology surveys at stations selected through dialogue with NPCA during detailed design. Surveys should occur during spring freshet, in mid-summer and late-summer.
    - Wetland hydrology surveys will include staff gauge water depth readings and visual inspection of the wetland for silt accumulation and active erosion, changes in canopy composition, and presence/extent of priority invasive species.

9.0 CONCLUSIONS AND RECOMMENDATIONS

This EIS was developed as part of the planning process for the proposed Riverfront Residential Area on the GR(CAN) Land Holdings in Niagara Falls, Ontario.

An assessment of impacts on the natural heritage features identified in the final Terms of Reference (i.e., significant wetlands, significant woodlands, significant wildlife habitat, and significant habitat of endangered and threatened species) and their associated functions has been conducted and discussed in relation to the PPS (MMAH 2014), related guidance documents, and the Regional Policy Plan (2014).

The Draft Plan of Subdivision's development boundary (**Figure 10**, **Appendix B**) was designed in a manner that avoids direct impacts to:

- Significant habitat of endangered and threatened species; and
- Significant wetlands.

The Draft Plan of Subdivision's development boundary (**Figure 10**, **Appendix B**) was designed to minimize impacts to:

- Significant woodlands; and
- Significant wildlife habitat.

Development within the Draft Plan of Subdivision boundary will result in:

- The removal of a portion (7.27 ha) of significant woodland, which is cultural woodland (CUW) in a state of advancing/severe decline due to ash die-back and invasion by Common Buckthorn; and
- The transplantation, propagation and permanent conservation of rare species SWH (i.e., provincially rare plant Great Plains Ladies'-tresses).

The proposed removal of 7.27 ha of significant woodland will be mitigated through woodland creation, woodland restoration and a planned increase in woodland functions (e.g., increased diversity, improved health, minor increase in areas sensitive woodland). Mitigation measures proposed for the provincially rare plant Great Plains Ladies'-tresses were discussed in section 7.4.1. A program is proposed to relocate the SWH polygons of this species to a secure, permanent native meadow restoration area within the NHS. These meadows will be managed over the long term to prevent the species from being displaced through natural succession (i.e., prevent shading from canopy cover establishment). The transplant recipient sites have been selected to enable the long-term maintenance of native meadow. Specific measures will be required to establish soils and microhabitats in those areas to optimize successful

outcomes. Native planting prescriptions are provided in the Conceptual Ecological Restoration Plan (**Appendix D**). Mitigation also proposes to increase the population sizes of locally and provincially rare plant species through the development and implementation of a specialized native plant nursery.

Potential indirect impacts to the retained natural heritage features will be mitigated through: management of the highly invasive shrub Common Buckthorn; implementation of dedicated woodland and native meadow restoration areas; the establishment of vegetated buffers; ecologically sensitive trail siting and associated lighting; and maintenance of suitable wetland water balance conditions (latter to be demonstrated as part of the stormwater management plan at the site plan stage).

Pedestrian impacts will be managed, and residents and visitors will have an opportunity to become more familiar with the local biodiversity through the proposed Wetland Discovery Center. That component represents an important opportunity for significant social gains to be achieved through this development.

Implementation of the Conceptual Ecological Restoration Plan (**Appendix D**) will provide an overall net gain in terms of ecological functions on the Subject Lands (note: restoration works will also result in partial removal of existing vegetation). The creation of the proposed native plant nursery will provide additional beneficial mitigation by supporting the supply of locally adapted plant seed/stock for restoration purposes.

Table 12 (**Appendix B**) provides a summary of commitments and recommendations presented within this EIS.

Considering the above, and as discussed within the impact assessment summary table (**Table 7**, **Appendix B**), development of the Subject Lands can be completed without negative impacts on the natural heritage features and associated functions. The addition of innovations (e.g., Wetland Discovery Centre, native plant nursery) present opportunities for significant gains in terms of the long-term viability and stewardship of the conserved natural features and associated functions.

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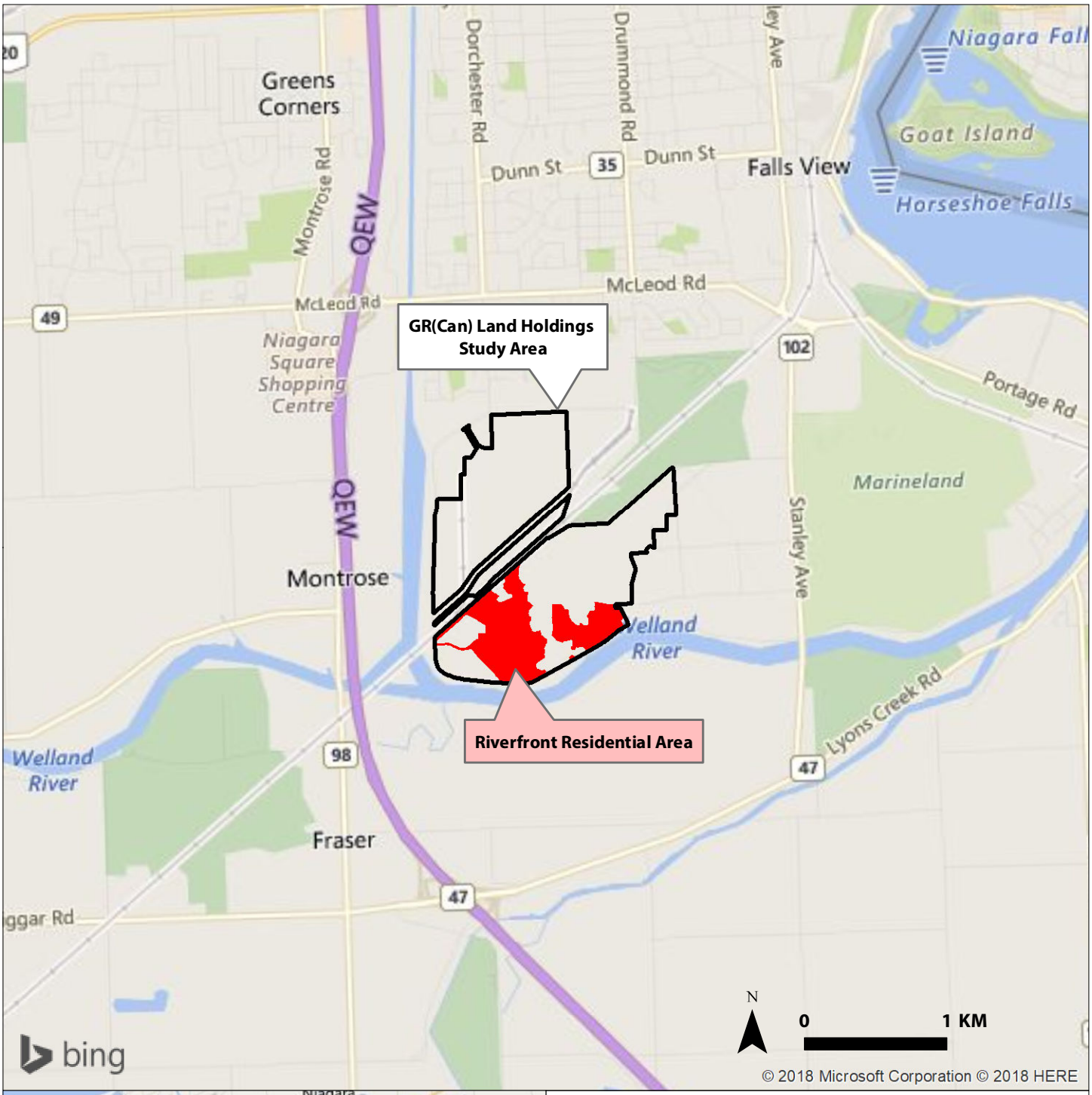
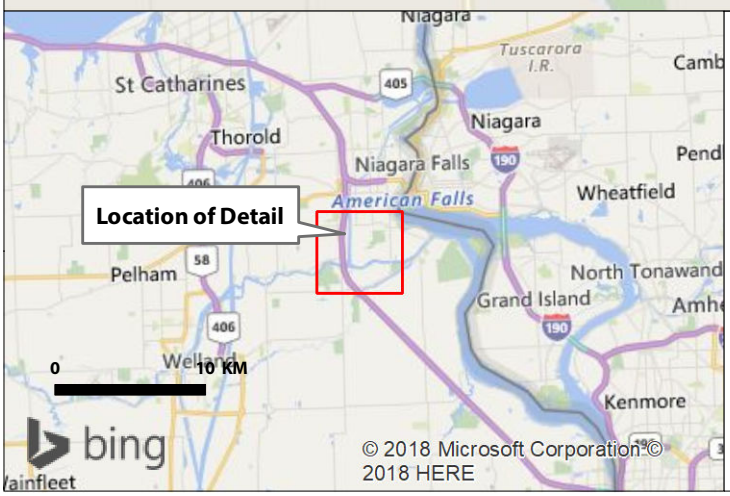
APPENDICES

Appendix A – Figures

Appendix B – Tables

Appendix A – Figures





Riverfront Residential Block Plan Environmental Impact Statement

Figure 1
Location of Subject Lands

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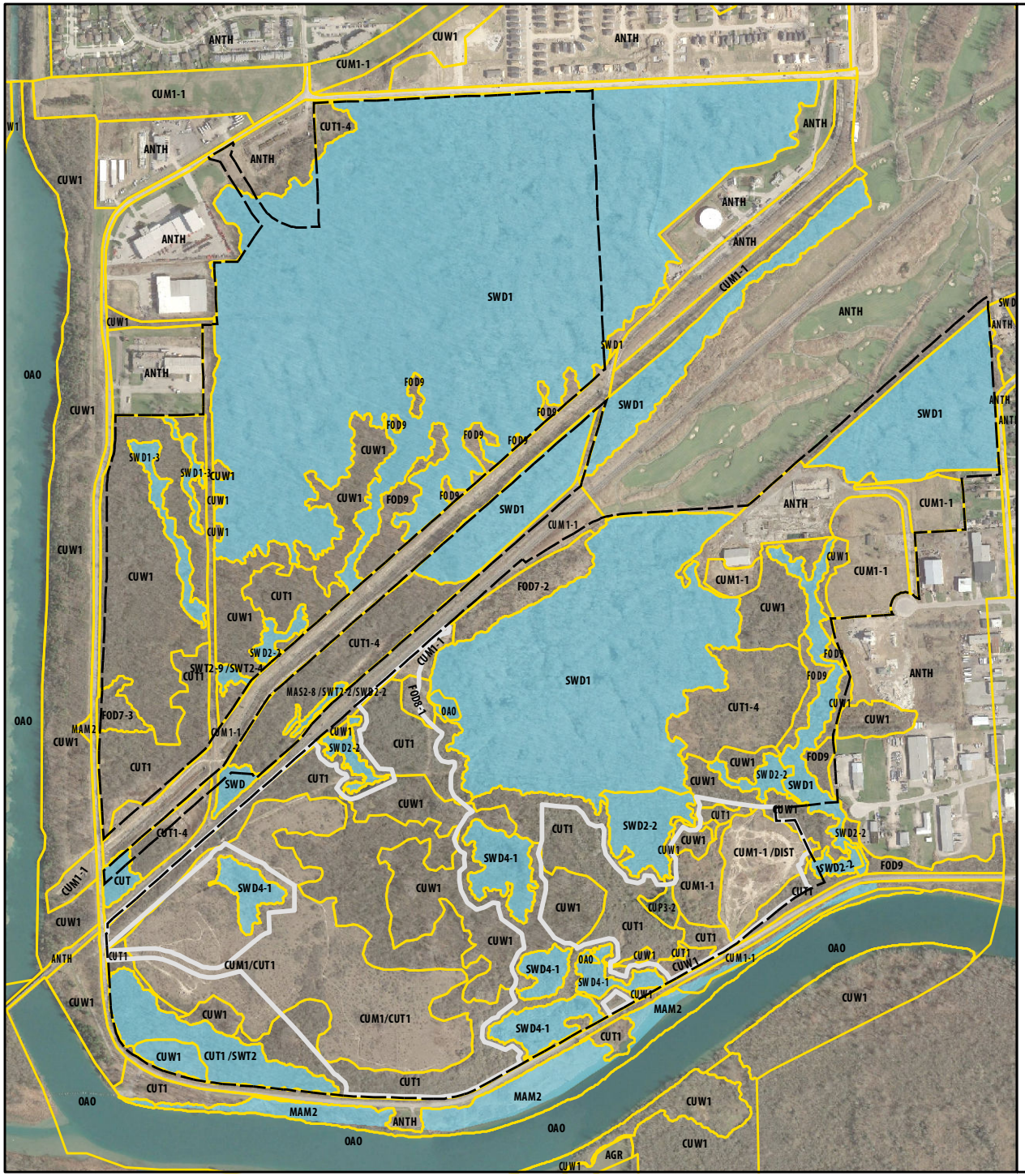

Study Area

Riverfront Residential

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Provincially Significant Wetland (MNRF)

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

Figure 2
Vegetation Commmunities and Provincially Significant Wetlands

0 100 Meters

N

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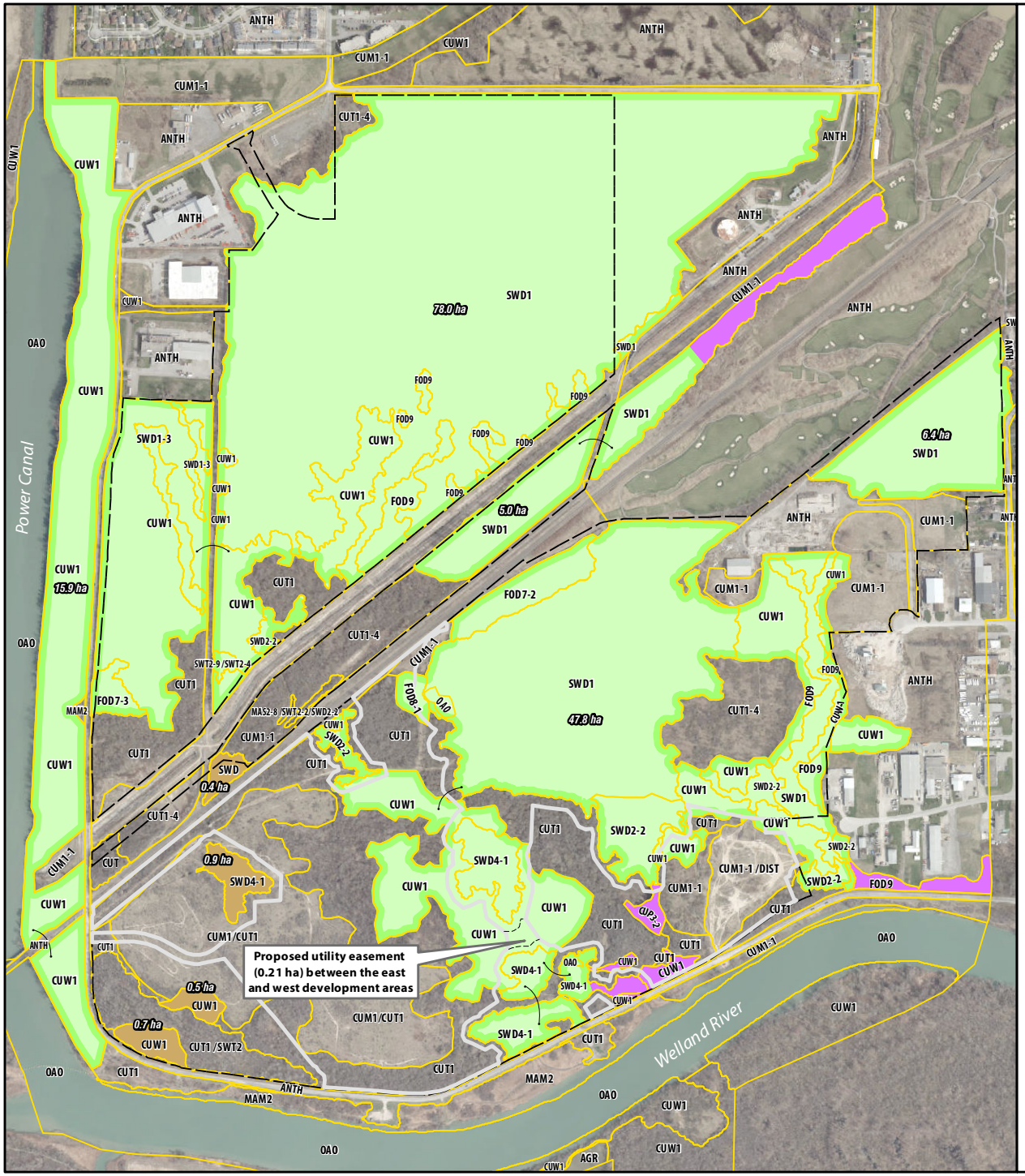

Study Area

Riverfront Residential

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Significant Woodland (Niagara Region Official Plan, 2014 and NHRM, 2010)

Non-significant Treed Patch (size criteria not met)

Non-significant Treed Patch (<40m av. width)

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

Figure 3
Significant Woodlands

0 100 Meters

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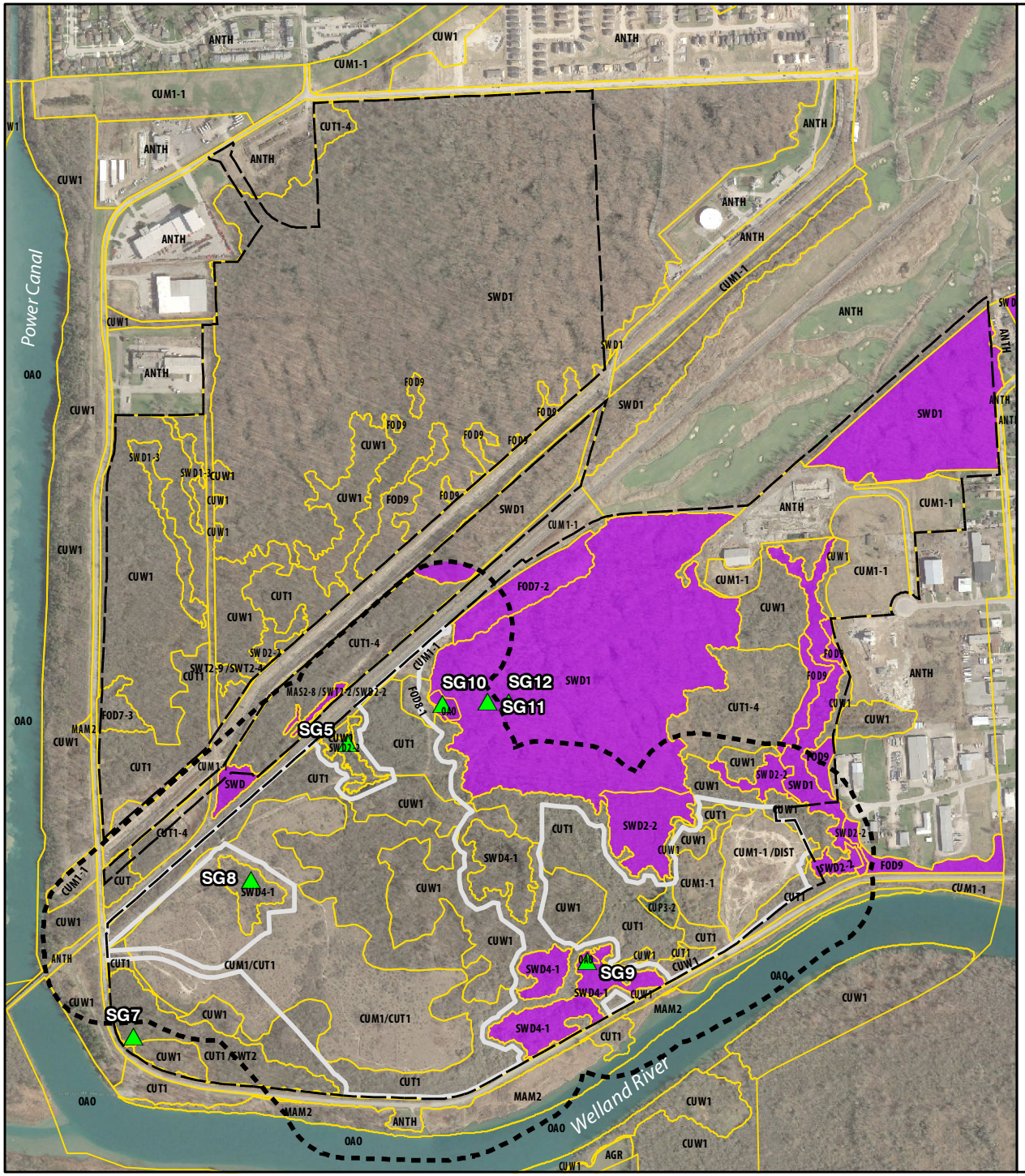

Study Area
Riverfront Residential
Adjacent Lands (120 m from Riverfront Residential)
Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)
Woodland Amphibian Breeding Significant Wildlife Habitat
Staff Gauge Locations

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

SIGNIFICANT WILDLIFE HABITAT

Figure 4a
Amphibian Breeding Habitat (Woodland)

0 100 Meters

N

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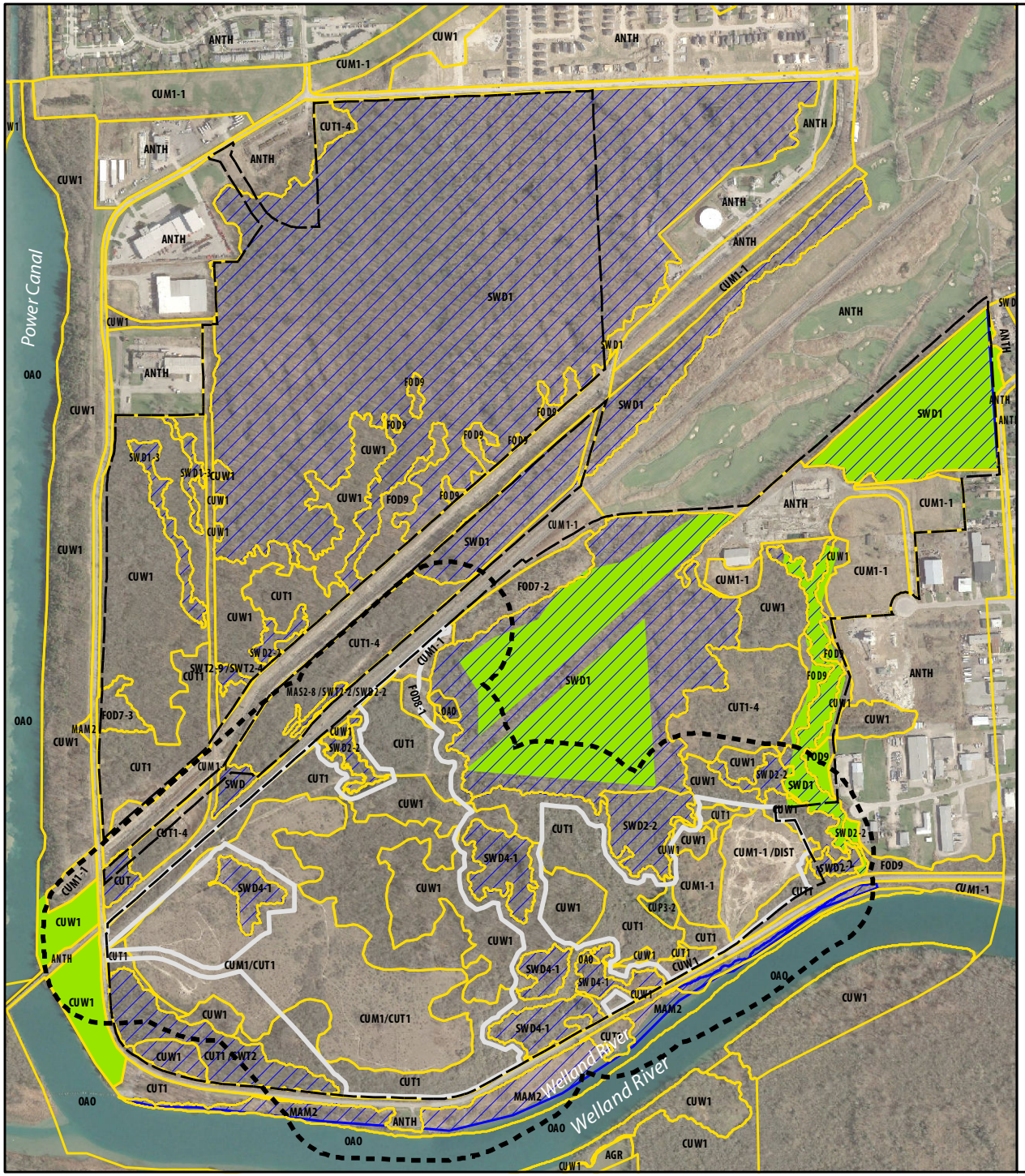
Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2018 11 17 EIS report figures\Figure 4a SWH Amphibian Breeding Habitat (Woodland).mxd REVISED: November 23, 2018



Study Area

Riverfront Residential

Adjacent Lands (120 m from Riverfront Residential)

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Provincially Significant Wetland (MNRF)

Rare Vegetation Communities (Older growth forest polygons)

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

SIGNIFICANT WILDLIFE HABITAT

Figure 4b
Rare Vegetation Communities

0 100 Meters

N

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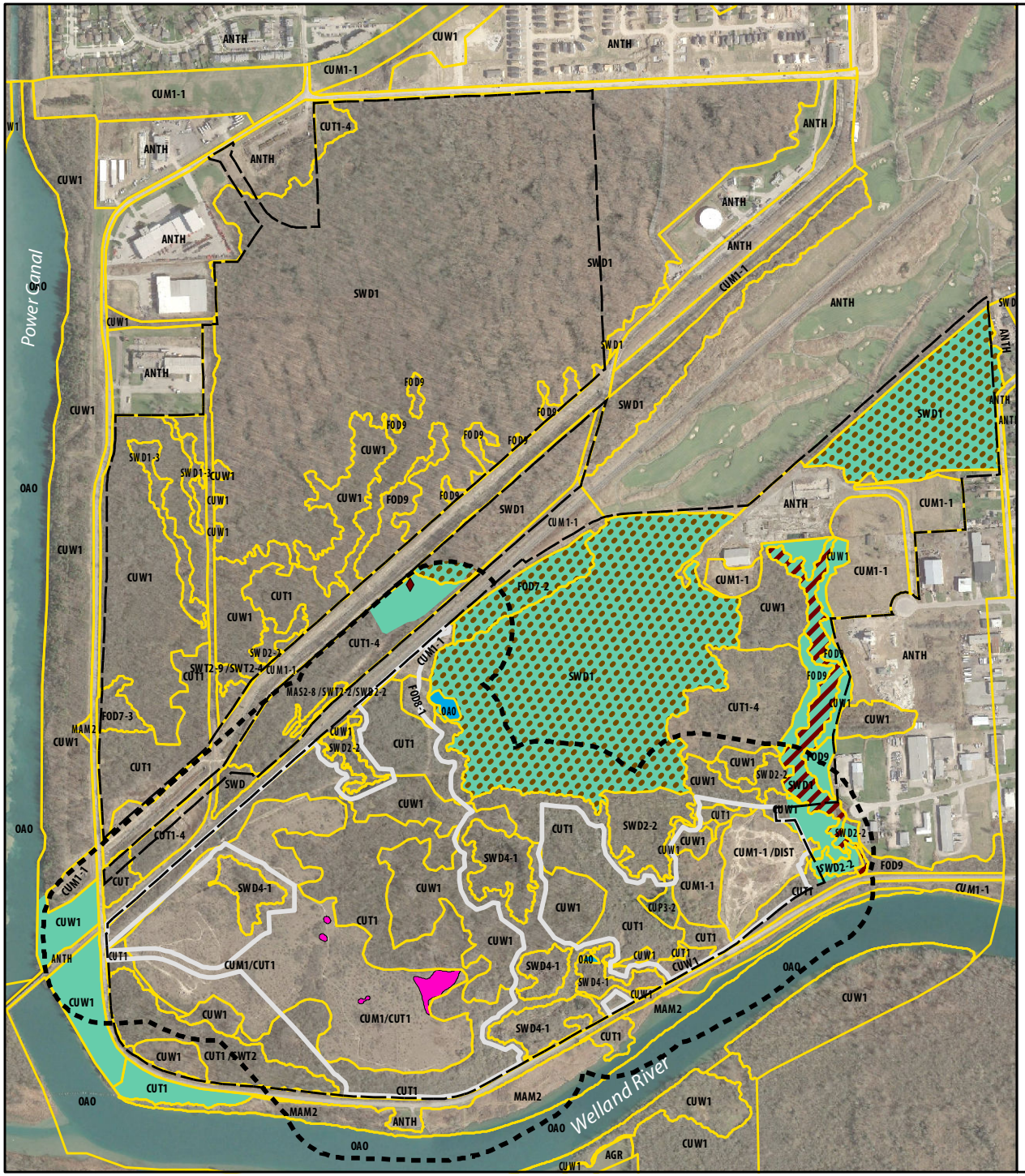

Study Area

Riverfront Residential

Adjacent Lands (120 m from Riverfront Residential

Ecological Land Classification (updated area within/adjacent to Riverfront Residential, Savanta 2018)

Provincially Rare Plant Locations (specimens) Outisde SWH Polygons

Gleditsia triacanthos (Honey-locust)

Rare Species SWH Polygons

Great Plains Ladies'-tresses (concentrations)

Honey-locust

Schreber's Aster

Snapping Turtle

Wood Thrush and Eastern Wood-Pewee

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

SIGNIFICANT WILDLIFE HABITAT

Figure 4c
Rare Species

0 100 Meters

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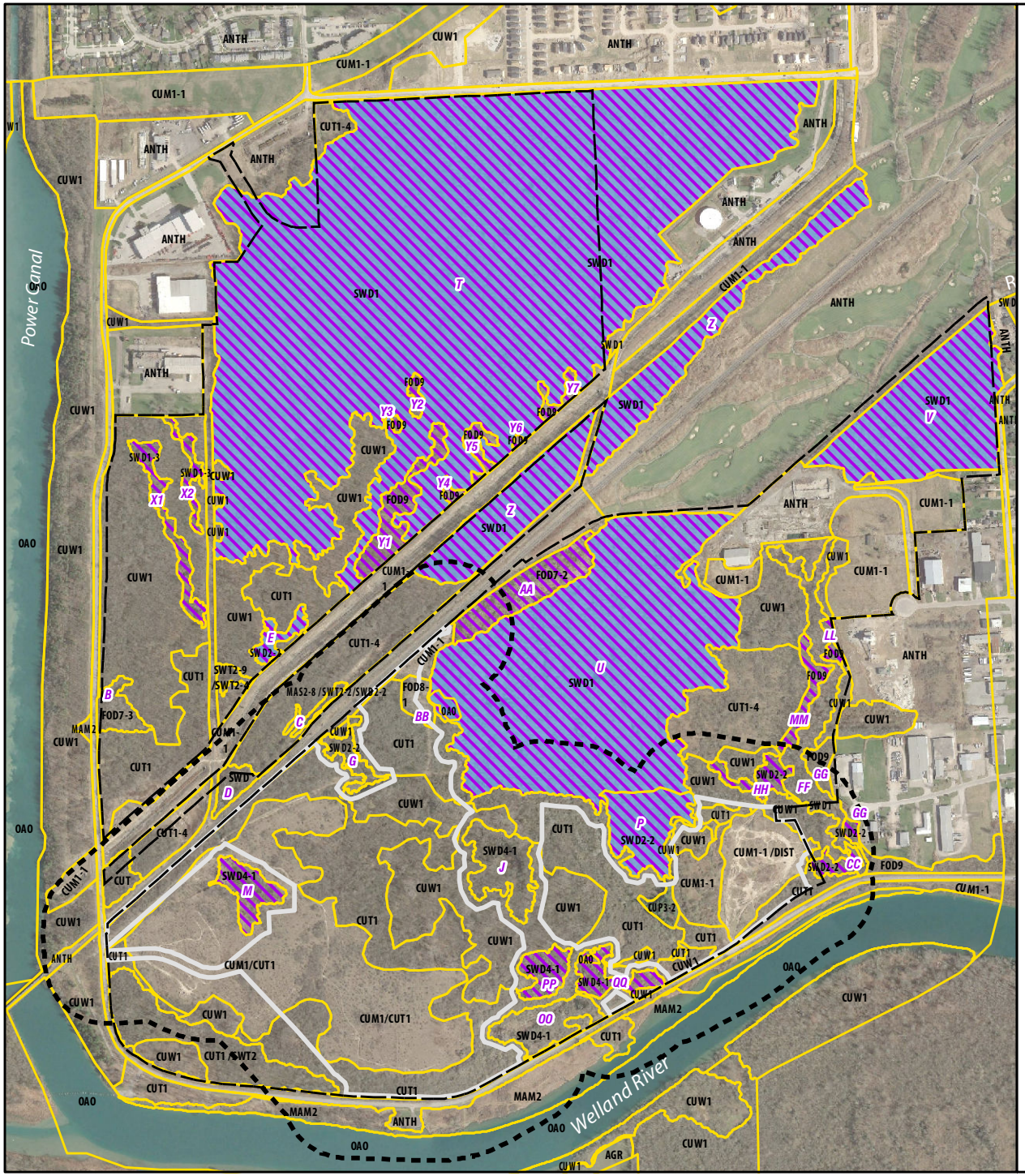

Study Area

Riverfront Residential

Adjacent Lands (120 m from Riverfront Residential)

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Candidate Bat Significant Wildlife Habitat Polygon for Assessment

Confirmed Bat Maternity Significant Wildlife Habitat

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

SIGNIFICANT WILDLIFE HABITAT

Figure 4d
Bat Maternity Colony

0 100 Meters

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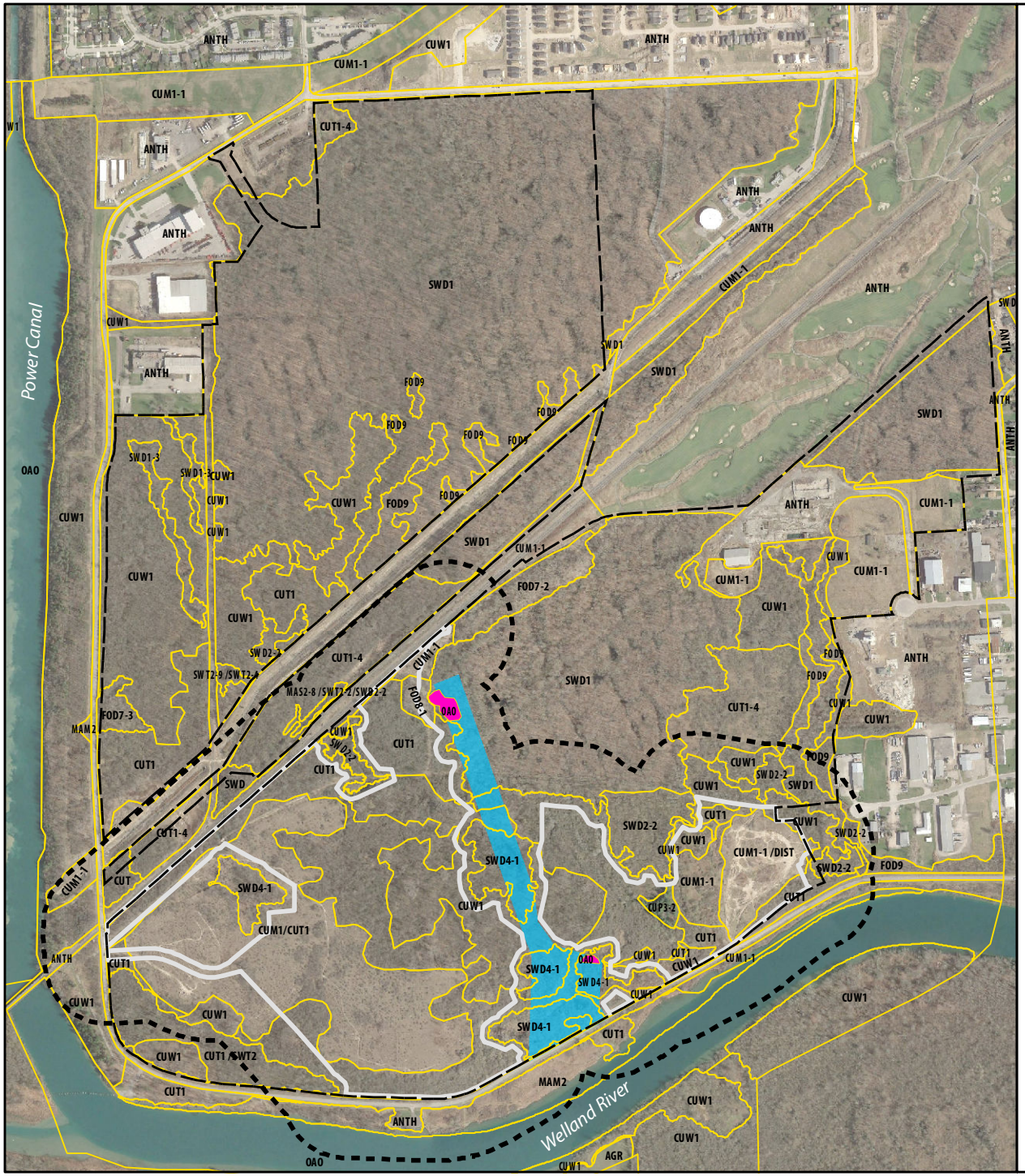

Study Area

Riverfront Residential

Adjacent Lands (120 m from Riverfront Residential)

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Wetland Amphibian Breeding Significant Wildlife Habitat and Turtle Overwintering Significant Wildlife Habitat

Amphibian Movement Corridor Significant Wildlife Habitat

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

SIGNIFICANT WILDLIFE HABITAT

Figure 4e Amphibian Breeding (Wetland), Turtle Overwintering, and Amphibian Movement Corridor

0 100 Meters

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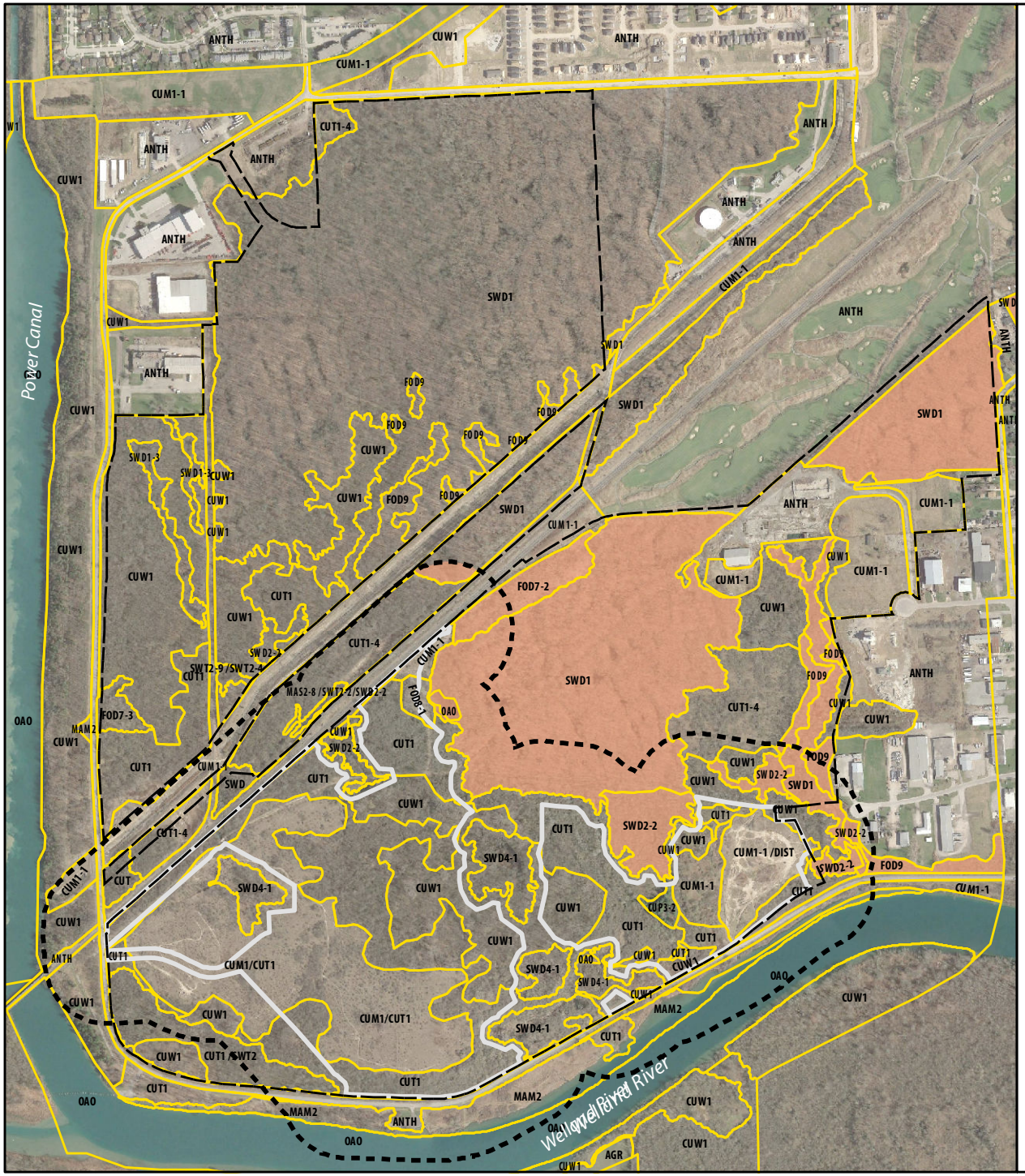
Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2018 11 17 EIS report figures\Figure 4e SWH AmphibBrdng (Wetland) Trt Ovrwntr and AmphibMvmntCorridor.mxd REVISED: November 23, 2018



Study Area

Riverfront Residential

Adjacent Lands (120 m from Riverfront Residential)

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Deer Winter Congregation Areas

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

SIGNIFICANT WILDLIFE HABITAT

Figure 4f
Deer Winter Congregation Areas

0 100 Meters

N

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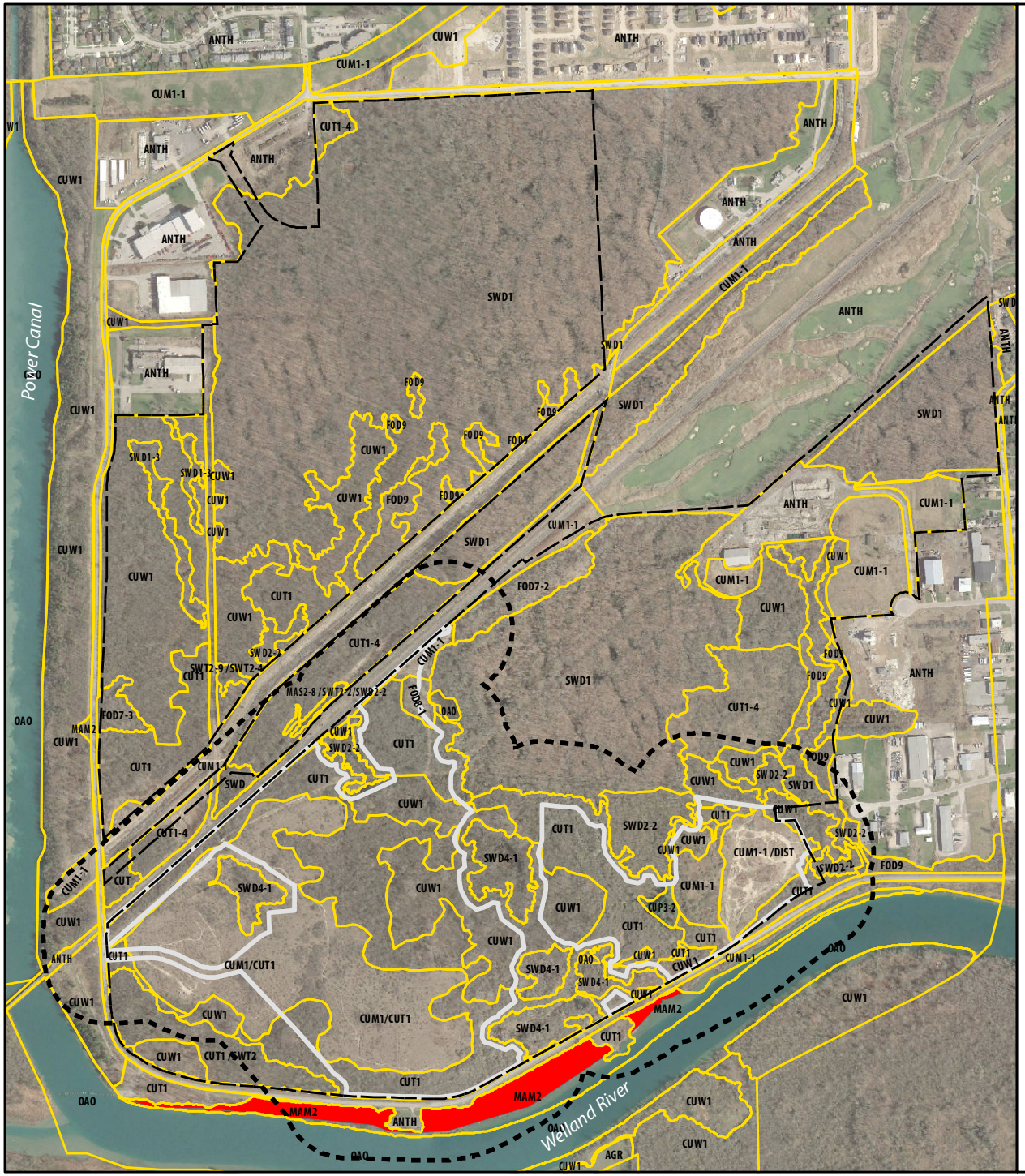

Study Area

Riverfront Residential

Adjacent Lands (120 m from Riverfront Residential)

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Candidate Turtle Nesting Area

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

SIGNIFICANT WILDLIFE HABITAT

Figure 4g
Turtle Nesting Areas

0 100 Meters

N

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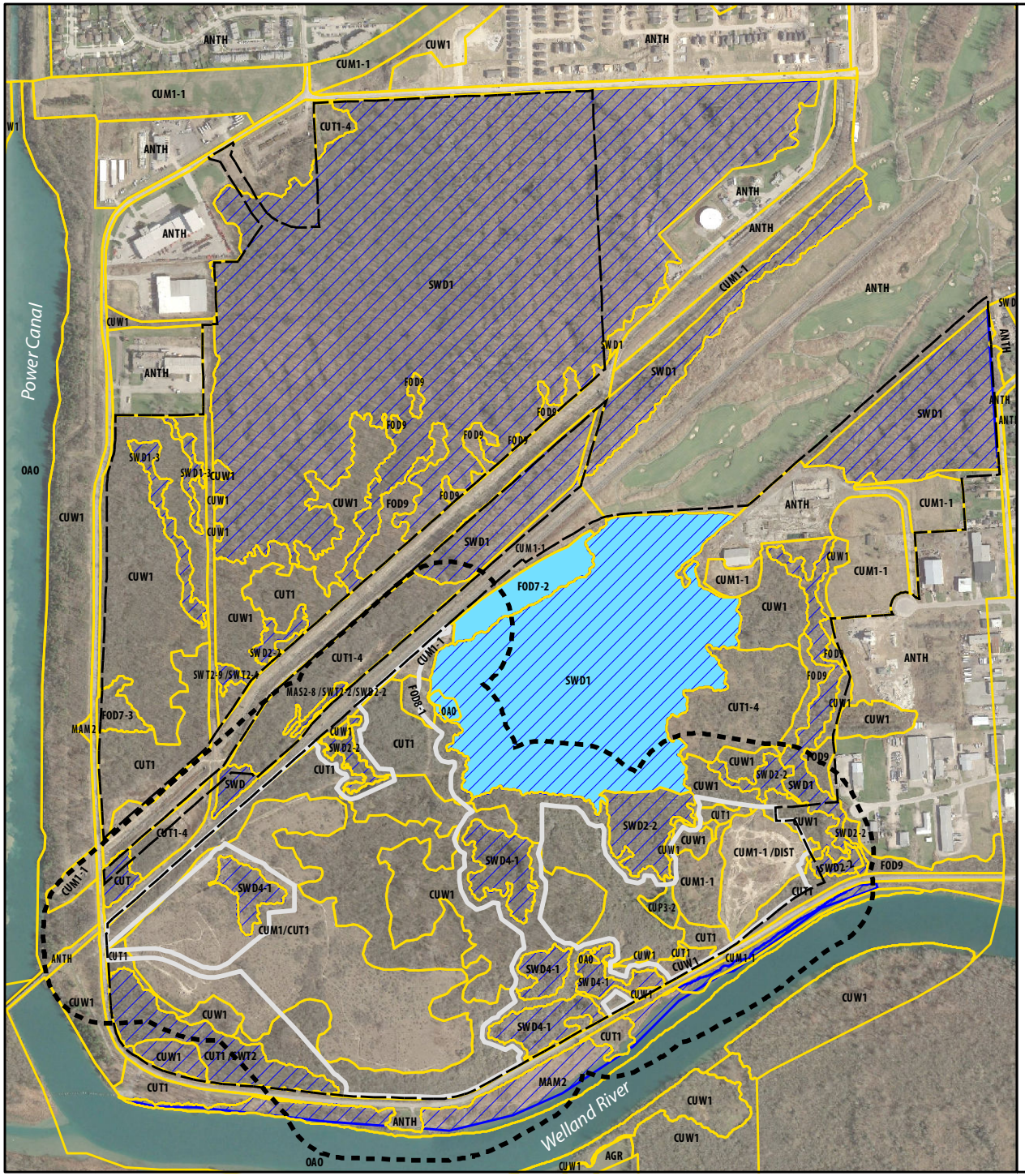

Study Area

Riverfront Residential

Adjacent Lands (120 m from Riverfront Residential)

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Provincially Significant Wetland (MNRF)

Woodland Area-Sensitive Bird Breeding Habitat

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

SIGNIFICANT WILDLIFE HABITAT

Figure 4h Woodland Area - Sensitive Bird Breeding Habitat

0 100 Meters

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Study Area

Riverfront Residential

Adjacent Lands (120 m from Riverfront Residential)

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Reptile Hibernacula

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
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SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

SIGNIFICANT WILDLIFE HABITAT

Figure 4i
Snake Hibernacula

0 100 Meters

N

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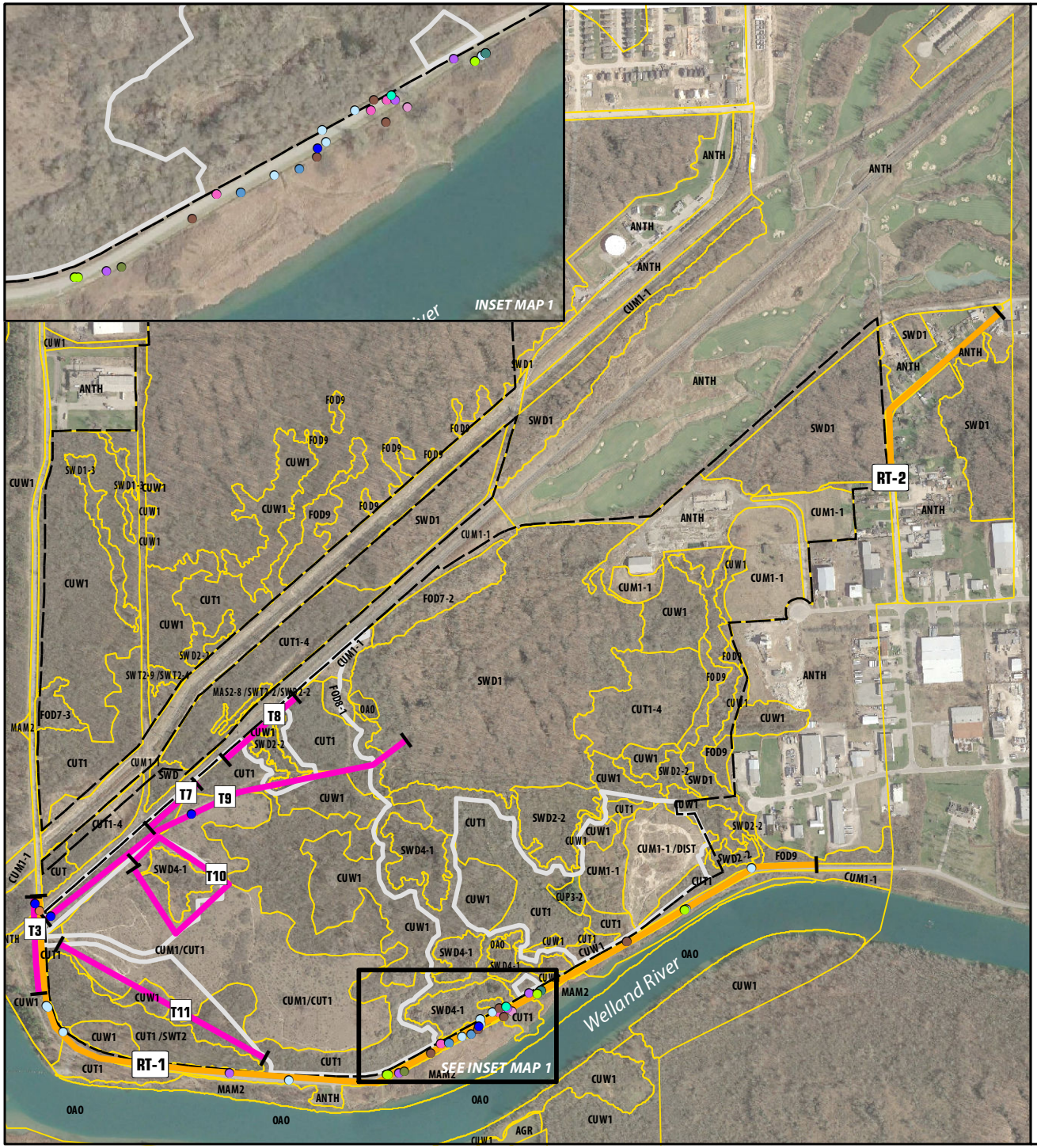

GR(Can) Land Holdings

Riverfront Residential

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Wildlife Road-Crossing Transect

Salamander Movement Transect

SPECIES

- American Goldfinch
- American Toad
- Blue-spotted Salamander
- Bullfrog
- Dekay's Brownsnake
- Eastern Gartersnake
- Green Frog
- Midland Painted Turtle
- Northern Leopard Frog
- Unidentified Snake Species
- Unidentified Bird Species
- Unidentified Frog Species
- Western Chorus Frog

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

Figure 5
Wildlife Movement Survey Results (2017, 2018)

0 100 Meters

N

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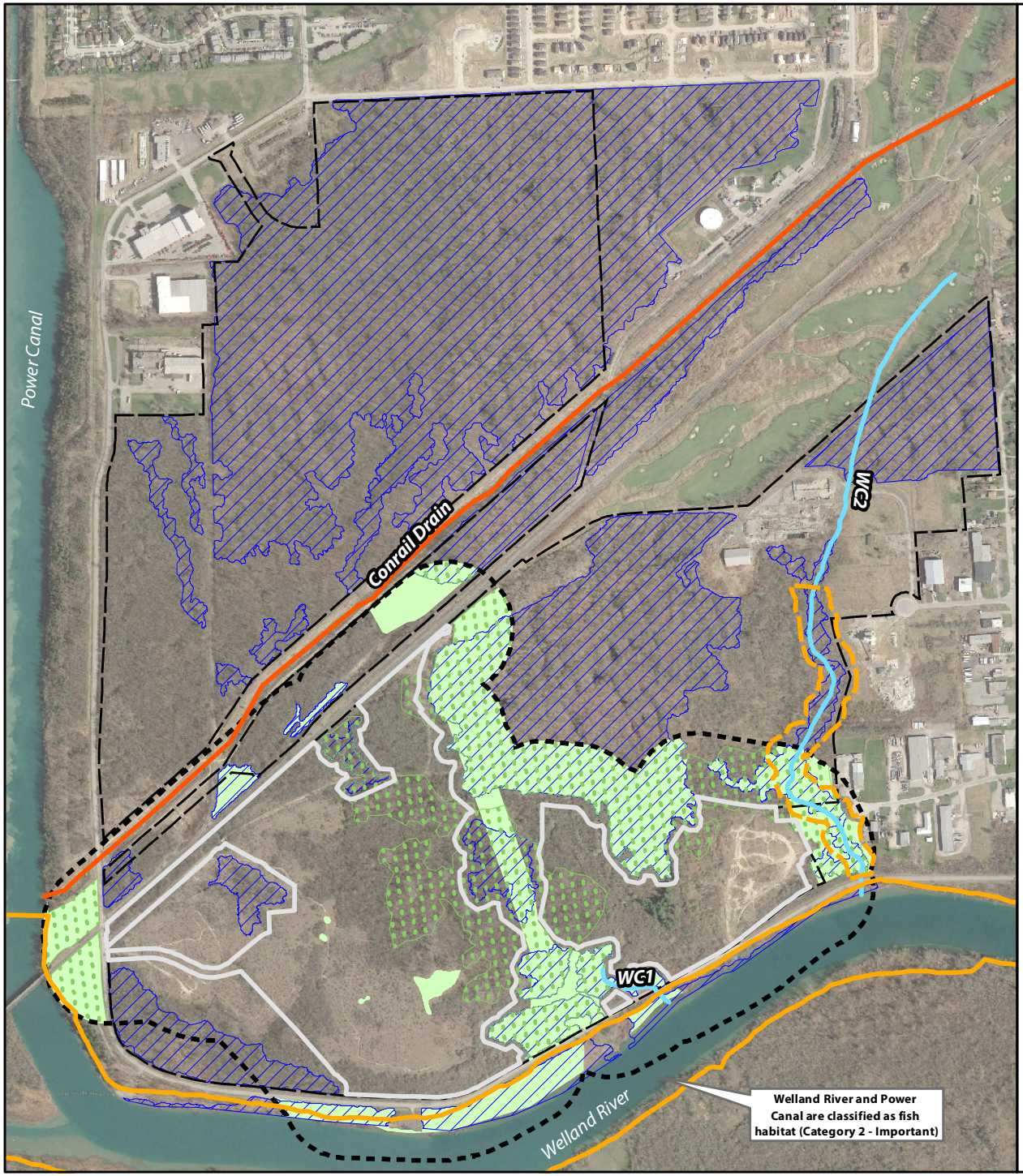

Study Area
Adjacent Lands (120 m from Riverfront Residential)
Riverfront Residential
Fish Habitat (Category 2 - Important)
Fish Habitat (Category 3 - Marginal)
Significant Woodland
Provincially Significant Wetland (MNRF)
Candidate Significant Valleyland
Significant Valleyland
Significant Wildlife Habitat

Locations of endangered and threatened species are considered sensitive data that is provided only to MNRF, through the Information Gathering Form process.

Riverfront Residential Block Plan Environmental Impact Statement

Figure 6
Significant Natural Heritage Features (Per Section 2.1 of PPS, 2014)

0 100 Meters

N

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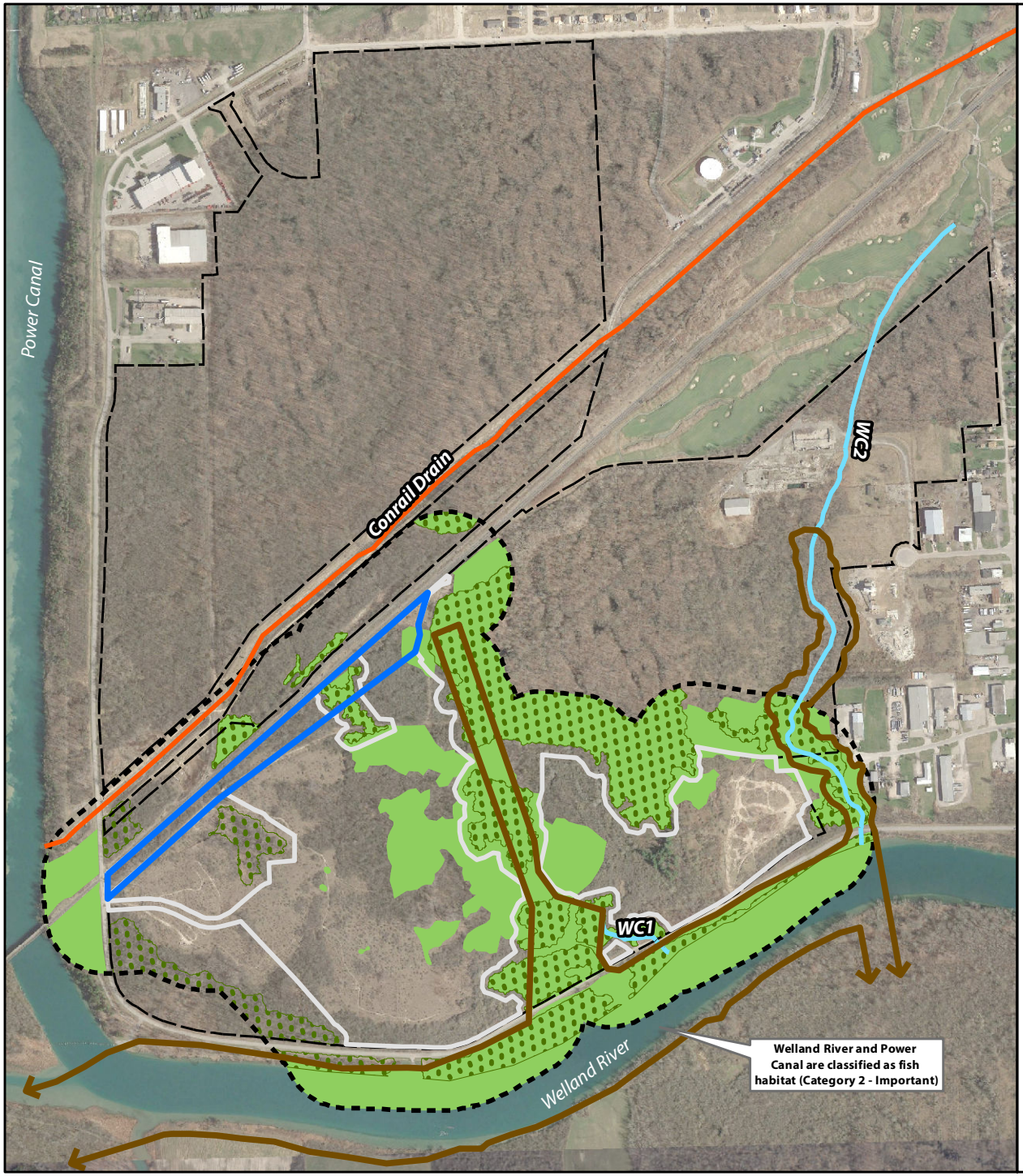

Study Area

Adjacent Lands (120 m from Riverfront Residential)

Riverfront Residential

Environmental Conservation Area (includes Significant Woodlands, SWH and Significant Valleylands - refer to Figure 9 for details)

Environmental Protection Area (includes PSWs - refer to Figure 9 for details)

Fish Habitat (Category 2 - Important)

Fish Habitat (Category 3 - Marginal)

Potential Natural Heritage Corridors

Anthropogenic Linkage Corridor (Open Space Designation)

Note: Species at Risk habitat is also included under the Region's EPA designation. SAR habitat polygon locations are considered sensitive data that is shared with MNRF through the Information Gathering Form process. Locations are not mapped in this EIS.

Riverfront Residential Block Plan Environmental Impact Statement

Figure 7
Niagara Region Core Natural Heritage System Features

0 100 Meters

N

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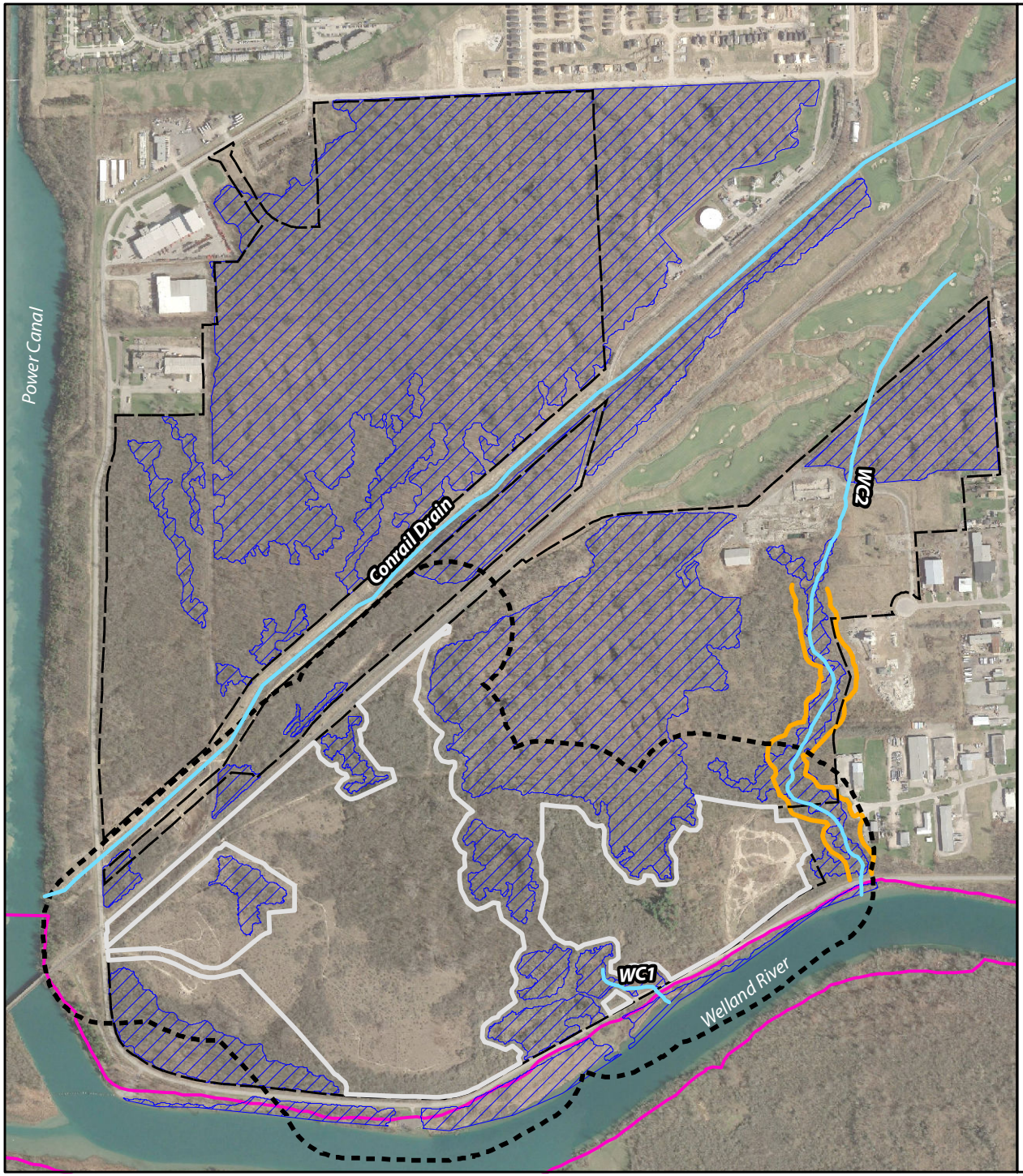

Study Area
Adjacent Lands (120 m from Riverfront Residential)
Riverfront Residential
Provincially Significant Wetland (MNRF)
Regional Floodplain (NPCA)
Valley Top of Slope (NPCA)
Watercourse

Riverfront Residential Block Plan Environmental Impact Statement

Figure 8
NPCA Regulated Features

0 100 Meters

N

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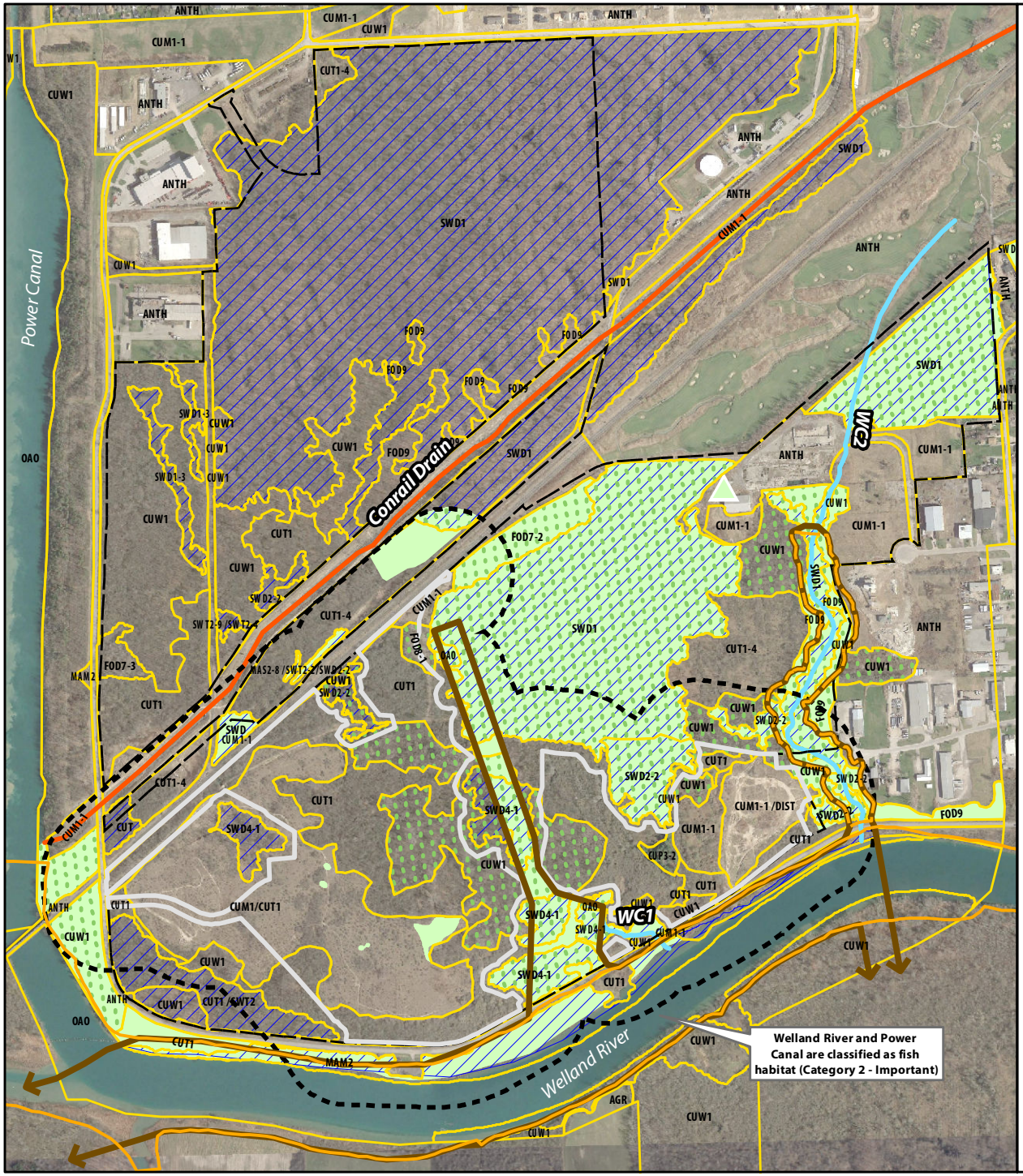

Study Area

Adjacent Lands (120 m from Riverfront Residential)

Riverfront Residential

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Significant Woodland (Niagara Region Official Plan, 2014 and NHRM, 2010)

Provincially Significant Wetland (MNRF)

Significant Valleyland

Candidate Significant Valleyland

Fish Habitat (Category 2 - Important)

Fish Habitat (Category 3 - Marginal)

Potential Natural Heritage Corridors

Significant Wildlife Habitat (MNRF)

- Bat Maternity Colonies SWH
- Woodland Area-Sensitive Breeding Bird SWH
- Woodland Breeding Amphibian SWH
- Amphibian Movement Corridor SWH
- Wetland Breeding Amphibian SWH
- Turtle Overwintering SWH
- Turtle Nesting SWH
- Snake Hibernacula SWH
- Deer Wintering SWH
- Rare Vegetation Community (including Older Growth Woodland) SWH
- Rare Species SWH (Eastern Wood-Pewee, Wood Thrush, Snapping Turtle, Schreber's Aster, Honey-locust, Great Plains Ladies' - tresses)

Riverfront Residential Block Plan Environmental Impact Statement

Figure 9
Natural Heritage Feature Summary

0 100 Meters

N

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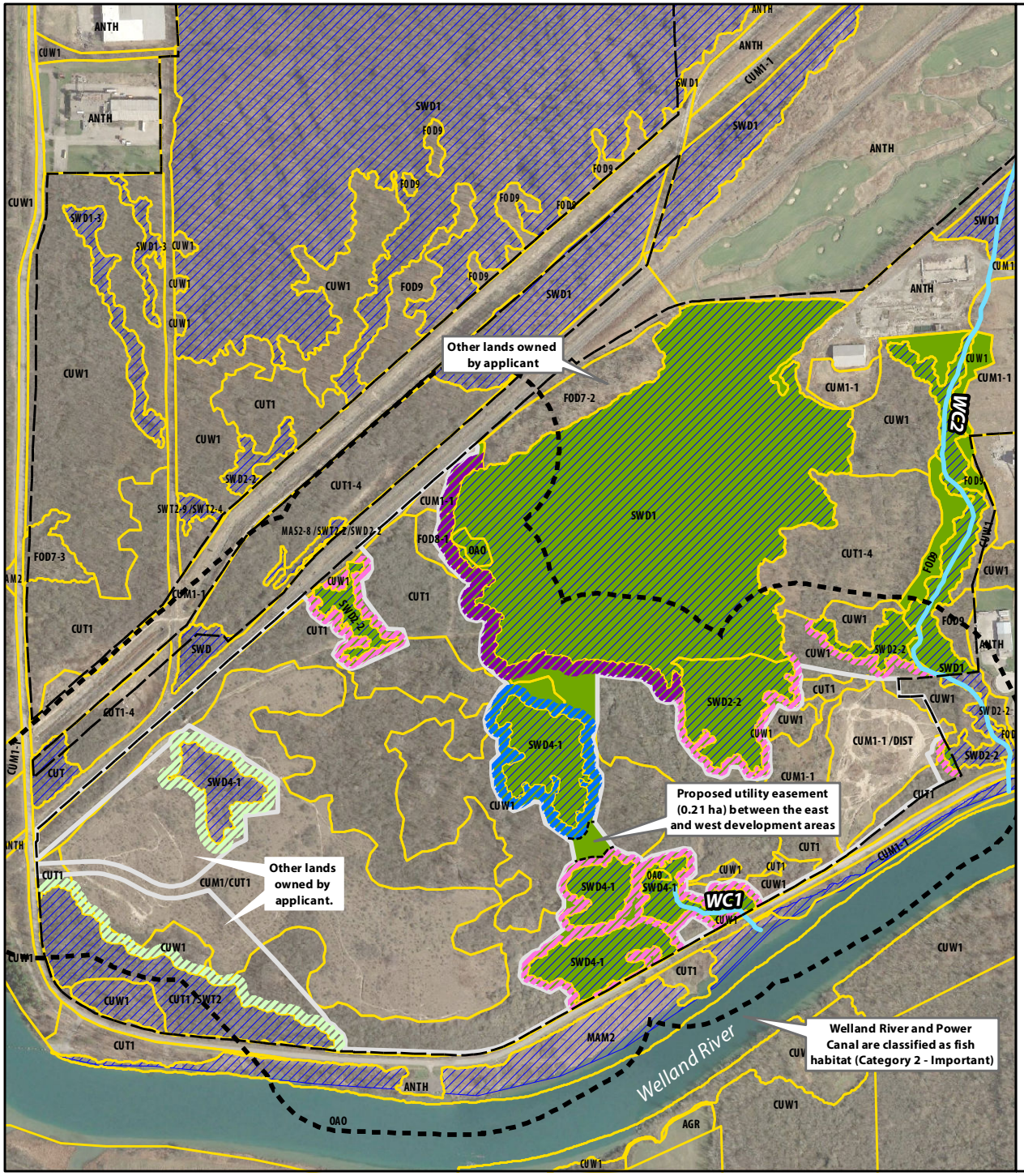
Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2018 11 17 EIS report figures\Figure 9 Natural Heritage Feature Summary.mxd REVISED: November 23, 2018



Study Area
Riverfront Residential
Adjacent Lands (120 m from Riverfront Residential)
Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)
Provincially Significant Wetland (MNRF)
Fish Habitat (Category 2 - Important)
Riverfront Residential Natural Heritage System
10 m Buffer
15 m Buffer
20 m Buffer
Other Lands Owned by Applicant - Outside OPA 128
15 m Buffer

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

Figure 10
Natural Heritage System and Buffers

0 100 Meters

N

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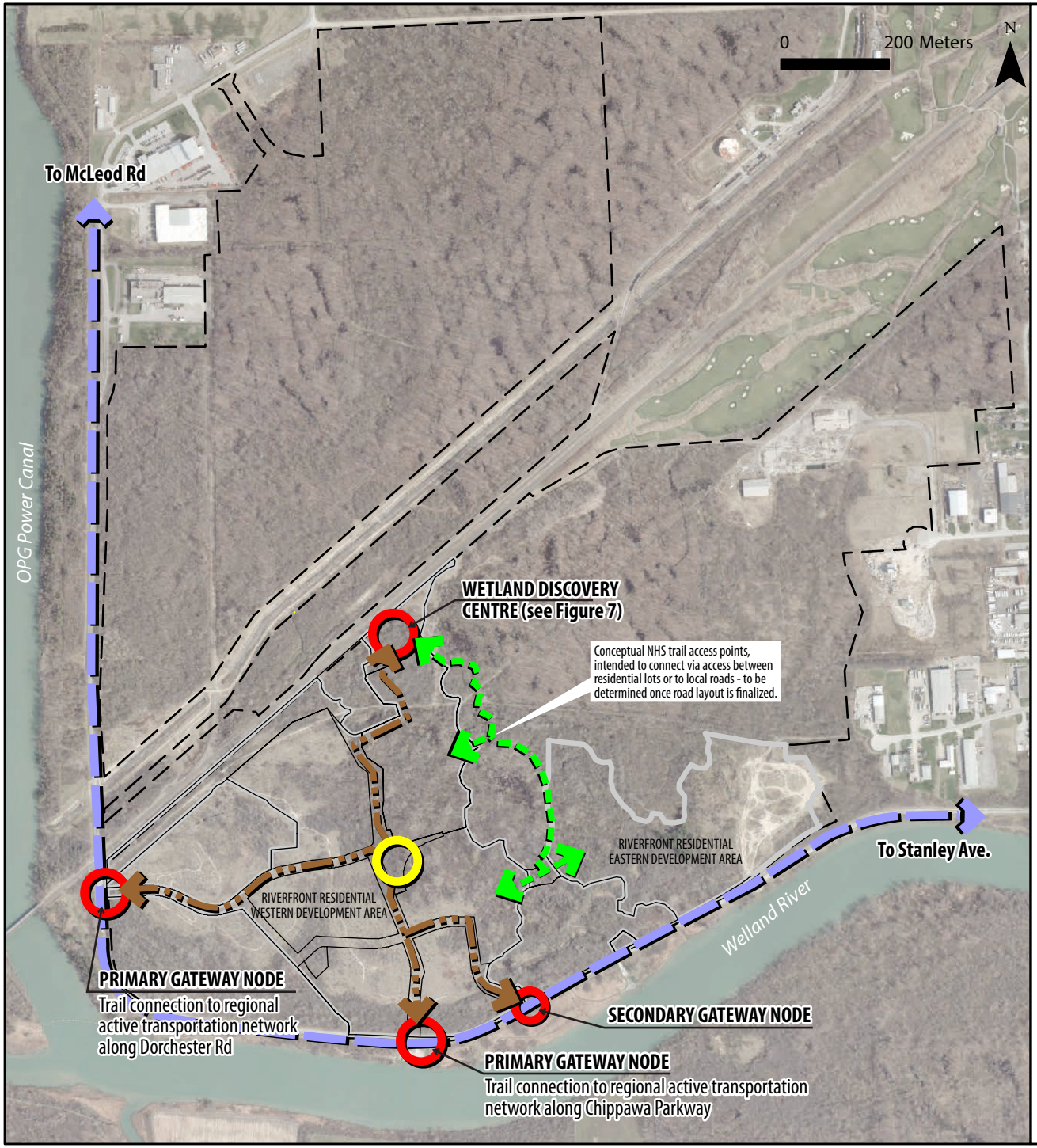
Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2018 11 17 EIS report figures\Figure 10 Natural Heritage System and Buffers.mxd REVISED: November 25, 2018



- Roadway Sidewalk/Trail
- Off-Road NHS Trail (raised boardwalk with railings)
- Primary Regional Access Road
- Destination and Connection
- Proposed Community Open Space
- Riverfront Residential Area
- GR(Can) Land Holdings

Riverfront Residential Block Plan Environmental Impact Statement

Figure 11
Conceptual Trail Plan and Connections

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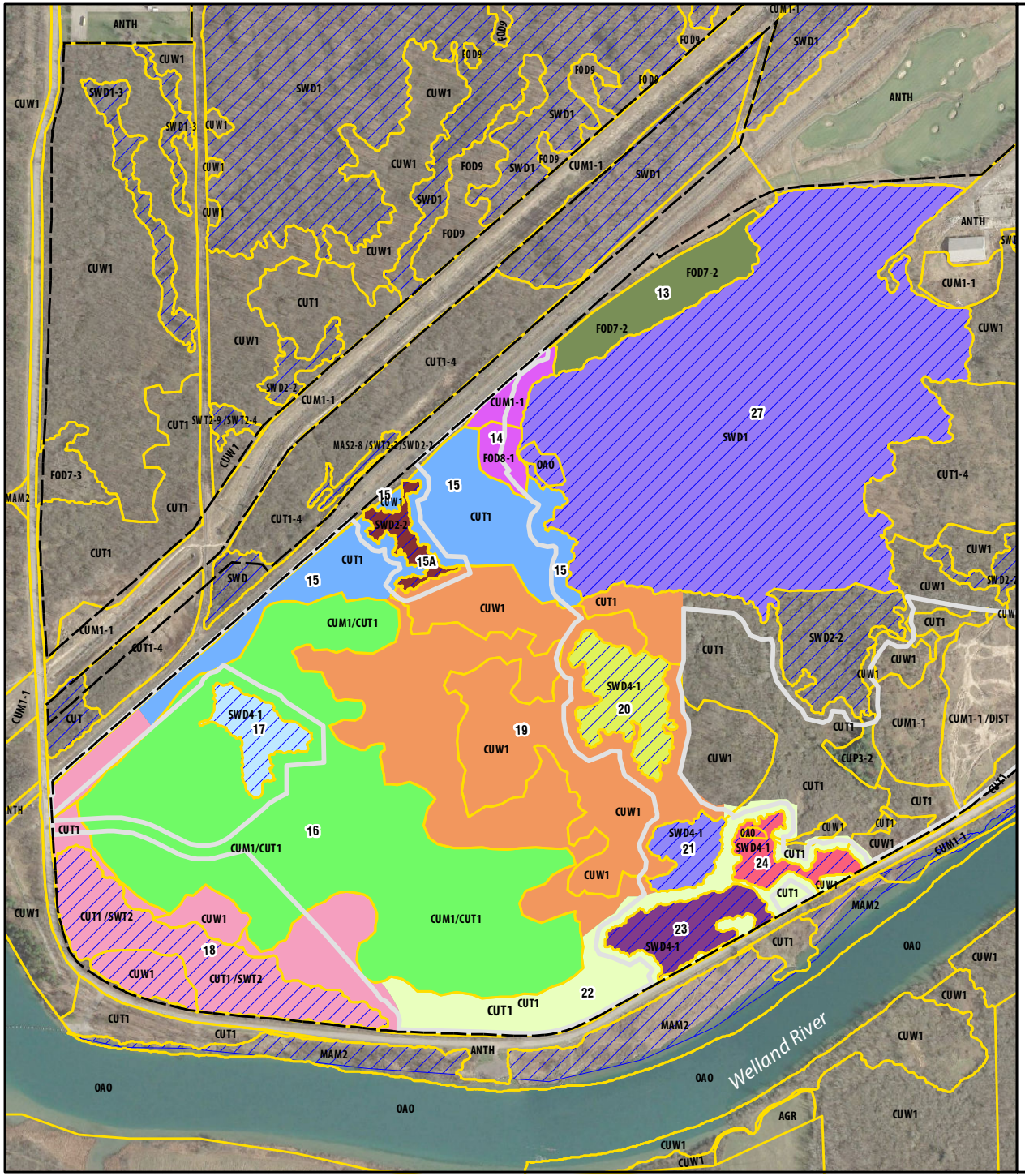
S:\9024 - SAV 7602 Riverfront Community\corel\2018 11 16 report figures\Figure 11 Conceptual Trail Plan and Connections.cdr REVISED: November 22, 2018



Study Area

Riverfront Residential

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Provincially Significant Wetland (MNRF)

19 ELC Polygon # (Dougan & Associates 2016 EIS)

The coloured polygons refer to the ELC unit numbers utilized in the 2016 EIS (Dougan & Associates). The individual colours do not represent interpretation, the colours serve to clearly depict where the Dougan & Associates ELC units occur. These polygon unit numbers are referenced in Tables 8 and 9 (Appendix B).

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

Figure 12
West Development Area Flora/Fauna Sensitivity Analysis ELC Polygons

0 100 Meters

N

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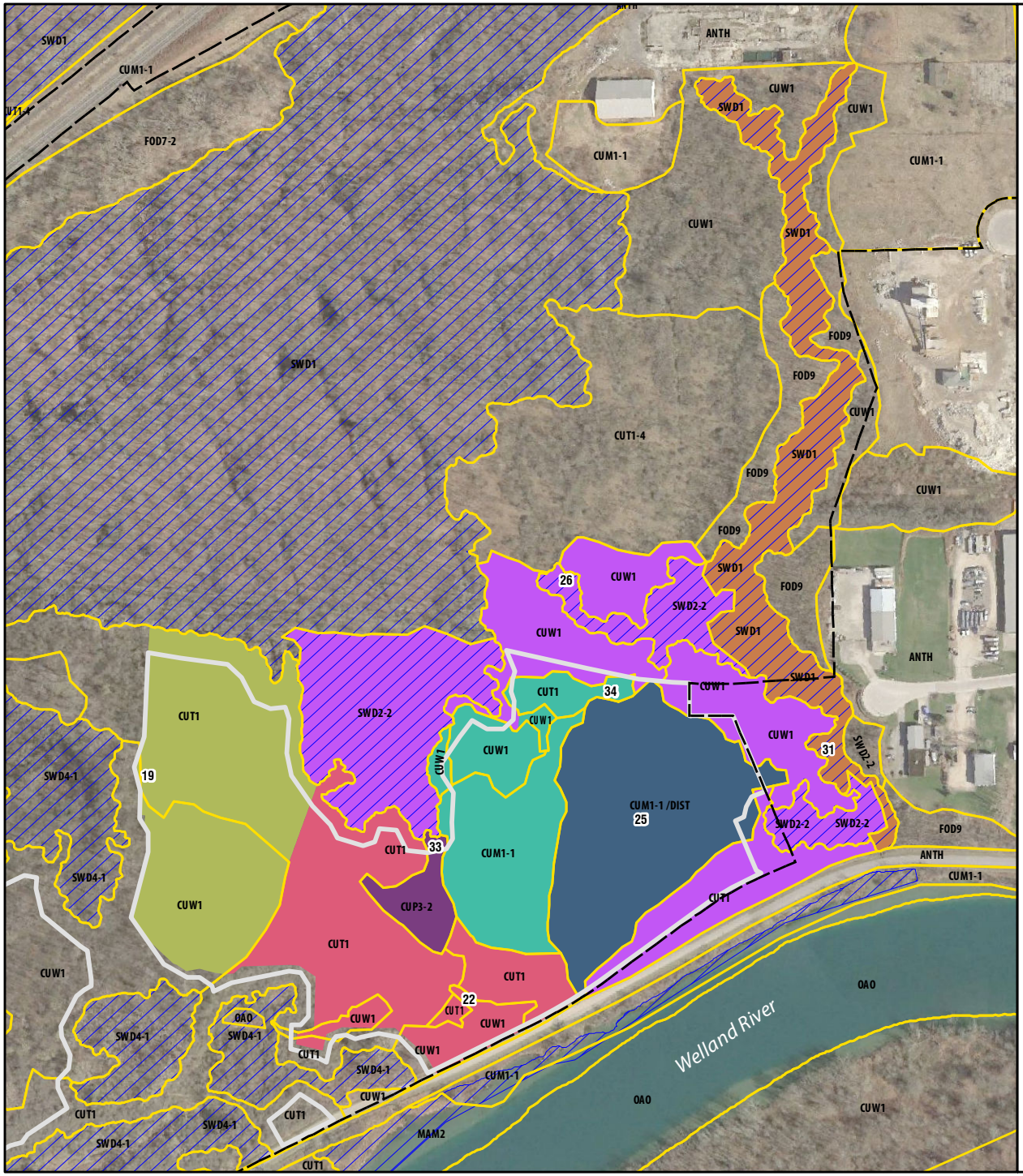
Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2018 11 17 EIS report figures\Figure 12 West Development Area Flora Fauna Sensitivity Analysis ELC Polygons.mxd REVISED: November 27, 2018



Study Area

Riverfront Residential

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Provincially Significant Wetland (MNRF)

26 ELC Polygon # (Dougan & Associates 2016 EIS)

The coloured polygons refer to the ELC unit numbers utilized in the 2016 EIS (Dougan & Associates). The individual colours do not represent interpretation, the colours serve to clearly depict where the Dougan & Associates ELC units occur. These polygon unit numbers are referenced in Tables 8 and 9 (Appendix B).

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

Figure 13
East Development Area Flora/Fauna Sensitivity Analysis ELC Polygons

0 100 Meters N

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Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2018 11 17 EIS report figures\Figure 13 East Development Area Flora Fauna Sensitivity Analysis ELC Polygons.mxd REVISED: November 27, 2018

Appendix B – Tables

Table 1: Savanta Field Studies (April 2017 – November 2018)

FIELD DATE	NATURE OF INVESTIGATION	SURVEYOR
2017		
April 28 May 10, 15, 19, 23, 28	• Wildlife road crossing surveys	R. Lee
October 10	• Wildlife road crossing surveys	L. Williamson M. Green
November 7, 8, 9	• Bat habitat assessment surveys	L. Williamson J. Leslie
2018		
January 8, 11, 12, 15, 16 February 5	• Bat habitat assessment surveys	L. Williamson M. Green O. Park
May 31 June 5, 12,19 July 9	• Bat acoustic monitor deployment (May 31) and monitor rotation dates	L. Williamson M. Green R. Rossi R. Lee
June 22	• Bat acoustic monitor retrieval	L. Williamson M. Green
July 20	• Bat acoustic monitor retrieval	L. Williamson M. Green R. Rossi A. Smith
June 8, 14	• Woodlot Canopy Cover / Stem Density Surveys • Ecological Land Classification Update Surveys	J. Leslie A. Smith
July 3	• Wetland Feature Surveys	C. Zoladeski
July 12	• Staff Gauge Installation	R. Lee R. Rossi A. Smith
July 18	• Soil Core Sampling	O. Park R. Rossi A. Smith
August 2	• Woodlot Canopy Cover / Stem Density Surveys • Ecological Land Classification Update Surveys • Installation and Monitoring of Staff Gauges	J. Leslie
August 3	• Wetland and Restoration Area Surveys	C. Zoladeski

FIELD DATE	NATURE OF INVESTIGATION	SURVEYOR
August 9	• Staff Gauge Installation • Soil Core Sampling	L. Williamson M. Green
August 10	• Soil Core Sampling	L. Williamson M. Green
August 27	• Staff Gauge Monitoring • Turtle hatchling survey and turtle nesting suitability observations (City lands south of Chippawa Parkway)	L. Williamson M. Green
September 7	• Staff Gauge Monitoring • Milkweed Abundance Survey	L. Williamson P. Burke
September 14	• Milkweed Abundance Survey • Turtle hatchling survey and turtle nesting suitability observations (City lands south of Chippawa Parkway) • Wildlife road crossing survey	L. Williamson
September 17	• Rare plant survey (Honey-locust and Great Plains Ladies'-tresses)	C. Zoladeski
September 21	• Rare Plant Survey (Great Plains Ladies'-tresses)	O. Park
September 21	• Staff Gauge Monitoring • Milkweed Abundance Survey	L. Williamson
October 11	• Staff Gauge Monitoring	L. Williamson
October 25	• Staff Gauge Monitoring	L. Williamson
November 9	• Staff Gauge Monitoring	L. Williamson
November 22	• Staff Gauge Monitoring	L. Williamson

Table 2: Significant Wildlife Habitat Assessment Ecoregion 7E – Summary Table

Significant Wildlife Habitat (SWH) Type	ELC Ecosite(s) Present	Habitat Criteria Met	Targeted Field Studies Completed	Wildlife Species Present	SWH Type Present within the Riverfront Residential proposed development areas	SWH Type Present within the Riverfront Residential proposed NHS
1. Seasonal Concentration Areas						
a) Waterfowl Stopover and Staging Areas (terrestrial)	Yes – CUM and CUT vegetation communities present	No[1] – eligible vegetation communities present on the Subject Lands are not subject to annual spring flooding from melt water or runoff	No	N/A	No	No
b) Waterfowl Stopover and Staging Areas (aquatic)	No	No	No	N/A	No	No
c) Shorebird Migratory Stopover Areas	No	No	No	N/A	No	No
d) Raptor Wintering Areas	No – upland forest communities are small and consist primarily of inclusions within swamps	No	Yes[2]	Yes – One Sharp-shinned Hawk recorded flying over the study area but no breeding evidence (i.e., this individual is considered a non-breeder, fly-over or migrant)	No	No
e) Bat Hibernacula	No – cave ecosites are absent from the Subject Lands	N/A	N/A	N/A	No	No
f) Bat Maternity Colonies	Yes	Yes – as determined through bat habitat assess-ment surveys	Yes[4]	Yes	No	Yes – this SWH layer is shown on **Figure 4d** (**Appendix A**)
g) Turtle Wintering Areas	Yes – two open aquatic features are present within swamp communities	Yes	Yes[2, 3]	Yes	No	Yes – this SWH layer is shown on **Figure 4e** (**Appendix A**)
h) Reptile Hibernacula	Yes	Probable – depth of identified potential hiber-nacula (i.e. below frost line) could not be confirmed	Yes[2, 3]	Yes	No	The only reptile hibernacula identified south of the railway on the Subject Lands is associated with an anthropogenic structure well north of the proposed development area; this SWH layer is shown on **Figure 4i** (**Appendix A**)
i) Colonial Bird Nesting Sites (bank/cliff)	No	N/A	N/A	N/A	No	No

Significant Wildlife Habitat (SWH) Type	ELC Ecosite(s) Present	Habitat Criteria Met	Targeted Field Studies Completed	Wildlife Species Present	SWH Type Present within the Riverfront Residential proposed development areas	SWH Type Present within the Riverfront Residential proposed NHS
j) Colonial Bird Nesting Sites (tree/shrub)	Yes – SWD1 present	Yes	Yes[1]	No	No	No
k) Colonial Bird Nesting Sites (ground)	No – rocky peninsula habitat types absent; CUT present in proximity to Welland River but no Brewer's Blackbird recorded during site surveys or in the OBBA	No	Yes[1]	No	No	No
l) Migratory Butterfly Stopover Areas	Yes	No – Subject Lands are > 5km from Lake Ontario and Lake Erie	N/A	N/A	No	
m) Landbird Migratory Stopover Areas	Yes	No – Subject Lands are > 5km from Lake Ontario and Lake Erie	N/A	N/A	No	
n) Deer Winter Congregation Areas	Yes - as identified by MNRF	Yes	N/A – habitat was identified by MNRF and refined by Savanta (in dialogue with MNRF) to match suitable ELC types on the Subject Lands	Yes	Yes – this SWH layer is shown on **Figure 4f** (**Appendix A**)	
2a) Rare Vegetation Communities						
o) Rare Vegetation Types (cliffs, talus slopes, sand barrens, alvars, old-growth forests, savannahs, and tallgrass prairies)	Yes – older growth forests present	Yes	Yes[1]	Yes	No	Yes – rare vegetation SWH is shown on **Figure 4b** (**Appendix A**)
p) Other Rare Vegetation Types (S1-S3)	Yes	Yes	Yes[1, 4]	Yes	No	Yes – rare vegetation SWH is shown on **Figure 4b** (**Appendix A**)
2b) Specialized Wildlife Habitat						
q) Waterfowl Nesting Area	Yes	Yes	Yes[1]	Yes – only possible breeding evidence was recorded for Mallard and Wood Duck	No – minimum abund-ance criteria not met	No
r) Bald Eagle and Osprey Habitats	Yes	Yes	Yes[1]	No	No	No
s) Woodland Raptor Nesting Habitat	Yes	No – 200m interior habitat is less than 4ha in size on the Subject Lands	Yes[1, 2]	No	No	No

Significant Wildlife Habitat (SWH) Type	ELC Ecosite(s) Present	Habitat Criteria Met	Targeted Field Studies Completed	Wildlife Species Present	SWH Type Present within the Riverfront Residential proposed development areas	SWH Type Present within the Riverfront Residential proposed NHS
t) Turtle Nesting Areas	No - however MAM present off-site on City lands south of Chippawa Parkway	No – however MAM present off-site on City lands south of Chippawa Parkway	Yes[2, 3, 4]	Yes	No	No – however candidate polygon identified for this SWH type off-site to the south of Chippawa Parkway; this SWH layer is shown on **Figure 4g** (**Appendix A**)
u) Seeps and Springs	Yes - eastern tributary is within a forested area	No – no groundwater inter-action on the Subject Lands	No	N/A	No	No
v) Woodland Amphibian Breeding Habitats (within or < 120m from woodland)	Yes	Yes	Yes[1]	Yes	No	Yes – this SWH layer is shown on **Figure 4a** (**Appendix A**)
w) Wetland Amphibian Breeding Habitats (wetland >120m from woodland)	Yes – two open aquatic features present	Yes	Yes[1]	Yes	No	Yes – this SWH layer is shown on **Figure 4e** (**Appendix A**)
x) Woodland Area-Sensitive Bird Breeding Habitat	Yes	Yes	Yes[1]	Yes	No	Yes – this SWH layer is shown on **Figure 4h** (**Appendix A**)
3. Species of Conservation Concern						
y) Marsh Bird Breeding Habitat	Yes – SW communities present	Yes	Yes[1]	No	No	No
z) Open Country Bird Breeding Habitat	Yes	No – CUM1 vegetation communities are less than 30 ha in size	N/A	N/A	No	No
aa) Shrub/Early Successional Bird Breeding Habitat	Yes	No – CUT and CUW present but prevalence of invasive species (Common Buck-thorn) results in poor habitat quality[2]	Yes[1]	Yes	No	No
ab) Terrestrial Crayfish	No – SWD communities are present however Terrestrial Crayfish require access to the water table and groundwater interaction not present on-site	No	No – however all SWD communities on the Subject Lands will be retained	No – chimneys were not recorded during the course of various ecological surveys (2015-2018)	No	No

Significant Wildlife Habitat (SWH) Type	ELC Ecosite(s) Present	Habitat Criteria Met	Targeted Field Studies Completed	Wildlife Species Present	SWH Type Present within the Riverfront Residential proposed development areas	SWH Type Present within the Riverfront Residential proposed NHS
ac) Special Concern and Rare Wildlife Species						
i. Eastern Wood-Pewee (*Contopus virens*)	N/A	Yes	Yes[1]	Yes	No	Yes – this SWH layer is shown on **Figure 4c** (**Appendix A)**
ii. Wood Thrush (*Hylocichla mustelina*)	N/A	Yes	Yes[1]	Yes	No	Yes – this SWH layer is shown on **Figure 4c (Appendix A**)
iii. Monarch (*Danaus plexippus*)	N/A	No – low abundance of Milkweed species (host plant) within suitable ELC types on the Subject Lands	Yes[4] – to check Milkweed abundance within suitable ELC types on the Subject Lands	Low numbers of Monarch incidentally observed	No	No
iv. Snapping Turtle (*Chelydra serpentina*)	N/A	Yes	Yes[1, 2, 3]	Yes	No	Yes – this SWH layer is shown on **Figure 4c** (**Appendix A**)
v. Schreber's Aster (*Eurybia schreberi*)	N/A	Yes	Yes[1]	Yes	No	Yes – this SWH layer is shown on **Figure 4c** (**Appendix A**)
vi. Great Plains Ladies'-tresses (*Spiranthes magnicamporum*)	N/A	Yes	Yes[4]	Yes	Yes – this SWH layer is shown on **Figure 4c** (**Appendix A**)	No
vii. Honey-locust (*Gleditsia triacanthos*)	N/A	Yes	Yes[1, 4]	Yes	No	Yes – this SWH layer is shown on **Figure 4c** (**Appendix A**)
4. Animal Movement Corridors						
ad) Amphibian Movement Corridors	N/A	Yes – wetland breeding amphibian SWH present on the Subject Lands	Yes[1 - 4]	Yes	No	Yes – this SWH layer is shown on **Figure 4a** (**Appendix A**)

[1] Dougan and Associates 2016 EIS

[2] Savanta September 2017 EIS

[3] Savanta March 2018 EIS Addendum

[4] Savanta 2018 Riverfront Residential Block Plan EIS

Table 3: Suitable Bat Roosting Tree Density Survey Results

VEGETATION COMMUNITY			CANDIDATE SIGNIFICANT WILDLIFE HABITAT (>25 CM DBH)	
Polygon Label	**Vegetation Community Type**	**Approx. Area Size (ha)**	**# of Suitable Roost Trees Observed**	**Density**
B	FOD7-3	0.63	6	9.52
C	MAS2-8/SWT2-2/SWD2-2	0.22	0	0.00
D	SWD	0.43	0	0.00
E	SWD2-2	0.42	5	11.90
G	SWD2-2	0.68	1	1.47
J	SWD4-1	1.53	15	9.80
M	SWD4-1	0.89	14	15.73
P*	SWD2-2	1.88	5	10.00
T*	SWD1	59.23	123	70.29
U*	SWD1	20.79	104	94.55
V*	SWD1	6.40	42	84.00
X1	SWD1-3	0.92	20	21.74
X2	SWD1-3	0.41	9	21.95
Y1	FOD9	1.23	43	34.96
Y2	FOD9	0.16	7	43.75
Y3	FOD9	0.05	2	40.00
Y4	FOD9	0.11	5	45.45
Y5	FOD9	0.33	6	18.18
Y6	FOD9	0.03	6	200.00
Y7	FOD9	0.29	16	55.17
Z*	SWD1	3.28	8	16.00
AA*	FOD7-2	1.77	10	20.00
CC	SWD2-2	0.34	8	23.53
EE	SWD2-2	0.12	3	25.00
FF	SWD1	2.36	6	2.54
GG	FOD9	0.38	0	0.00
HH	SWD2-2	0.54	7	12.96
LL	FOD9	0.17	4	23.53
MM	FOD9	0.57	17	29.82
OO	SWD4-1	1.25	3	2.40
PP	SWD4-1	0.69	31	44.93

VEGETATION COMMUNITY			CANDIDATE SIGNIFICANT WILDLIFE HABITAT (>25 CM DBH)	
Polygon Label	**Vegetation Community Type**	**Approx. Area Size (ha)**	**# of Suitable Roost Trees Observed**	**Density**
QQ	SWD4-1	0.74	8	10.81

Notes:

Non-shaded cells: Polygon surveyed using >10 plots, 12.6 m radius plots
Shaded cells: Polygon surveyed using <10 plots, 12.6 m radius plots due to habitat reassessment

Table 4: Wetland Hydroperiod Observations (Staff Gauge Readings)

STAFF GAUGE ID	ELC	UTM			WATER LEVEL	
		Zone	Easting	Northing	Date (2018)	Depth (cm)
5	SWD2-2	17	653994.42	4768342.80	July 12	Dry
					August 2	Dry
					August 27	Dry
					September 7	Dry
					September 21	Dry
					October 11	Dry
					October 25	Dry
					November 9	Dry
					November 22	Dry
7	CUT1/SWT2	17	653591.29	4767785.95	August 2	Dry
					August 27	Dry
					September 7	Dry
					September 21	Dry
					October 11	Dry
					October 25	Dry
					November 9	6
					November 22	8
8	SWD4-1	17	653810.13	4768062.65	August 2	Dry
					August 27	Dry
					September 7	Dry
					September 21	Dry
					October 11	Dry
					October 25	Dry
					November 9	5
					November 22	5
9	Open Aquatic Feature - south	17	654456.55	4767926.56	August 9	1.5
					August 27	Dry
					September 7	Dry
					September 21	Dry
					October 11	Dry
					October 25	Dry
					November 9	8
					November 22	6
10	Open Aquatic Feature – north	17	654171.00	4768440.00	August 9	18
					August 27	19
					September 7	9
					September 21	7
					October 11	16
					October 25	9
					November 9	42
					November 22	47
11	SWD1 Slough Pool 1	17	654260.57	4768417.69	August 9	11
					August 27	14
					September 7	10
					September 21	9
					October 11	17

Table 4: Wetland Hydroperiod Observations (Staff Gauge Readings)

STAFF GAUGE ID	ELC	UTM			WATER LEVEL	
		Zone	Easting	Northing	Date (2018)	Depth (cm)
					October 25	8
					November 9	39
					November 22	46
12	SWD1 Slough Pool 2	17	654307.04	4768420.18	August 9	40
					August 27	45
					September 7	38
					September 21	38
					October 11	47
					October 25	40
					November 9	67
					November 22	72

Table 5: Wildlife Road Crossing Survey Results

SURVEY DATE	SURVEY ROUND	TRANSECT NO.	SPECIES OBSERVED	UTM OF OBSERVATION		INDIVIDUALS	
				EASTING	NORTHING	QTY	STATUS
2017 Results							
28-AL-2017	1	RT1	Green Frog	654357	4767737	1	Dead
28-AL-2017	1	RT2	No species recorded				
10-MA-2017	2	RT1	Coyote	655670	4768001	1	Alive
10-MA-2017	2	RT2	No species recorded				
15-MA-2017	3	RT1	Western Chorus Frog	654541	4767842	1	Dead
15-MA-2017	3	RT1	Western Chorus Frog	654467	4767807	1	Dead
15-MA-2017	3	RT1	Western Chorus Frog	654455	4767799	1	Dead
15-MA-2017	3	RT1	Western Chorus Frog	654339	4767736	1	Dead
15-MA-2017	3	RT1	Dekay's Brownsnake	654713	4767940	1	Dead
15-MA-2017	3	RT1	Midland Painted Turtle	654470	4767810	1	Alive
15-MA-2017	3	RT2	No species recorded				
19-MA-2017	4	RT1	American Toad	654533	4767836	1	Dead
19-MA-2017	4	RT1	American Toad	654829	4768004	1	Dead
19-MA-2017	4	RT2	No species recorded				

LEGEND:

MONTH	
JA	January
FE	February
MR	March
AL	April
MA	May
JN	June
JL	July
AU	August
SE	September
OC	October
NO	November
DE	December

Table 5: Wildlife Road Crossing Survey Results

SURVEY DATE	SURVEY ROUND	TRANSECT NO.	SPECIES OBSERVED	UTM OF OBSERVATION		INDIVIDUALS	
				EASTING	NORTHING	QTY	STATUS
23-MA-2017	5	RT1	American Toad	654232	4767673	1	Dead
23-MA-2017	5	RT2	No species recorded				
28-MA-2017	6	RT1	Bullfrog	654232	4767673	1	Dead
28-MA-2017	6	RT2	No species observed				
10-OC-2017	7	RT1	Dekay's Brownsnake	654466	4767790	1	Dead
10-OC-2017	7	RT1	Blue-spotted Salamander	654415	4767770	1	Dead
10-OC-2017	7	RT1	Dekay's Brownsnake	654457	4767807	1	Dead
10-OC-2017	7	RT1	Eastern Gartersnake	654079	4767814	1	Dead
10-OC-2017	7	RT1	Eastern Gartersnake	654473	4767807	1	Dead
10-OC-2017	7	RT1	Dekay's Brownsnake	654162	4767848	1	Dead
10-OC-2017	7	RT1	Eastern Gartersnake	654517	4767838	1	Dead
2018 Results							
14-SE-2018	1	RT1	Eastern Gartersnake	654256	4767678	1	Dead
14-SE-2018	1	RT1	Green Frog	654401	4767755	1	Dead
14-SE-2018	1	RT1	American Goldfinch	654267	4767681	1	Dead

LEGEND:

MONTH	
JA	January
FE	February
MR	March
AL	April
MA	May
JN	June
JL	July
AU	August
SE	September
OC	October
NO	November
DE	December

Table 5: Wildlife Road Crossing Survey Results

SURVEY DATE	SURVEY ROUND	TRANSECT NO.	SPECIES OBSERVED	UTM OF OBSERVATION		INDIVIDUALS	
				EASTING	NORTHING	QTY	STATUS
14-SE-2018	1	RT1	Dekay's Brownsnake	654414	4767764	1	Dead
14-SE-2018	1	RT1	Northern Leopard Frog	654482	4767801	1	Dead
14-SE-2018	1	RT2	No species observed				

LEGEND:

MONTH	
JA	January
FE	February
MR	March
AL	April
MA	May
JN	June
JL	July
AU	August
SE	September
OC	October
NO	November
DE	December

Table 6: Salamander Movement Survey Results

TRANSECT #	DATE (2017)	ROUND	UTM	SPECIES	NUMBER OF INDIVIDUALS	MOVEMENT DIRECTION
T3 (S)	FB24	1	-	None	-	-
T6	FB24	1	-	None	-	-
T7	FB24	1	-	None	-	-
T8	FB24	1	-	None	-	-
T9	FB24	1	-	None	-	-
T10	FB24	1	-	None	-	-
T11	FB24	1	-	None	-	-
T3 (S)	FB28	2	653542, 4767999 653543, 4768022	Blue Spotted Salamander	2	E
T6	FB28	2	-	None	-	-
T7	FB28	2	-	None	-	-
T8	FB28	2	-	None	-	-
T9	FB28	2	653833, 4768207	Blue Spotted Salamander	1	NE
T10	FB28	2	-	None	-	-
T11	FB28	2	-	None	-	-

LEGEND:

MONTH (CODE)	
JA	January
FB	February
MR	March
AP	April
MA	May
JU	June
JL	July
AU	August
SE	September
OC	October
NO	November
DE	December

Table 8A: West Development Area Sensitive Flora Species / Rare Vegetation Community Analysis

ELC POLYGON (FIGURE 12, APPENDIX A)	SCIENTIFIC NAME	COMMON NAME	CO-EFFICIENT OF CONSERVATISM (CC)	S-RANK (NHIC 2016)	G-RANK (NHIC 2016)	LOCALLY RARE (OLDHAM 2010)	IMPACT OF THE WEST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
ELC Polygon 13 (FOD7-2)	*Quercus palustris*	Pin Oak	9	S4	G5		• This vegetation community is located on 'other lands owned by the applicant' situated east of the proposed open space park along the railway. The FOD7-2 is part of a significant woodland and contains significant wildlife habitat for woodland birds. The Riverfront Residential Area does not directly front this vegetation community.	• The Riverfront Residential Area does not directly front this vegetation community – the adjacent open space park should be set back 10m from the western edge of the FOD7-2 to avoid potential impacts to this woodland.
ELC Polygon 14 (FOD8-1 + CUM1)	*Carex leptonervia*	Finely-nerved Sedge	5	S5	G5	X	• Part of this vegetation is proposed for removal; the portion that overlaps with proposed wetland buffers will be maintained.	• Since Finely-nerved Sedge is considered common and secure in Ontario (S5) and has a generally broad habitat fidelity (i.e. CC 5), passive mitigation is proposed, where seed collection should occur if/where mature specimens are observed during flora salvage ahead of site clearing. Seed collection can be conducted in early summer for this species. Seeds should be dispersed in local deciduous or mixed forest habitat. This species is capable of adapting to disturbed conditions (Reznicek et al. 2011).
	Eleocharis palustris	Creeping Spike-rush	6	S5	G5?	X		• Since Creeping Spike-rush is considered common and secure in Ontario (S5) and has a generally broad habitat fidelity (i.e. CC 6), passive mitigation is proposed, where seed collection should occur if/where mature specimens are observed during flora salvage ahead of site clearing. Seed collection can be conducted in late summer for this species. Seeds should be dispersed in local meadow or shallow marsh habitat where surface water pooling is known to occur for at least part of the season. Since this species was observed in upland habitat (presumably in a small depression or tire rut where water pools), no additional mitigation measures are proposed for specimens occurring in retained areas close to the construction footprint.
ELC Polygon 15 (SWD2-2)	*Quercus bicolor*	Swamp White Oak	8	S4	G5		• This PSW unit is retained. With a canopy dominated by Green Ash in a state of dieback, this community will be subject to structural change over time; this could result in a natural decline of plant species with high sensitivity to disturbance (i.e., those with a high co-efficient of conservatism value). This is a relatively small and narrow wetland and a 10 m buffer should adequately protect the transitioning species composition and ecological function. No locally or provincially rare plants were observed in this wetland.	• Recommended buffer width of 10 m. Buffer planting approach proposed in the Restoration Plan (**Appendix D**) was designed to provide appropriate edge protection and to aid in natural succession over time as this community transitions due to the dieback of the existing, mature Green Ash canopy.

ELC POLYGON (FIGURE 12, APPENDIX A)	SCIENTIFIC NAME	COMMON NAME	CO-EFFICIENT OF CONSERVATISM (CC)	S-RANK (NHIC 2016)	G-RANK (NHIC 2016)	LOCALLY RARE (OLDHAM 2010)	IMPACT OF THE WEST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
ELC Polygon 16 (CUM1 / CUT1)	*Sorghastrum nutans*	Yellow Indian-grass	8	S4	G5	X	• This early successional vegetation community is proposed for removal.	• Yellow Indian-grass is considered apparently secure in Ontario (S4) and has moderate habitat fidelity/tolerance to disturbance (i.e., CC 8). This species should be included in the seed mix (from nursery stock and/or from seed collect on-site) applied to native open meadow habitat restoration areas east and southwest of the west development area (i.e., native meadow restoration 1 areas as outlined in the Conceptual Ecological Restoration Plan - **Appendix D**).
	Sprianthes magnicamporum	Great Plains Ladies'-tresses	8	S3?	G4	X		• Great Plains Ladies'-tresses is provincially rare (S3?) and has moderate habitat fidelity / tolerance to disturbance (i.e. CC 8). Sod mat transfers are proposed to relocate specimens from this population to several targeted transplant locations within the NHS (as detailed in Appendix D). As detailed in Appendix D, locations were selected based on the presence of suitable early successional habitat, similar soils (LIO mapping) to the source population, and the ability to selectively remove Common Buckthorn in these areas and, as a result, limit soil disturbance and broad herbicide application.
	Antennaria howelii	Howell's Pussytoes	2	S5	G5	X		• Since Howell's Pussytoes is considered common and secure in Ontario (S5) and has a generally broad habitat fidelity (i.e., CC 2), passive mitigation is proposed, where seed collection should occur if/where mature specimens are observed during flora salvage ahead of site clearing. Seed collection can be conducted in mid-summer for this species. Seeds should be dispersed in local upland meadows or sparsely treed areas (i.e., native meadow restoration areas).
	Carex flava	Yellow Sedge	5	S5	G5	X		• Since Yellow Sedge is considered common and secure in Ontario (S5) and has a generally broad habitat fidelity (i.e., CC 5), passive mitigation is proposed, where seed collection should occur if/where mature specimens are observed during flora salvage ahead of site clearing. Seed collection can be conducted in mid to late summer for this species. Seeds should be dispersed in local meadow marsh or open swamp habitat.
ELC Polygon	*Carex flava*	Yellow Sedge	5	S5	G5	X	• This PSW unit is located outside of OPA 128 on other	• This PSW unit is located outside of OPA 128 on other

ELC POLYGON (FIGURE 12, APPENDIX A)	SCIENTIFIC NAME	COMMON NAME	CO-EFFICIENT OF CONSERVATISM (CC)	S-RANK (NHIC 2016)	G-RANK (NHIC 2016)	LOCALLY RARE (OLDHAM 2010)	IMPACT OF THE WEST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
17 (SWD4-1)	*Carex garberi*	Elk Sedge	10	S4	G5	X	lands owned by the applicant. The plant species noted here will be retained within the PSW.	lands owned by the applicant. The PSW fronts the proposed development and a 15 m buffer width is recommended. Four locally rare plants are present in this wetland, as well as one species with a co-efficient of conservatism value of 10 (i.e., CC10 - the highest value, assigned to species with strict habitat fidelity and high sensitivity to disturbance). The latter species' abundance was rare in this wetland (2016 EIS). This buffer width also recognizes that the canopy has a high proportion of White Willow (*Salix alba*), which is an exotic species, intermixed with various other native canopy species.
	Carex leptonervia	Finely-nerved Sedge	5	S5	G5	X		
	Quercus palustris	Pin Oak	9	S4	G5			
	Rhamnus alnifolia	Alder-leaved Buckthorn	7	S5	G5	X		
ELC Polygon 18 (CUT1/ SWT2 and CUW1)	*Carex prasina*	Drooping Sedge	10	S4	G4	X	• This PSW unit is located outside of OPA 128 on other lands owned by the applicant. This PSW is in a state of transition due to the dieback of mature Ash trees within the tree canopy layer. Species with a high CC value (i.e., Drooping Sedge) may naturally decline due to changing habitat conditions.	• This PSW unit is located outside of OPA 128 on other lands owned by the applicant. The PSW fronts the proposed development and a 15 m buffer width is recommended. Four locally rare plants are present in this wetland, as well as one species with a co-efficient of conservatism value of 10 (i.e., CC10 - the highest value, assigned to species with strict habitat fidelity and high sensitivity to disturbance). The species with a CC value of 10 (Drooping Sedge) prefers rich deciduous woodlands where it grows in wet depressions. The latter species' abundance was rare in this wetland (2016 EIS). Due to the significant dieback of Ash trees in this community, species having a high CC value may naturally decline due to changing habitat conditions. A 15 m buffer should adequately protect the transitioning species composition and ecological functions.
	Cinna latifolia	Drooping Woodreed	7	S5	G5	X		
	Quercus bicolor	Swamp White Oak	8	S4	G5			
	Quercus palustris	Pin Oak	9	S4	G5			
	Rhamnus alnifolia	Alder-leaved Buckthorn	7	S5	G5	X		
	Viola affinis	Le Conte's Violet	6	S4?	G5	X		
ELC Polygon 19 (CUT1 and CUW1)	*Prunus americana*	American Plum	6	S4	G5	X	• A portion of this mixed, cultural vegetation community is proposed for removal.	• Mitigation should consist of planting local nursery stock in nearby suitable habitat. This species prefers open meadows or upland thickets.
	Quercus palustris	Pin Oak	9	S4	G5			• Through completion of a Tree Saving Plan, survey the removal area and locate any mid-age to mature trees having potential to be incorporated into the site plan. • Since this species is not rare in Ontario and common in Niagara Region, proposed mitigation is focused on healthy specimens that are established in the local landscape. Although this species is characteristic of poor to moderately drained soil, it can also tolerate upland habitat and, relative to other trees species, is considered to have moderate to good tolerance of disturbance (Matheny and Clark 1998).

ELC POLYGON (FIGURE 12, APPENDIX A)	SCIENTIFIC NAME	COMMON NAME	CO-EFFICIENT OF CONSERVATISM (CC)	S-RANK (NHIC 2016)	G-RANK (NHIC 2016)	LOCALLY RARE (OLDHAM 2010)	IMPACT OF THE WEST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
	Carex leptonervia	Finely-nerved Sedge	5	S5	G5	X		• Finely-nerved Sedge is considered common and secure in Ontario (S5) and has generally broad habitat fidelity (i.e. CC 5). Seed collection should occur if/where mature specimens are observed during flora salvage ahead of site clearing. Seed collection can be conducted in early summer for this species. Seeds should be dispersed in local deciduous or mixed forest habitat. This species is capable of adapting to disturbed conditions (Reznicek et al. 2011); mitigation is not proposed for specimens occurring in retained areas close to construction.
ELC Polygon 20 (SWD4-1)	*Quercus palustris*	Pin Oak	9	S4	G5		• This PSW unit is retained. The plant species noted here will be retained.	• Recommended buffer of 15 m. One locally rare plant species (Alder-leaved Buckthorn) and one plant species with a high CC value of 9 (Pin Oak) are present. Changes to hydrology are the primary risk to these species. This community also contains a relatively large area of shallow water; none of the rare plant species that were observed are dependent on prolonged water saturation, although it does increase the interspersion value of the wetland, which is known to increase diversity of flora and fauna. With suitable maintenance of the existing hydrological regime, a 15 m buffer is expected to adequately protect the species composition and ecological function.
	Rhamnus alnifolia	Alder-leaved Buckthorn	7	S5	G5	X		
ELC Polygon 21 (SWD4-1)	*Quercus palustris*	Pin Oak	9	S4	G5		• This PSW unit that is retained. The plant species noted here will be retained.	• Recommended buffer width of 10m. No locally rare plant species were observed. One plant species was observed with a high CC value (Pin Oak), which is generally tolerant of human influence. Much of this wetland has frequent admixtures of upland plant species, suggesting drier conditions for much of the year. A 10 m buffer is expected to adequately protect the species composition and ecological functions.
ELC Polygon 22 (CUT1)	*Cinna latifolia*	Drooping Woodreed	7	S5	G5	X	• This early successional vegetation community is proposed for partial removal.	• Mitigation should consist of targeted seed salvage of specimens observed within or in close proximity to the development footprint. This should occur in late summer when seeds are fully developed, with seed dispersal occurring in swamp habitat (coniferous, mixed, or thickets) in areas with minimal human disturbance and high diversity of native species.
ELC Polygon 23 (SWD4-1)	*Quercus palustris*	Pin Oak	9	S4	G5		• This PSW is retained. The plant species noted here will be retained.	• Recommended buffer width of 10 m. No locally rare plant species were observed; one plant species with a high CC value was observed (Pin Oak), which is generally tolerant of human influence. Much of this wetland has frequent admixtures of upland plant

ELC POLYGON (FIGURE 12, APPENDIX A)	SCIENTIFIC NAME	COMMON NAME	CO-EFFICIENT OF CONSERVATISM (CC)	S-RANK (NHIC 2016)	G-RANK (NHIC 2016)	LOCALLY RARE (OLDHAM 2010)	IMPACT OF THE WEST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
								species, suggesting drier conditions for much of the year. A 10 m buffer is expected to adequately protect the species composition and ecological function.
ELC Polygon 24 (SWD4-1)	*Quercus palustris*	Pin Oak	9	S4	G5		• This PSW unit is retained. The plant species noted here will be retained.	• Recommended buffer width of 10m. No locally rare plant species were observed; one plant species with a high CC value was observed (Pin Oak), which is generally tolerant of human influence. Much of this wetland has frequent admixtures of upland plant species, suggesting drier conditions for much of the year. A 10 m buffer is expected to adequately protect the species composition and ecological function.
ELC Polygon 27 (SWD1)	*Aronia melanocarpa*	Black Chokeberry	7	S5	G5	X	• This PSW unit is retained. The plant species noted here will be retained along with the rare vegetation community (Buttonbush Mineral Thicket Swamp SWT2-4) and older growth forest stands. The provincially rare Buttonbush Mineral Thicket Swamp occurs as inclusions, in low troughs, within this swamp away from the feature's edge. The older growth forest stands are situated in the interior of this swamp. The rare plant and vegetation communities within this PSW will be protected by the assigned buffer, associated planting, appropriate maintenance of the existing water balance regime (to be demonstrated through the stormwater management plan), and trail siting.	• Recommended buffer width of 20 m. This wetland has the highest diversity of plant species with a CC value of 8 or higher (i.e., species having a higher degree of habitat fidelity and sensitivity to disturbance), and the highest abundance of locally rare plants. Since this is a relatively large wetland, a larger proportion of the interior will remain protected from disturbance through a wider buffer. Existing clay soil on the Subject Lands reduces permeability and increases surface water runoff; the 20 m buffer will assist in maintaining hydrological input and reduce impacts caused by overland runoff, along with LIDs and BMPs. This will aid in maintaining existing water quality within the wetland core and the species that have come to depend on this.
	Carex grayi	Gray's Sedge	8	S4	G4	X		
	Carex pallescens	Pale Sedge	5	S4	S5	X		
	Carex projecta	Necklace Sedge	5	S5	G5	X		
	Cinna latifolia	Drooping Woodreed	7	S5	G5	X		
	Eurybia schreberi	Schreber's Aster	8	S2	G4	X		
	Galium obtusum	Blunt-leaved Bedstraw	6	S4S5	G5	X		
	Glyceria septentrionalis var. septentrionalis	Eastern Mannagrass	8	S4	G5			
	Ilex mucronata	Mountain Holly	8	S5	G5	X		
	Quercus bicolor	Swamp White Oak	8	S4	G5			

ELC POLYGON (FIGURE 12, APPENDIX A)	SCIENTIFIC NAME	COMMON NAME	CO-EFFICIENT OF CONSERVATISM (CC)	S-RANK (NHIC 2016)	G-RANK (NHIC 2016)	LOCALLY RARE (OLDHAM 2010)	IMPACT OF THE WEST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
	Quercus palustris	Pin Oak	9	S4	G5			
	NA	Older Growth Forest Stands	-	-	-	-		
	NA	Buttonbush Mineral Thicket Swamp (SWT2-4)	-	S3	G4	-		

Notes:

1. Dense Blazing Star (*Liatris spicata var. spicata*) is present on adjacent lands. Species at Risk habitat polygons are not provided in the EIS since this is sensitive data that is provided only to the MNRF. SAR are addressed with MNRF through the IGF process.
2. Species latin names highlighted in light blue are new species detected by Savanta during 2018 botanical surveys that are new additions to the original Dougan and Associates plant list (EIS, 2016)
3. S-rank and G-rank for the rare vegetation community (Buttonbush Mineral Thicket Swamp SWT2-4) are as per the NHIC 2013 database status table
4. Oldham, M.J. 2010. Checklist of the Vascular Plants of Niagara Regional Municipality. Ontario Natural Heritage Information Centre, Ministry of Natural resources. Peterborough, Ontario for Niagara Peninsula Conservation Authority, Welland, Ontario.
5. Reznicek, E. G. Voss, & B. S. Walters. February 2011. Michigan Flora Online. University of Michigan. Web. September 11, 2018. https://michiganflora.net/species.aspx?id=996

Table 8B: West Development Area - Sensitive Fauna Species/Wildlife Habitat Analysis

WILDLIFE HABITAT TYPE	SPECIES RECORDED	ELC POLYGON (FIGURE 12, APPENDIX A)	IMPACT OF THE WEST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
Woodland Fauna				
Woodland Area-Sensitive Bird SWH	• Yellow-throated Vireo • Tufted Titmouse	13, 27	• These ELC polygons include the occurrences of regionally rare birds within the Subject Lands (Black and Roy 2010): Tufted Titmouse and Yellow-throated Vireo. ELC polygon 27 (SWD1) will be retained within the NHS; the FOD7-2 is part of other lands owned by the applicant. • Buffer plantings and woodland restoration efforts proposed in the Conceptual Restoration Plan (**Appendix D**), over time, will improve woodland patch size which will benefit all of the listed species.	• Appropriate buffer width (20m) and associated planting will be applied to protect ELC polygon 27 (SWD1) which fronts development of the Subject Land; ELC polygon 13 (FOD7-2) is part of other lands owned by the applicant – the open space designation on the Subject Lands adjacent to this feature will be set back at least 10 m from the western edge of the FOD7-2. • Trail siting guidance is provided (**Appendix D**) to minimize impacts of trails on sensitive flora and fauna within this wooded feature. Namely, the use of a raised, contained boardwalk with railings is recommended for the duration of the trail that is proposed within this feature's edge. This will provide residents with access to the feature while containing pedestrians to the boardwalk (i.e., minimizing informal trails). • Management of the invasive shrub, Common Buckthorn, will also help to improve quality of restored forest areas. • The proposed Wetland Discovery Centre (**Appendix D**) will add significant social value to the community. It will serve as a hub for educating residents and visitors about the rare species and habitat types present within the Subject Lands and will provide guidance to help preserve local biodiversity.
Deer Wintering SWH	• White-tailed Deer	13, 27		
Bat Maternity Colony SWH	• Hoary Bat • Silver-haired Bat • Big Brown Bat	27		
Rare Species SWH (Woodland Species)	• Eastern Wood-Pewee • Wood Thrush	13, 27		
Woodland Breeding Amphibian SWH	• Wood Frog • Gray Treefrog • Spring Peeper • Western Chorus Frog • Blue-spotted Salamander	13, 21, 23, 24, 27	• All of the woodland amphibian species recorded on the Subject Lands are considered regionally widespread except for Blue-spotted Salamander which is regionally rare (NPCA 2010). • All of the ELC polygons within the NHS on the Subject Lands that contain this SWH type will be retained. Buffer plantings and woodland restoration efforts proposed in the Conceptual Ecological Restoration Plan (**Appendix D**), over time, will improve woodland patch size which will benefit all of the listed species (i.e., provision of non-breeding habitat types and improved amphibian movement corridor functions). • Development of the Subject Lands will result in an increased local road network and traffic which may result in increased amphibian road mortality.	• Appropriate buffer width and associated planting will be applied to protect the features where this SWH type was identified. • Buffer width varies from 10 m (applied to ELC polygons 21, 23) to 15 m (applied to ELC polygon 24) to 20 m (applied to the ELC polygon 27); ELC polygon 13 (FOD7-2) is part of other lands owned by the applicant – the open space designation on the Subject Lands adjacent to this feature will be set back at least 10m from the western edge of the FOD7-2. • Trail siting guidance is provided (**Appendix D**) to minimize impacts of trails on sensitive flora and fauna within this wooded feature. Namely, the use of a raised, contained boardwalk with railings is recommended for the duration of the trail that is proposed within this feature's edge. This will provide residents with access to the feature while containing pedestrians to the boardwalk (i.e., minimizing informal trails). • Management of the invasive shrub, Common Buckthorn, will also help to improve quality of restored forest areas. • The proposed Wetland Discovery Centre (**Appendix D**) will also aide in educating residents and visitors about the rare species and habitat types present within the Subject Lands and suggest

WILDLIFE HABITAT TYPE	SPECIES RECORDED	ELC POLYGON (FIGURE 12, APPENDIX A)	IMPACT OF THE WEST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
				citizen actions to help preserve local biodiversity. • The life processes of woodland breeding amphibians are met within the large woodland/wetland complexes that will be preserved on-site. • The provision of a wildlife ecopassage beneath Chippawa Parkway would improve connectivity between the Subject Lands and City lands/wetlands associated with the Welland River south of the roadway. • This ecopassage would need to be identified through the Chippawa Parkway EA process. If an ecopassage is installed then wildlife fencing (i.e., *Animex* fencing) should be considered extending 30 m to 100 m from the NHS/roadway interface to direct amphibians, reptiles and small to medium sized mammals on the Subject Lands towards the eco-passage.
Wetland Fauna				
Wetland Breeding Amphibian SWH	• Gray Treefrog • American Toad • Northern Leopard Frog • Bullfrog • Blue-spotted Salamander	24 (OAO inclusion) 27 (OAO inclusion)	• All of the wetland amphibian and reptile species recorded on the Subject Lands are considered regionally widespread except for Blue-spotted Salamander (regionally rare) and Snapping Turtle (local-Species at Risk, Special Concern) (NPCA 2010). • All of these ELC polygons will be retained. Buffer plantings and woodland restoration efforts proposed in the Conceptual Ecological Restoration Plan (**Appendix D**), over time, will create an improved movement corridor for individuals moving between different habitat types to support their life processes. • Development of the Subject Lands will result in an increased local road network and traffic that may result in increased amphibian and reptile road-mortality. • Turtle nesting habitat is highly limited on the Subject Lands due to historical disturbance and compaction of soils. • Turtles may be crossing Chippawa Parkway in order to access potential nesting areas on City property south of the road; which increases the risk of road mortality. • Road mortality is a threat to turtle population levels in southern Ontario.	• Appropriate buffer width and associated planting will be applied to protect the features that contain the ponds where these SWH types were identified (20 m buffer applied to ELC polygon 27; 10m buffer applied to ELC polygon 24). • Trail siting guidance is provided (**Appendix D**) to minimize impacts of trails on sensitive flora and fauna within the NHS. Namely, the use of a raised, contained boardwalk with railings is recommended for the duration of the trail that is proposed within the NHS in the vicinity of these two ponds. This will provide residents with access to the NHS while containing pedestrians to the boardwalk (i.e., minimizing informal trails). • Management of the invasive shrub, Common Buckthorn, will also help to improve quality of restored forest areas. • The proposed Wetland Discovery Centre (**Appendix D**) will also aid in educating residents and visitors about the rare species and habitat types present within the Subject Lands and suggest citizen actions to help preserve local biodiversity. • Since turtle nesting habitat is highly limited on the Subject Lands, the creation of two artificial turtle nesting beaches is recommended within the NHS area between these two ponds. • Suitable pond habitat for open wetland (non-woodland) amphibians and turtles is limited on the Subject Lands. • The creation of two turtle / amphibian ponds is proposed within the NHS within restored open meadow habitat. • The EA for the proposed widening of Chippawa Parkway should consider the provision of a wildlife eco-passage beneath the roadway. The latter would provide a connection between

WILDLIFE HABITAT TYPE	SPECIES RECORDED	ELC POLYGON (FIGURE 12, APPENDIX A)	IMPACT OF THE WEST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
				habitats north and south of Chippawa Parkway, including potential turtle nesting habitat on City lands south of this road. • If an eco- passage is installed, then wildlife fencing is recommended extending from the NHS/ roadway interface to direct wildlife towards the crossing. • Target wildlife species for the eco-passage should include reptiles, amphibians, and small to medium sized mammals.
Turtle Overwintering SWH	• Midland Painted Turtle • Snapping Turtle	24 (OAO inclusion) 27 (OAO inclusion)		
Rare Species SWH (Wetland Species)	• Snapping Turtle	24 (OAO inclusion) 27 (OAO inclusion)		
Aquatic Fauna				
Type 2 Important Fish Habitat in Watercourse 1	• Emerald Shiner	24 (Watercourse 1 located within SWD4-1)	• No direct impacts on fish habitat in Watercourse 1 are anticipated to occur as a result of development and site alteration on adjacent lands (only a proposed pump station is proposed for construction adjacent to the feature) • Indirect effects during construction could include erosion and sedimentation within the watercourse (with associated effects on fish and fish habitat) and accidental spills (with potential effects on fish, depending on the material, magnitude and location of the spill). • Indirect post-construction effects could include changes in hydrology and associated effects on fish habitat and alterations in water quality due to runoff from adjacent lands. • Site restoration work (including invasive species management) will occur within the buffer and could result in indirect effects on fish habitat.	• Fish habitat will be protected from adjacent development and site alteration by a minimum 10 m buffer from the wetland unit that contains the watercourse. In several locations, the watercourse runs in close proximity to the wetland boundary and therefore the minimum buffer width is 10 m. In most locations, the watercourse is located within the interior of the wetland unit and the buffer (including riparian wetland) from the watercourse channel will be greater than 10 m. Restoration works within the buffer will enhance buffer function and associated fish habitat protection. • Erosion and sedimentation control measures will be implemented during construction to minimize the potential for transfer of eroded sediments from the construction area to the watercourse. Monitoring will be completed during construction to confirm that mitigation is installed and functioning as designed. • Spill prevention and response measures will be implemented throughout construction to minimize the potential for accidental spills and to mitigate potential effects of any spills that do occur. • The proposed minimum buffer adjacent to the watercourse will assist in mitigating potential effects due to erosion and sedimentation and accidental spills on the Subject Lands by providing additional buffering capacity to minimize the potential for these materials to reach the watercourse. • Stormwater management mitigation on the Subject Lands will collect runoff from impervious surfaces (e.g., roads and driveways) and direct it to the stormwater management pond, which will provide Normal level of

WILDLIFE HABITAT TYPE	SPECIES RECORDED	ELC POLYGON (FIGURE 12, APPENDIX A)	IMPACT OF THE WEST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
				quality control and will discharge to the Welland River. Therefore, no direct discharge from SWM ponds to Watercourse 1 will occur, with no associated potential for effects on water quality and habitat (e.g., due to erosion). • Low Impact Development measures and other stormwater mitigation (e.g., roof drain collector systems) will be implemented as necessary to maintain or improve hydrology within Watercourse 1. This will require confirmation through feature-based water balance, to be completed a later date. • Best management practices (e.g., erosion and sedimentation controls, timing windows, adherence to manufacturer's instructions associated with use of herbicide adjacent to watercourses) will be implemented during invasive species management activities.
Significant Valleyland & Type 2 Important Fish Habitat associated with the Welland River	• 30 species of fish have been recorded in the Lower Welland River (Chippawa Channel). Details are provided in NPCA (2011)	n/a – Feature is located off the Subject Lands	• No direct impacts on fish habitat in the Welland River are anticipated to occur as a result of development and site alteration on the Subject Lands • A SWM Pond on the Subject Lands will discharge directly to the Welland River and it is anticipated that some discharge infrastructure (e.g., outlet headwall and conveyance channel) will be required within the Welland River riparian area and potentially on the banks • Indirect effects during construction could include erosion and sedimentation within the watercourse (with associated effects on fish and fish habitat) and accidental spills (with potential effects on fish, depending on the material, magnitude and location of the spill). • Indirect post-construction effects could include changes in hydrology and associated effects on fish habitat and alterations in water quality due to runoff from adjacent lands.	• The SWM Pond discharge infrastructure should be designed to minimize negative effects on riparian and fish habitat in the Welland River. Mitigation will likely be required to minimize potential negative effects during installation of the infrastructure (e.g., timing windows, work-site isolation, erosion and sediment controls). • Erosion and sedimentation control measures will be implemented during construction to minimize the potential for transfer of eroded sediments from the construction area to the Welland River. Monitoring will be completed during construction to confirm that mitigation is installed and functioning as designed. • Spill prevention and response measures will be implemented throughout construction to minimize the potential for accidental spills and to mitigate potential effects of any spills that do occur. • Stormwater management mitigation on the Subject Lands will collect runoff from impervious surfaces (e.g., roads and driveways) and direct it to the stormwater management pond, which will provide Normal level of quality control and will discharge to the Welland River.
Type 3 Marginal Fish Habitat in the Conrail Drain (adjacent lands)	• Brook Stickleback	n/a – Feature is located off the Subject Lands	• No direct impacts on fish habitat in the Conrail Drain are anticipated to occur as a result of development and site alteration on the Subject Lands since the drain is located a minimum of approximately 100 m from the Subject Lands and at most points is >120 m away. • Indirect impacts on fish habitat in the Conrail Drain are not anticipated since the distance of the feature from the Subject Lands and that a railway line separates the Subject Lands from the feature, preventing direct drainage from the Subject Lands from reaching the Conrail Drain	• Erosion and sedimentation control measures will be implemented during construction to minimize the potential for transfer of eroded sediments from the construction area to the Conrail Drain. Monitoring will be completed during construction to confirm that mitigation is installed and functioning as designed. • Spill prevention and response measures will be implemented throughout construction to minimize the potential for accidental spills and to mitigate potential effects of any spills that do occur. • Stormwater management mitigation on the Subject Lands will collect runoff from impervious surfaces (e.g., roads and driveways) and direct it to the stormwater management pond which will discharge to the Welland River. No stormwater from the Subject Lands will be directed to the Conrail Drain.

Notes:

- Species at Risk habitat polygons are not provided in the EIS since this is sensitive data that is provided only to the MNRF. There are no significant Species at Risk fauna habitat polygons within the west development area. The Species at Risk fauna habitat polygons for bats and Acadian Flycatcher are all situated in retained habitat that will have appropriate buffer width, associated buffer planting, and trail siting applied to protect the habitat of these species. Species at Risk are addressed with MNRF through the Information Gathering Form process.
- This table addresses only SWH polygons that fall within or adjacent to the west development area; the applicable ELC polygons are shown on **Figure 12** (**Appendix A**)
- Regarding woodland breeding amphibian SWH, the Riverfront Community EIS Addendum (Savanta, March 2018) SWH mapping included ELC polygon 15, which is a Green Ash Mineral Deciduous Swamp and also a PSW unit. As confirmed through site visits to this feature in summer 2018, this feature does not contain suitable breeding amphibian habitat (lack of suitable depressional areas). As such, this feature (ELC polygon 15) would not meet the MNRF SWH criteria for woodland amphibian SWH. ELC polygon 15 is however retained since it is a PSW unit.
- Black, J.E. and K.J. Roy 2010. Niagara Birds.
- Niagara Peninsula Conservation Authority (NPCA) 2010. Niagara Natural Areas Inventory.

Table 9A: East Development Area - Sensitive Flora Species / Rare Vegetation Community Analysis

ELC POLYGON (FIGURE 13, APPENDIX A)	SCIENTIFIC NAME	COMMON NAME	CO-EFFICIENT OF CONSERVATISM (CC)	S-RANK (NHIC 2016)	G-RANK (NHIC 2016)	LOCALLY RARE (OLDHAM 2010)	IMPACT OF THE EAST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
ELC Polygon 19 (CUT1 and CUW1)	*Prunus americana*	American Plum	6	S4	G5	X	• Species-specific mitigation measures are proposed for the portion of this vegetation community planned for removal	• Mitigation should consist of planting local nursery stock in nearby suitable habitat within the NHS as per **Appendix D**. This species prefers open meadows or upland thickets.
	Quercus palustris	Pin Oak	9	S4	G5			• Through completion of a Tree Saving Plan, survey the removal area and locate any mid-age to mature trees having potential to be incorporated into the site plan. Since this species is not rare in Ontario and common in Niagara Region, proposed mitigation is focused on healthy specimens that are established in the local landscape and not identified as a potential hazard tree by a qualified arborist. • Although this species is characteristic of poor to moderately drained soil, it can also tolerate upland habitat and, relative to other trees species, is considered to have moderate to good tolerance of disturbance (Matheny and Clark 1998).
	Carex leptonervia	Finely-nerved Sedge	5	S5	G5	X		• Finely-nerved Sedge is considered common and secure in Ontario (S5) and has generally broad habitat fidelity (i.e., CC 5). Seed collection should occur if/where mature specimens are observed during flora salvage ahead of site clearing. Seed collection can be conducted in early summer for this species. Seeds should be dispersed in local deciduous or mixed forest habitat. This species is capable of adapting to disturbed conditions (Reznicek et al. 2011).
ELC Polygon 22 (CUT1)	*Cinna latifolia*	Drooping Woodreed	7	S5	G5	X	• This early successional vegetation community is proposed for removal outside of areas that overlap with PSW buffers.	• Mitigation should consist of targeted seed salvage of specimens observed within or in close proximity to the development footprint. This should occur in late summer when seeds are fully developed, with seed dispersal occurring in swamp habitat (coniferous, mixed, or thickets) in areas with minimal human disturbance and high diversity of native species.
ELC Polygon 25 (CUM1-1 / DIST)	*Carex pellita*	Woolly Sedge	4	S5	G5	X	• This disturbed cultural meadow is proposed for removal. Species-specific mitigation measures are provided.	• Wooly Sedge is considered common and secure in Ontario (S5) and has generally broad habitat fidelity (i.e., CC 4). Seed collection should occur if/where mature specimens are observed during flora salvage ahead of site clearing. Seed collection can be conducted in mid to late summer for this species. Seeds should be dispersed in local meadow or shallow marsh habitat where surface water pooling is known to occur for at least part of the season.
	Quercus palustris	Pin Oak	9	S4	G5			• Through completion of a Tree Saving Plan, survey the removal area and locate any mid-age to mature trees with potential to be incorporated into the site plan. Since this species is not rare in Ontario and is common in Niagara Region, proposed mitigation is focused on healthy specimens that are established in the local landscape. Although this species is characteristic of poor to moderately drained soil, it can also tolerate upland habitat and, relative to other trees species, is considered to have moderate

ELC POLYGON (FIGURE 13, APPENDIX A)	SCIENTIFIC NAME	COMMON NAME	CO-EFFICIENT OF CONSERVATISM (CC)	S-RANK (NHIC 2016)	G-RANK (NHIC 2016)	LOCALLY RARE (OLDHAM 2010)	IMPACT OF THE EAST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
								to good tolerance of disturbance (Matheny and Clark 1998).
ELC Polygon 26 (SWD2-2, CUW1, CUT1)	*Cinna latifolia*	Drooping Woodreed	7	S5	G5	X	• This vegetation community is a PSW unit that is retained. The plant species noted here will be retained.	• Recommended buffer width of 10 m. One locally rare plant species was observed (Drooping Woodreed), which has a CC value of 7 (i.e., not known to be highly sensitive to disturbance). Much of this wetland has frequent admixtures of upland plant species, suggesting drier conditions for much of the year. A 10m buffer is expected to adequately protect the species composition and ecological functions.
	NA	Older Growth Forest Stands	-	-	-	-		
ELC Polygon 31 (SWD1)	*Gleditsia triacanthos*	Honey-locust	3	S2?	G5	X	• This vegetation community is a PSW unit that is retained and also contains a candidate significant valleyland associated with watercourse 2. The plant species noted here will be retained.	• The closest point of this vegetation community (PSW) is set back approximately 40 m from the east One provincially rare and locally rare plant (Honey-locust) is present within this swamp. Honey-locust has a CC values of 3 and is not known to be highly sensitive to disturbance. Matheny and Clark (1998) also note that Honey-locust has a relatively good tolerance of disturbance. Two additional species present (Pin Oak and Swamp White Oak) have CC values of 9 and 8, respectively. These trees are considered to have moderate to good tolerance of disturbance (Matheny and Clark 1998). Much of this wetland has frequent admixtures of upland plant species, suggesting drier conditions for much of the year. This wetland is set back from development (approximately 40 m at its closest point to east development area) and will be naturally buffered by existing, intervening vegetation. A 10m buffer is applied to the Green Ash Mineral Deciduous Swamp (SWD2-2) located between this feature and the east development area. The setback from development, adjacent retained vegetation and associated buffer width are expected to protect the species composition and ecological functions of this wetland (SWD1).
	Quercus palustris	Pin Oak	9	S4	G5			
	Quercus bicolor	Swamp White Oak	8	S4	G5			
ELC Polygon 33 (CUP3-2)	*Quercus bicolor*	Swamp White Oak	8	S4	G5		• This disturbed cultural meadow is proposed for removal. Species-specific mitigation measures are provided.	• Through completion of a Tree Saving Plan, survey the removal area and locate mid-age to mature trees with potential to be incorporated into the site plan. Since this species is not rare in Ontario and common in Niagara Region, proposed mitigation is focused on healthy specimens that are established in the local landscape. Consideration will also be given to local hydrology, as this species does prefer moist soil. Relative to other trees species, Swamp White Oak is considered to have a good tolerance of disturbance (Matheny and Clark 1998).
	Quercus palustris	Pin Oak	9	S4	G5			• Through completion of a Tree Saving Plan, survey removals area and locate any mid-age to mature trees with potential to be incorporated into the site plan. Since this species is not rare in Ontario and common in Niagara Region, proposed mitigation is focused on healthy specimens that are established in the local landscape. Although this species is characteristic of poor to moderately drained soil, it can also tolerate upland habitat and, relative to other trees species, is considered to have moderate to good tolerance of disturbance (Matheny and Clark 1998).

ELC POLYGON (FIGURE 13, APPENDIX A)	SCIENTIFIC NAME	COMMON NAME	CO-EFFICIENT OF CONSERVATISM (CC)	S-RANK (NHIC 2016)	G-RANK (NHIC 2016)	LOCALLY RARE (OLDHAM 2010)	IMPACT OF THE EAST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
ELC Polygon 34 (CUW1, CUT1, CUM1)	*Quercus palustris*	Pin Oak	9	S4	G5		• This disturbed cultural woodland is proposed for removal. Species-specific mitigation measures are provided.	• Through completion of a Tree Saving Plan, survey removals area and locate any mid-age to mature trees having potential to be incorporated into the site plan. • Since this species is not rare in Ontario and common in Niagara Region, proposed mitigation is focused on healthy specimens that are established in the local landscape. Although this species is characteristic of poor to moderately drained soil, it can also tolerate upland habitat and, relative to other trees species, is considered to have moderate to good tolerance of disturbance (Matheny and Clark 1998).

Notes

1. Species latin names highlighted in light blue are new species detected by Savanta during 2018 botanical surveys that are new additions to the original Dougan and Associates plant list (EIS, 2016)
2. Oldham, M.J. 2010. Checklist of the Vascular Plants of Niagara Regional Municipality. Ontario Natural Heritage Information Centre, Ministry of Natural resources. Peterborough, Ontario for Niagara Peninsula Conservation Authority, Welland, Ontario.
3. Matheny, N. and J.R. Clark. 1998. Trees and Development: A Technical Guide to Preservation of Trees During Land Development. International Society of Arboriculture: Illinois.
4. The 2016 EIS (Dougan and Associates) had noted the presence of *Ribes glandulosum* in the east development area, the latter was confirmed to be a data entry error and was meant to be *Ribes americanum* which is a common species

Table 9B: East Development Area - Sensitive Fauna Species/Wildlife Habitat Analysis

WILDLIFE HABITAT TYPE	SPECIES RECORDED	ELC POLYGON (FIGURE 13, APPENDIX A)	IMPACT OF EAST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
Woodland Fauna				
Deer Wintering SWH	• White-tailed Deer	26 (SWD2-2 portions only) 31	• These vegetation communities are PSWs that will be retained. • Buffer plantings and woodland restoration efforts proposed in the Conceptual Restoration Plan (**Appendix D**), over time, will improve woodland patch size which will benefit this SWH type	• Appropriate buffer width and associated planting will be applied to protect this woodland/wetland feature edge. Buffer width is 10 m. No trails are proposed in this area. • Management of the invasive shrub, Common Buckthorn, will also help to improve quality of restored habitat along the ravine at the east end of the Subject Lands (within the NHS). The proposed Wetland Discovery Centre (**Appendix D**) will aid in educating residents and visitors about the rare species and habitat types present within the Subject Lands and suggest citizen actions to help preserve local biodiversity
Rare Species SWH	• Wood Thrush	26 (Wooded eastern portion along ravine only) 31	• Wood Thrush utilizes habitat within PSWs and cultural woodland at the east end of the Subject Lands. • The habitat polygon continues further north of the proposed residential area along a retained ravine. • Adjacent to the east development area, the PSWs will be retained and only a fringe of cultural woodland is proposed for removal that extends into the proposed development area. • PSW buffer plantings and woodland restoration efforts outlined in the Conceptual Restoration Plan (**Appendix D**), over time, will improve woodland patch quality in this area which is of benefit to this species.	• Appropriate buffer width and associated planting will be applied to protect this woodland/wetland feature edge. Buffer width is 10 m. No trails are proposed in this area. • Management of the invasive shrub, Common Buckthorn, within this Wood Thrush SWH polygon will help improve habitat quality. The proposed Wetland Discovery Centre (**Appendix D**) will aid in educating residents and visitors about the rare species and habitat types present within the Subject Lands and suggest citizen actions to help preserve local biodiversity.
Woodland Breeding Amphibian SWH	• Gray Treefrog • Western Chorus Frog • Spring Peeper	26 (SWD2-2 portions only) 31	• Based on targeted amphibian call count surveys conducted by Dougan and Associates (EIS 2016) in wetlands west of the east development area it is probable that a similar suite of amphibian species is present north and east of the east development area (i.e., SWD2-2 portions of ELC polygon 26 and SWD1 within ELC polygon 31). • Since the wetlands in ELC polygons 26 and 31 are retained within the NHS, candidate significant wildlife habitat presence for woodland amphibians was assumed to be present. • The calling amphibian species are all considered regionally wide-spread. Blue-spotted Salamander was not recorded in the east development area during surveys by Savanta. • Buffer plantings and restoration efforts proposed in the Conceptual Restoration Plan (**Appendix D**), over time, will	• Appropriate buffer width and associated planting will be applied to protect the features where this SWH type was identified. • Buffer width is 10 m. • No trails are proposed in this area. • The proposed Wetland Discovery Centre (**Appendix D**) will aid in educating residents and visitors about the rare species and habitat types present within the Subject Lands and suggest citizen actions to help preserve local biodiversity. • Management of the invasive shrub Common Buckthorn will help improve habitat quality within the ravine at the east end of the Subject Lands (within the NHS). • This ravine may assist with north-south movement of amphibians

WILDLIFE HABITAT TYPE	SPECIES RECORDED	ELC POLYGON (FIGURE 13, APPENDIX A)	IMPACT OF EAST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
			improve woodland patch size which will benefit all of the listed species (i.e. provision of non-breeding habitat types and improved amphibian movement corridor functions). • Development of proposed residential areas will result in an increased local road network and traffic which may result in increased amphibian	and other fauna within the Subject Lands. • The life processes of woodland breeding amphibians are met within the large woodland/wetland complexes that will be preserved on-site. • The provision of a wildlife eco-passage beneath Chippawa Parkway would improve connectivity between the Subject Lands and City lands/wetlands associated with the Welland River south of the roadway. • This eco-passage would need to be identified through the Chippawa Parkway EA process. • If an eco-passage is installed then wildlife fencing (i.e., *Animex* fencing) should be considered extending 30 m to 100 m from the NHS/roadway interface to direct amphibians, reptiles and small to medium sized mammals on the Subject Lands towards the eco-passage.
Aquatic Fauna				
Fish Habitat	• Emerald Shiner	24 (Watercourse 1 located within SWD4-1)	• No direct impacts on fish habitat in Watercourse 1 are anticipated to occur as a result of development and site alteration on adjacent lands • Indirect effects during construction could include erosion and sedimentation within the watercourse (with associated effects on fish and fish habitat) and accidental spills (with potential effects on fish, depending on the material, magnitude and location of the spill). • Indirect post-construction effects could include changes in hydrology and associated effects on fish habitat and alterations in water quality due to runoff from adjacent lands. • Site restoration work (including invasive species management) will occur within the buffer and could result in indirect effects on fish habitat.	• Fish habitat will be protected from adjacent development and site alteration by a minimum 10 m buffer from the wetland unit that contains the watercourse. In several locations, the watercourse runs in close proximity to the wetland boundary and therefore the minimum buffer width is 10 m. In most locations, the watercourse is located within the interior of the wetland unit and the buffer (including riparian wetland) from the watercourse channel will be greater than 10 m. Restoration works within the buffer will enhance buffer function and associated fish habitat protection. • Erosion and sedimentation control measures will be implemented during construction to minimize the potential for transfer of eroded sediments from the construction area to the watercourse. Monitoring will be completed during construction to confirm that mitigation is installed and functioning as designed. • Spill prevention and response measures will be implemented throughout construction to minimize the potential for accidental spills and to mitigate potential effects of any spills that do occur. • The proposed minimum buffer adjacent to the watercourse will assist in mitigating potential effects due to erosion and sedimentation and accidental spills on the Subject Lands by providing additional buffering capacity to minimize the potential for these materials to reach the watercourse. • Stormwater management mitigation on the Subject Lands will collect runoff from impervious surfaces (e.g., roads and driveways) and direct it to the stormwater management pond, which will provide Normal level of quality control and will discharge to the Welland River. Therefore, no direct discharge from SWM ponds to Watercourse 1 will occur, with no associated potential for effects on water quality and habitat (e.g., due to

WILDLIFE HABITAT TYPE	SPECIES RECORDED	ELC POLYGON (FIGURE 13, APPENDIX A)	IMPACT OF EAST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
				erosion). • Low Impact Development measures and other stormwater mitigation (e.g., roof drain collector systems) will be implemented as necessary to maintain or improve hydrology within Watercourse 1. This will require confirmation through feature-based water balance, to be completed at a later date. • Best management practices (e.g., erosion and sedimentation controls, timing windows, adherence to manufacturer's instructions associated with use of herbicide adjacent to watercourses) will be implemented during invasive species management activities.
Candidate Significant Valleyland & Type 2 Important Fish Habitat in Watercourse 2	• White Sucker • Largemouth Bass • Central Mudminnow • Brown Bullhead • Golden Shiner • Bluntnose Minnow	31 (Watercourse 2 located within SWD1)	• No direct impacts on fish habitat in Watercourse 2 are anticipated to occur as a result of development and site alteration on adjacent lands • Installation of a watermain crossing of Watercourse 2 (via open-cut or directional drilling methodologies) could result in direct impacts on fish habitat, including temporary impacts during construction (e.g., loss of habitat) and long-term impacts following completion of construction. • Indirect effects during construction could include erosion and sedimentation within the watercourse (with associated effects on fish and fish habitat) and accidental spills (with potential effects on fish, depending on the material, magnitude and location of the spill). • Indirect post-construction effects could include changes in hydrology and associated effects on fish habitat and alterations in water quality due to runoff from adjacent lands.	• Fish habitat will be protected from adjacent development and site alteration by a minimum 10 m buffer from the wetland unit that contains the watercourse. Given that the watercourse is located well inside the wetland, the buffer (including the riparian wetland) will be greater than 15 m from the watercourse channel in all locations where it runs adjacent to the proposed development area. Restoration works within the wetland buffer will enhance buffer function and associated fish habitat protection. • Standard mitigation appropriate for the selected watermain installation methodology will be required to minimize the potential for temporary and long-term negative impacts on fish. Mitigation is anticipated to include in-water work timing windows and work site isolation (if in-water work is proposed) and well as erosion and sedimentation controls, spill prevention and response measures, appropriate design mitigation (e.g., depth beneath watercourse) and restoration of disturbed areas. • Erosion and sedimentation control measures will be implemented during construction to minimize the potential for transfer of eroded sediments from the construction area to the watercourse. Monitoring will be completed during construction to confirm that mitigation is installed and functioning as designed. • Spill prevention and response measures will be implemented throughout construction to minimize the potential for accidental spills and to mitigate potential effects of any spills that do occur. • The buffer from the adjacent wetland will assist in mitigating potential effects due to erosion and sedimentation and accidental spills on the Subject Lands by providing additional buffering capacity to minimize the potential for these materials to reach the watercourse. • Stormwater management mitigation on the Subject Lands will collect runoff from impervious surfaces (e.g., roads and driveways) and direct it to the stormwater management pond, which will provide Normal level of quality control and will discharge to the Welland River. Therefore, no direct discharge from SWM ponds to Watercourse 2 will occur, with no associated potential for effects on water quality and habitat (e.g., due to erosion). • Low Impact Development measures and other stormwater mitigation (e.g., roof drain collector systems) will be implemented as necessary to maintain

WILDLIFE HABITAT TYPE	SPECIES RECORDED	ELC POLYGON (FIGURE 13, APPENDIX A)	IMPACT OF EAST DEVELOPMENT AREA	PROPOSED MITIGATION MEASURES
				or improve hydrology within Watercourse 2. This will require confirmation through feature-based water balance, to be completed a later date.
Significant Valleyland and Type 2 Important Fish Habitat in the Welland River	• 30 species of fish have been recorded in the Lower Welland River (Chippawa Channel). Details are provided in NPCA (2011)	n/a – Feature is located off the Subject Lands	• No direct impacts on fish habitat in Welland are anticipated to occur as a result of development and site alteration on the Subject Lands • A SWM Pond on the Subject Lands will discharge directly to the Welland River and it is anticipated that some discharge infrastructure (e.g., outlet headwall and conveyance channel) will be required within the Welland River riparian area and potentially on the banks • Indirect effects during construction could include erosion and sedimentation within the watercourse (with associated effects on fish and fish habitat) and accidental spills (with potential effects on fish, depending on the material, magnitude and location of the spill). • Indirect post-construction effects could include changes in hydrology and associated effects on fish habitat and alterations in water quality due to runoff from adjacent lands.	• The SWM Pond discharge infrastructure should be designed to minimize negative effects on riparian and fish habitat in the Welland River. Mitigation will likely be required to minimize potential negative effects during installation of the infrastructure (e.g., timing windows, work-site isolation, erosion and sediment controls). • Erosion and sedimentation control measures will be implemented during construction to minimize the potential for transfer of eroded sediments from the construction area to the Welland River. Monitoring will be completed during construction to confirm that mitigation is installed and functioning as designed. • Spill prevention and response measures will be implemented throughout construction to minimize the potential for accidental spills and to mitigate potential effects of any spills that do occur. • Stormwater management mitigation on the Subject Lands will collect runoff from impervious surfaces (e.g., roads and driveways) and direct it to the stormwater management pond, which will provide Normal level of quality control and will discharge to the Welland River.

Notes:

- Species at Risk habitat polygons are not provided in the EIS since this is sensitive data that is provided only to the MNRF. There are no significant Species at Risk fauna habitat polygons within the east development area. 'The significant Species at Risk fauna habitat polygons for bats and Acadian Flycatcher are all situated within the NHS and will have appropriate buffer width, associated buffer planting, and trail siting applied to protect the habitat of these species. Species at Risk are addressed with MNRF through the Information Gathering Form process.

- This table addresses only SWH polygons that fall within or adjacent to east development area; the applicable ELC polygons are shown on **Figure 13** (**Appendix A**)

Table 10 - Wetland Vegetation Communities Present in each Wetland Catchment Area

		WETLAND CATCHMENT							
ELC CODE	**ELC NAME**	W1	W2	W3	W4	W5	W6	EWC	EWC-LC
SWD1	Oak Mineral Deciduous Swamp	X						X	
SWD2-2	Green Ash Mineral Deciduous Swamp	X	X					X	X
SWD4-1	Willow Mineral Deciduous Swamp			X	X		X		
SWT2	Mineral Thicket Swamp					X			
SWT2-4	Buttonbush Mineral Deciduous Thicket Swamp (inclusion)	X							
OAO	Open Aquatic (inclusion)	X			X				

Table 11: Water Budget Recommendations By Wetland Vegetation Community

ELC code	Significant wildlife habitat identified for breeding amphibians?	Dominant canopy layer vegetation species	Water inundation requirements for dominant vegetation species	Post-development (no mitigation) inundation conditions	Water Budget Assessment Recommendations (Wood 2018)
OAO Open Aquatic	Yes for W1 and W4 (Figure 4e, Appendix A)	NA (primarily open water)	Permanent standing water	W1 – 4% increase in annual runoff volumes, permanently standing water conditions maintained W4 – 10% increase in annual runoff volumes, permanently standing water conditions maintained	Identify need for clean water to features to support turtle habitat Recommend conveyance LIDs to support permanent standing water conditions
SWD1 Oak Mineral Deciduous Swamp	Yes for W1 and EWC (Figure 4a, Appendix A)	Bur Oak, Pin Oak	Bur Oak are relatively intolerant of flooding >2 weeks long during the growing season; Pin Oak requires intermittent flooding during the dormant season but is relatively intolerant of flooding during the growing season similar to Bur Oak	W1 - 4% increase in annual runoff volumes, water inundation requirements for dominant Oak species likely maintained W3 – 10% increase in annual surface runoff volumes may or may not support the dominant species depending on seasonal timing EWC – 1% increase in annual runoff volumes, water inundation requirements for dominant Oak species likely maintained	Recommend infiltration LIDs to reduce post-development surface runoff volumes during summer period
SWD2-2 Green Ash Mineral Deciduous Swamp	Yes for W1, EWC, and EWC-LF (Figure 4a, Appendix A) No amphibian breeding SWH identified for the SWD2-2 in W2	Green Ash	Green Ash is common on land subject to flooding and can remain healthy when flooded for as much as 40% of the growing season	W1 – 4% increase in annual surface runoff volumes, water inundation requirements for dominant Ash species likely maintained W2 – 8% increase in annual surface runoff volumes which may extend flooding past the species tolerance for 40% of the growing season EWC – 1% increase in annual surface runoff volumes; water inundation requirements for dominant Ash species likely maintained EWC-LF – 2% decrease in annual surface runoff volumes; water inundation requirements for dominant Ash species likely maintained	Recommend infiltration LIDs to reduce post-development surface runoff volumes during summer period Further assessment is needed to determine if the Green Ash swamp within EWC- catchment is a tableland wetland (surface water fed) or a riparian wetland.

Table 11: Water Budget Recommendations By Wetland Vegetation Community

ELC code	Significant wildlife habitat identified for breeding amphibians?	Dominant canopy layer vegetation species	Water inundation requirements for dominant vegetation species	Post-development (no mitigation) inundation conditions	Water Budget Assessment Recommendations (Wood 2018)
SWD4-1 Willow Mineral Deciduous Swamp	Yes for W4 and W6 (Figure 4a, Appendix A) No amphibian breeding SWH identified for the SWD4-1 in W3	Hybrid Crack Willow	This hybrid species is common on land subject to flooding (i.e. riversides, stream banks, pond sides); tolerant to inundation and requires a relatively short dry season (~ 2 months)	W3 – 10% increase in annual surface runoff volumes may or may not support the dominant species depending on seasonal timing W4 – 10% increase in annual surface runoff volumes may or may not support the dominant species depending on seasonal timing W6 - 3% increase in annual surface runoff volumes, water inundation requirements for dominant Willow species likely maintained	Recommend a combination of conveyance and infiltration LIDs to support frequent flooding, and a short dry season
SWT2 Mineral Thicket Swamp	No (Figure 4a, Appendix A)	Common Buckthorn, Grey Dogwood, Nannyberry	Shallow inundation up to 5cm or water at surface level early April - late May, drawdown in summer, and moist (no inundation) September-November	W4 - 10% increase in annual surface runoff volumes may or may not support the dominant species depending on seasonal timing W5 – 3% increase in annual surface runoff volumes, water inundation requirements for dominant species likely maintained	Recommend infiltration LIDs to reduce post-development surface runoff volumes during summer period

Table 12: Summary of EIS Commitments & Recommendations

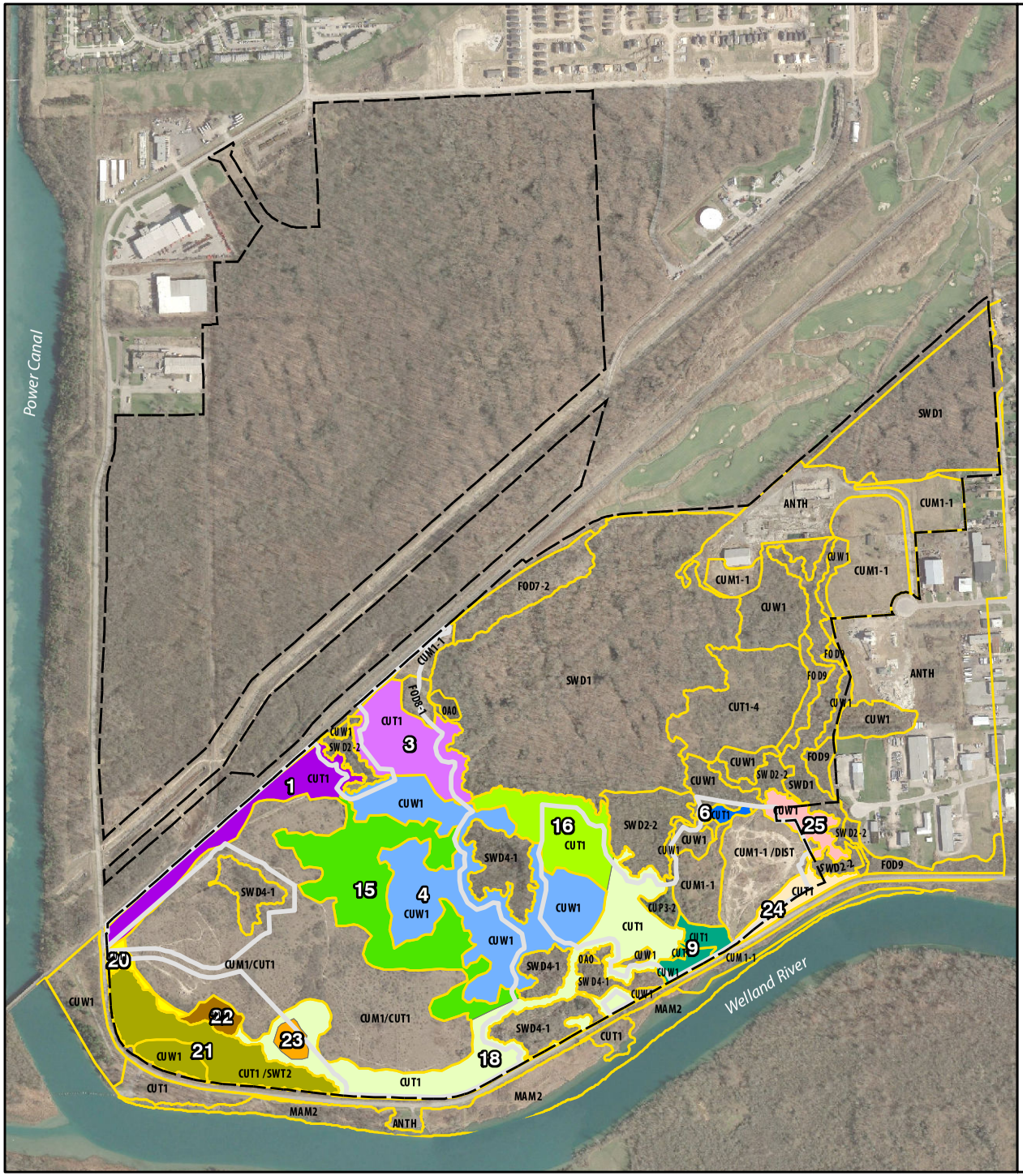
ID Label	TOPIC	EIS RECOMMENDATION
i) Endangered and Threatened Species		
SAR-1	**Acadian Flycatcher**	**Section 7.5.1**: Potentially suitable habitat for Acadian Flycatcher was identified within a retained significant wetland/woodland of the NHS on the Subject Lands. Discussion is ongoing with MNRF, through the Information Gathering Form (IGF) process, regarding the significance of habitat on-site. A 20 m setback will be applied to the suitable habitat polygon.
SAR-2	**Bat species (Eastern Small-foot Myotis, Northern Myotis, Little Brown Myotis)**	**Section 5.4**: Several endangered bat species (Eastern Small-footed Myotis, Northern Myotis, Little Brown Myotis) were recorded on the Subject Lands through the completion of MNRF survey protocol in 2018. Significant SAR bat habitat is present within swamp/woodlands well outside of the area proposed for development (Riverfront Residential will not front the retained woodland/swamp units). Only low numbers of SAR bat calls (1 to 3 calls) were recorded within the proposed development area (probable transient individual(s) or emitted calls while travelling between habitats). Dialogue is underway with MNRF through the IGF to confirm delineation of SAR bat habitat on-site. **Section 7.3.1**: Tree and woody vegetation removals outside the NHS should be completed outside the bat roosting season (Mar 30 to Oct 1) to avoid impacts to SAR bats. This approach avoids contravention of ESA (2007) Section 9 for the four 'at risk' bat species and an overall benefit permit is not required for the removal of trees outside of the NHS. If vegetation clearing must occur between March 30 and Oct 1, due diligence screening will be conducted through the completion of nighttime bat presence/absence surveys.
SAR-3	**Dense Blazing Star**	**Section 7.5.2**: Clusters of a Threatened plant species (Dense Blazing Star) were recorded on the Subject Lands outside of the proposed development area. A local road is proposed to be constructed within 120m of the Dense Blazing Star population in order to provide access and servicing to the Riverfront Residential development. This species is considered non-native in Niagara and is not identified as critical habitat in the MNRF Recovery Strategy. Dialogue is underway with MNRF to confirm that this species does not receive protection under the Endangered Species Act (2007) on the Subject Lands.
ii) Flora / fauna / soils rescue and salvage		
RESC-1	**Bats and Migratory Birds**	**Section 7.3.1**: If tree/woody vegetation outside the NHS is proposed for removal during the bat roosting season/bird nesting season (i.e., between March 30 and October 1), then due diligence screening must be conducted. This would entail evening bat acoustic surveys and daytime avian nest surveys, as described in section 7.3.1.
RESC-2	**Transplant / Salvage Opportunities**	**Section 7.5.2**: Populations of Dense Blazing Star (Threatened, see SAR-3 above) were recorded on the Subject Lands outside of the proposed development area. The non-native status of Dense Blazing Star on the Subject Lands will be confirmed with the MNRF through the IGF process. Pending agreement from MNRF, on-site populations may not be considered for habitat protection under the Endangered Species Act (2007). In which case, transplanting a portion of the Dense Blazing Star population into native meadow restoration areas on-site is recommended to increase the local population. Harvesting and re-planting corms from the on-site population during dormancy (late October to April) is recommended. Dense Blazing Star is also included in nursery groundcover seed mixes that are to be applied within some buffer areas. **Section 7.4.1**: A provincially rare population of Great Plains Ladies'-tresses was identified within the proposed west development area. A transplantation program is proposed into permanent native meadow restoration areas to sustain this species in appropriate habitat of the retained NHS. Sod mat/plug transplantation is recommended (**Appendix D**). **Section 7.1**: As detailed in **Tables 8a and 9a (Appendix B)**, a variety of locally rare plant species occur within the PSWs, with some species occurring both within PSW units and within proposed development areas. Five locally rare (Oldham 2010) plant species, listed below, occur on the Subject Lands only within ELC polygons that are proposed for partial or complete removal. Mitigation measures are provided in **Tables 8a and 9a (Appendix B)** and further detail is provided in section 5 of the Conceptual Ecological Restoration Plan (**Appendix D**).

ID Label	TOPIC	EIS RECOMMENDATION
		• Creeping Spike-rush (*Eleocharis palustris)* • American Plum (Prunus americana) • Woolly Sedge (*Carex pellita*) • Yellow Indian-grass (*Sorghastrum nutans*) **Appendix D**: For vegetation salvage, specific measures are required at sites where invasive species are present (i.e., harvesting plugs). Flora/soil salvage should not be conducted if a salvage site contains highly invasive species (Category 1; Urban Forest Associates 2002). Specific transplant opportunities are identified in the Conceptual Ecological Restoration Plan (**Appendix D**).
iii) Invasive Plant Management		
INV-3	**Invasive Plant Species**	**Appendix D**: Provides details regarding the proposed management of the highly invasive shrub Common Buckthorn and subsequent in-plantings with native stock. **Section 7.4, 7.6.2**: Edge management will be conducted (i.e. herbicide treatment) following best management practices within specified areas of woodland/wetland buffers before planting with native, restoration stock occurs (as per **Appendix D**). This will facilitate establishment of planted, native vegetation by reducing competition from non-native and invasive species.
iv) Natural Heritage Feature Buffers		
NHFB-1	**Provincially Significant Wetlands**	**Section 7.1**: Variable width buffers will be applied to the PSWs that front the development based on their sensitivity to adjacent development as detailed in **Tables 8a** to **8b** and **9a** to **9b** (**Appendix B**). Proposed buffer widths vary from 10 m to 20 m and are illustrated on **Figure 10** (**Appendix A**). **Appendix D**: The Conceptual Ecological Restoration Plan outlines invasive species management and edge management recommendations within wetland buffers and provides tailored native planting prescriptions.
NHFB-2	**Retained Woodlands**	**Section 7.1**: Variable width buffers will be applied to retained woodlands based on their sensitivity to adjacent development as detailed in **Tables 8a** to **8b and 9a** to **9b** (**Appendix B**). Proposed buffer widths vary from 10 m to 20 m and are illustrated on **Figure 10** (**Appendix A**). **Appendix D**: The Conceptual Ecological Restoration Plan outlines invasive species management and edge management recommendations within woodland buffers and provides tailored native planting prescriptions. Pre-stressing west-oriented woodland edges (i.e., exposed to predominant westerly winds) is recommended adjacent to the east development area to reduce potential for tree windthrow.
NHFB-3	**Fish Habitat**	**Section 7.6**: A pump house is proposed in proximity to fish habitat associated with watercourse 1 (WC1). Construction of the proposed pump house should occur outside of the 10m buffer applied to WC1 and the 10 m buffer applied to the PSWs also located in the vicinity of the proposed pump house location.
v) Conceptual Trail Plan		
TRAI-1	**Trail System**	**Section 6** and **7.4**: A conceptual trail network is provided on **Figure 11** (**Appendix A**) and includes one trail within the NHS. The preliminary location of the NHS trail was selected to avoid impacts to SWH and Species at Risk habitat. This NHS trail is proposed to be a raised boardwalk with railings in order to provide residents with controlled access to the NHS while deterring informal trail creation, off-leashing of pets, etc. At detailed design, the exact location of the NHS trail should be staked with a qualified biologist in the field to avoid mature trees, cavity trees, and other sensitive features/elements, such as natural surface water drainage inlets into woodland/wetland areas. Any lighting associated with the trail should be downward-facing to minimize light pollution within retained natural areas.

ID Label	TOPIC	EIS RECOMMENDATION
vi) Wetland Water Balance		
WWBA-1	**Retained Wetlands** **Preliminary Water Balance**	**Section 7.2.1**: A preliminary water balance and conceptual grading plan (**Appendix H**) was prepared for the wetland catchments on the Subject Lands. **Table 11** (**Appendix B**) provides commitments in terms of the specific hydroperiod and seasonal water inundation needs of wetlands on the Subject Lands. Wetland catchments with a predicted >10% change in drainage area or average annual surface water volume were assessed to determine whether mitigation is required. Specific wetland units were identified that will require mitigation solutions be determined at the stormwater management plan stage. It must be demonstrated through the stormwater management plan at the Site Plan level that the specific hydroperiod/seasonal water balance requirements can be met in the post-development condition (i.e., through implementation of LIDs and BMPs)
WWBA-2	**Retained Open Aquatic Features – Augmenting Hydroperiod**	**Section 7.2.1**: Two retained open aquatic features within the NHS would benefit from receiving additional water input compared to existing conditions in order to better support functional and productive habitat for open wetland amphibians and turtle species. The opportunity to direct additional surface water to these two existing open aquatic ponds should be explored at the stormwater management plan stage. If pursued, a permit through NPCA would be required to purposefully augment water levels within certain wetlands/pools.
vii) Other Natural Heritage Restoration Components		
NHR-1	**Specialized Wildlife Habitat Features**	**Section 7.10**: The creation of several specialized wildlife habitat features is proposed within the restoration plan, including: pollinator habitat, turtle nesting beaches, and two open water wetlands. Specific details are provided in **Appendix D**. Regarding the two created wetlands (which target creation of turtle and open wetland amphibian habitat), the final dimensions of these wetlands will be determined at the stormwater management plan stage based on water availability to sustain each wetland. Associated grading will be required to provide sufficient surface water drainage to these features. This will necessitate the use of ESC measures, including appropriate timing of wetland construction (i.e., outside typical summer storm event periods). Target wetland hydroperiod, planting prescriptions and implementation details are provided in the **Appendix D**.
NHR-2	**Riverfront Wetland Discovery Centre and Native Plant Nursery**	**Sections 6**, **7.9.2**, **7.10**: The Conceptual Ecological Restoration Plan (**Appendix D**) proposes the creation of a native plant nursery and a Riverfront Wetland Discovery Centre (latter to serve as a public environmental education facility) on the GR(Can) Land Holdings. The nursery would serve to responsibly collect and store seed from mature specimens and propagate target tree, shrub and herbaceous species for use within restoration areas both on-site and, potentially, at future off-site restoration projects.
NHR-3	**Resource Management Plan Agreement Requirements**	Per OPA 128 section 2.5.11 (City 2018), relocation works for Great Plains Ladies'-tresses (rare species SWH) will require a Work Permit issued by the NPCA and in accordance with the conditions of a Resource Management Agreement entered into by the proponent and the City as a condition of draft plan approval, site plan approval or zoning by-law amendment. Per OPA 128 section 2.5.12 (City 2018), ecological restoration areas identified in the Conceptual Ecological Restoration Plan (**Appendix D**), which align with restoration areas shown on OPA Map 4 of Schedule A-6(a), shall be rehabilitated in accordance with the conditions of a Resource Management Agreement entered into by the proponent and the City as a condition of draft plan approval, site plan approval or zoning by-law amendment.
viii) Best Management Practices		

ID Label	TOPIC	EIS RECOMMENDATION
BMP-1	**Construction Requirements**	**Sections 6 and 7.9.1**: Construction practice requirements will include erosion and sediment control, a spill prevention and response plan, etc. ESC measures will be designed during the detailed design stage and an ESC control plan will be prepared for agency review and approval. The plan will identify the proposed erosion and sedimentation control measures, phasing of construction, and monitoring requirements.
BMP-2	**Tree Saving Plan**	**Section 7.3**: A Tree Saving Plan should be completed by a qualified arborist, at the site plan stage. The Tree Saving Plan will serve to identify suitable trees for retention within the development area. Trees selected for retention should be species that are relatively, tolerant of disturbance and that will not pose higher risk to human life or property.
BMP-3	**Rear Yard Fencing**	It is recommended that rear yards backing onto ecological buffers be fenced to deter landowner encroachment into the NHS (e.g., mowing, dumping of refuse).
BMP-4	**Pre-stressing West-facing Woodland Edges**	Proposed development will create new west-facing woodland edges that will be more susceptible to windthrow. Pre-stressing these edges is recommended to build the tolerance of the intended, new woodland edge to wind stress. In year 1, 20% of the trees within the removal area and within the margins of the future edge should be cut (including any trees deemed to be hazard trees). Cut trees should be felled and left within the feature to decay naturally. The next year, full vegetation removal can be completed (in the proposed removal area) to establish the new woodland edge.
ix) Ecological Monitoring		
MON-1	**NHS Monitoring**	**Section 8:** A proposed monitoring plan is provided that addresses planted and retained vegetation communities, flora and fauna. Monitoring is recommended within select retained and restored portions of the NHS in years 3 and 5 following the completion of native plantings. Monitoring locations should be selected through dialogue with the Region/NPCA at detailed design (i.e., to select monitoring station and plot locations, etc.). For vegetation monitoring within retained vegetated areas, spring and summer botany surveys are required in woodland areas and summer and fall botany surveys are required in non-woodland areas. Monitoring will focus on planted/transplanted stock survivorship, coverage, growth, and will document rare species and high priority invasive species (as per Urban Forest Associates 2002).

Appendix C – Field Forms



Study Area

Riverfront Residential

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Woodland Analysis Polygons

1	6	16	21	24
3	9	18	22	25
4	15	20	23	

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

Woodland Analysis - Stem Density Assessment Polygons

0 100 Meters

N

SAVANTA

Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2018 11 17 EIS report figures\Appendix C\Woodland Analysis - Stem Density Assessment Polygons.mxd REVISED: November 27, 2018

ELC COMMUNITY DESCRIPTION & CLASSIFICATION

PROJECT NAME: 7602		POLYGON: 1	
SURVEYOR(S): SR	DATE: JUNE 14. 18	PHOTO:	
START:	END:	UTM:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
		☐ RIVERINE		☐ SUBMERGED	☐ POND
☐ WETLAND	☐ MINERAL SOIL	☐ BOTTOMLAND	☐ CULTURAL	☐ FLOATING-LVD.	☐ RIVER
		☐ TERRACE		☐ GRAMINOID	☐ STREAM
☐ AQUATIC	☐ PARENT MIN.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
		☐ TABLELAND		☐ LICHEN	☐ SWAMP
	☐ ACIDIC BEDRK.	☐ ROLL. UPLAND		☐ BRYOPHYTE	☐ FEN
		☐ CLIFF		☐ DECIDUOUS	☐ BOG
	☐ BASIC BEDRK.	☐ TALUS		☐ CONIFEROUS	☐ BARREN
SITE		☐ CREVICE / CAVE	COVER	☐ MIXED	☐ MEADOW
☐ OPEN WATER	☐ CARB. BEDRK.	☐ ALVAR	☐ OPEN		☐ PRAIRIE
☐ SHALLOW WATER		☐ ROCKLAND	☐ SHRUB		☐ THICKET
☐ SURFICIAL DEP.		☐ BEACH / BAR	☐ TREED		☐ SAVANNAH
☐ BEDROCK		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	1	
2	SUB-CANOPY			
3	UNDERSTOREY	3-4	4	
4	GRD. LAYER	5-7	4	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤50% 4=CVR>50%

SIZE CLASS ANALYSIS:	C	<10	R	10 – 24	F	25 – 50	F	>50
STANDING SNAGS:	O	<10	A	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	R	<10	O	10 – 24	F	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4		SOIL PROFILE
TEXTURE:						
DEPTH TO MOTTLES (g):						
DEPTH TO GLEY (G):						
DEPTH OF ORGANICS:						
DEPTH TO BEDROCK:						
MOISTURE REGIME:						

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE:
VEGETATION TYPE:		CODE: CUT1
INCLUSION		CODE:
COMPLEX		CODE:

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
FRAPEN	R		R	R	
ULM AME	R		R		
POPDEL	R		R		
RHA TUPPA			R		
PAL VITA				O	
CAR ORB			R		
VIB RIPA				O	
VIB LENT			R		
LIG VULG				O	
CRATAEGUS SP.			R	R	
TOX RYDB				O	
PRU VIRG				O	
RHACATH			A	O	
COR RACE			A	O	

SPECIES CODE	LAYER 1	2	3	4	COLL.
PRUVIRG				O	
TAROFF				O	
CARBIA				R	
RUMEX SP.				R	
SYMPHO SP.				R-O	
LYT SALI				R	
RHA AUST				R	
SYM OF NOVA				R	
POA OF PRAT				R-O	
SALIX ALBI				R-O	
RAN ACRI				R	
LUC AMER				R	
JUNCUS SP.				R	
HEU CANA				O	

Notes:

- PLOT 1 PICS @ 10:13 (x2)
- TRAIL FOLLOWS FEATURE; PATHWAY CUTS THROUGH MIDDLE OF POLYGON, PARALLEL
- PLOT 2 PICS @ 4:34 (x2)

ELC — COMMUNITY DESCRIPTION & CLASSIFICATION

PROJECT NAME: 7602		POLYGON: 3
SURVEYOR(S): JTL	DATE: June 8-18	PHOTO:
START:	END:	UTM:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☐ MINERAL SOIL	☐ RIVERINE	☐ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN.	☐ BOTTOMLAND		☐ FLOATING-LVD.	☐ RIVER
	☐ ACIDIC BEDRK.	☐ TERRACE		☐ GRAMINOID	☐ STREAM
	☐ BASIC BEDRK.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
	☐ CARB. BEDRK.	☐ TABLELAND		☐ LICHEN	☐ SWAMP
SITE		☐ ROLL. UPLAND	COVER	☐ BRYOPHYTE	☐ FEN
☐ OPEN WATER		☐ CLIFF	☐ OPEN	☐ DECIDUOUS	☐ BOG
☐ SHALLOW WATER		☐ TALUS	☐ SHRUB	☐ CONIFEROUS	☐ BARREN
☐ SURFICIAL DEP.		☐ CREVICE / CAVE	☐ TREED	☐ MIXED	☐ MEADOW
☐ BEDROCK		☐ ALVAR			☐ PRAIRIE
		☐ ROCKLAND			☐ THICKET
		☐ BEACH / BAR			☐ SAVANNAH
		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	3	
2	SUB-CANOPY	—	—	
3	UNDERSTOREY	3-4	4	
4	GRD. LAYER	5-7	4	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 8=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤50% 4=CVR>50%

SIZE CLASS ANALYSIS:	A	<10	O	10 – 24	R	25 – 50	N	>50
STANDING SNAGS:	O	<10	O	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	O	<10	R	10 – 24	N	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4	SOIL PROFILE
TEXTURE:					
DEPTH TO MOTTLES (g):					
DEPTH TO GLEY (G):					
DEPTH OF ORGANICS:					
DEPTH TO BEDROCK:					
MOISTURE REGIME:					

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE:
VEGETATION TYPE:		CODE: CUT1
INCLUSION		CODE:
COMPLEX		CODE:

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
CRAEPNN	R		O-A	D	
ACENEGU	/		/	R	
MALUS	D		/		
PARVITA				O	
TOXRYDS				O	
LIGVUL			R		
RUBIDS			R		
PRUVIR			R		
ROSMULT				R	
RHACAT			O		
CORRACO			O-A		
CRATAEGUS	A		A		

SPECIES CODE	LAYER 1	2	3	4	COLL.
FRAVIR				O-A	
PRUVIRG				O	
GLYSTRI				O	
GEUM SP.				O	
CIRLUTE				O	
POA SP				R-O	
SYMPH. SP.				R	
RANABORT				R	
DRYCART				R	
PRUVIRG				O	
OXALIS				R	
POT SIMP				O	

Notes:

- PICS @ 6:53 (x2) & 7:15 (x2)
- MAINLY MALUS & CRATAEGUS IN CANOPY, FEW ASH; CANOPY ~ 70% W BUT <10% W/O MALUS & CRATAEGUS

ELC

COMMUNITY DESCRIPTION & CLASSIFICATION

PROJECT NAME: 7602		POLYGON: 4	
SURVEYOR(S): JTL	DATE: JUNE 8 + 14 - 18		PHOTO:
START:	END:	UTM:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☐ MINERAL SOIL	☐ RIVERINE	☐ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN.	☐ BOTTOMLAND		☐ FLOATING-LVD.	☐ RIVER
	☐ ACIDIC BEDRK.	☐ TERRACE		☐ GRAMINOID	☐ STREAM
	☐ BASIC BEDRK.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
	☐ CARB. BEDRK.	☐ TABLELAND		☐ LICHEN	☐ SWAMP
SITE		☐ ROLL. UPLAND		☐ BRYOPHYTE	☐ FEN
☐ OPEN WATER		☐ CLIFF		☐ DECIDUOUS	☐ BOG
☐ SHALLOW WATER		☐ TALUS		☐ CONIFEROUS	☐ BARREN
☐ SURFICIAL DEP.		☐ CREVICE / CAVE	**COVER**	☐ MIXED	☐ MEADOW
☐ BEDROCK		☐ ALVAR	☐ OPEN		☐ PRAIRIE
		☐ ROCKLAND	☐ SHRUB		☐ THICKET
		☐ BEACH / BAR	☐ TREED		☐ SAVANNAH
		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	3	
2	SUB-CANOPY	—	—	
3	UNDERSTOREY	3-4	4	
4	GRD. LAYER	5-6	4	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

SIZE CLASS ANALYSIS:	A	<10	O	10 – 24	R	25 – 50	N	>50
STANDING SNAGS:	O	<10	R	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	O	<10	R	10 – 24	N	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4		SOIL PROFILE
TEXTURE:						
DEPTH TO MOTTLES (g):						
DEPTH TO GLEY (G):						
DEPTH OF ORGANICS:						
DEPTH TO BEDROCK:						
MOISTURE REGIME:						

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE:
VEGETATION TYPE:		CODE: CUW1
INCLUSION		CODE:
COMPLEX		CODE:

Notes:

- PICS @ 7:53 (JUNE 8) PLOT 1 (LIVE TREE CANOPY COVER ~40%.
- BUCKTHORN ABUNDANT IN P1
- PLOT 2 PICS @ 1:54 (x2) (JUNE 14)
- PLOT 3 PICS @ 2:20 (x2)
- PLOT 4 PICS @ 3:23 (x2)

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
FRAPENN	O		A	O	
POPDELT	R		–	–	
SAL xFRAG	R				
PRUVIRG			R		
CRATAEGUS			R		
TOX RYDB				O	
LONXBEL			R		
RHACATH			D/A		
LIG VULG				O	
LINBENZ			R		

SPECIES CODE	LAYER 1	2	3	4	COLL.
CIR LUTE				O	
TAR OFFI				O	
ALL TRYP				O	
ONOSENS				R	
CAL GRAC				R	
EQU ARVE				R	
VIOLA SP.				O	
CAR LEPTOC				R	
ERI PHIL				O	

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	PROJECT NAME: 7602		POLYGON: 6
	SURVEYOR(S): STR	DATE: June 14-18	PHOTO:
	START:	END:	UTM:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN. ☐ ACIDIC BEDRK. ☐ BASIC BEDRK. ☐ CARB. BEDRK.	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD. ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE ☐ OPEN WATER ☐ SHALLOW WATER ☐ SURFICIAL DEP. ☐ BEDROCK			**COVER** ☐ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	2	
2	SUB-CANOPY	/	/	
3	UNDERSTOREY	3-4	4	
4	GRD. LAYER	5-7	4	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m
CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

SIZE CLASS ANALYSIS:		<10		10 – 24		25 – 50		>50
STANDING SNAGS:		<10		10 – 24		25 – 50		>50
DEADFALL/LOGS:		<10		10 – 24		25 – 50		>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:		YOUNG		MID-AGE		MATURE		OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4	SOIL PROFILE
TEXTURE:					
DEPTH TO MOTTLES (g):					
DEPTH TO GLEY (G):					
DEPTH OF ORGANICS:					
DEPTH TO BEDROCK:					
MOISTURE REGIME:					

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE:
VEGETATION TYPE:		CODE: CUT
INCLUSION		CODE:
COMPLEX		CODE:

Notes:
Pics @ 6:31 (4?)

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
FRAPENN	O				
ULMAMER	R				
CRATAEGUS			R		
VITRIPA				D	
CARRACE			A		

SPECIES CODE	LAYER 1	2	3	4	COLL.
SOL cf ALTI				A	
PENSTEMON DIGITALIS				R	
OENOTHERA SP. BIENNIS				R	✓ Pics
CAR VULP				R	
SOL cf RUGO				R	
VIC TETR					

Scanned with CamScanner

ELC — COMMUNITY DESCRIPTION & CLASSIFICATION

PROJECT NAME: 7602		POLYGON: 9
SURVEYOR(S): JTL	DATE: JUNE 14-18	PHOTO:
START:	END:	UTM:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
		☐ RIVERINE		☐ SUBMERGED	☐ POND
☐ WETLAND	☐ MINERAL SOIL	☐ BOTTOMLAND	☐ CULTURAL	☐ FLOATING-LVD.	☐ RIVER
		☐ TERRACE		☐ GRAMINOID	☐ STREAM
☐ AQUATIC	☐ PARENT MIN.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
		☐ TABLELAND		☐ LICHEN	☐ SWAMP
	☐ ACIDIC BEDRK.	☐ ROLL. UPLAND		☐ BRYOPHYTE	☐ FEN
		☐ CLIFF		☐ DECIDUOUS	☐ BOG
	☐ BASIC BEDRK.	☐ TALUS		☐ CONIFEROUS	☐ BARREN
SITE		☐ CREVICE / CAVE	COVER	☐ MIXED	☐ MEADOW
☐ OPEN WATER	☐ CARB. BEDRK.	☐ ALVAR	☐ OPEN		☐ PRAIRIE
☐ SHALLOW WATER		☐ ROCKLAND	☐ SHRUB		☐ THICKET
☐ SURFICIAL DEP.		☐ BEACH / BAR	☐ TREED		☐ SAVANNAH
☐ BEDROCK		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	3	
2	SUB-CANOPY	/		
3	UNDERSTOREY	3-4	4	
4	GRD. LAYER	5-7	4	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤50% 4=CVR>50%

SIZE CLASS ANALYSIS:	O	<10	O	10 – 24	C	25 – 50	N	>50
STANDING SNAGS:	O	<10	A	10 – 24	R	25 – 50	N	>50
DEADFALL/LOGS:	O	<10	O	10 – 24	R	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4	SOIL PROFILE
TEXTURE:					
DEPTH TO MOTTLES (g):					
DEPTH TO GLEY (G):					
DEPTH OF ORGANICS:					
DEPTH TO BEDROCK:					
MOISTURE REGIME:					

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE:
VEGETATION TYPE:		CODE: CUT1
INCLUSION		CODE:
COMPLEX		CODE:

Notes:

- MANY DEAD/DYING ASH IN CANOPY
- PICS @ 12:13 (E2)
- RIM OF WILLOW IN NORTH CANOPY EDGE (NOT WETLAND AS PER HOBBS)
- DIST GRND / FORMER FILL MOUNDS)

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
ULMAMER	R	/			
FRAPENN	R	/			
JUGNIGR		/	R		
SALXBRAG	R	/			
(MALUS) SP.	R	/			
(CRATAEGUS)			R		
RUBIDSI				R	
CORLACE			O	O	
RHUTYPH			R		
ROSMULT			O		
WITRIPA			O		
LONYBEL			O		
RHACATH			A	O	

SPECIES CODE	LAYER 1	2	3	4	COLL.
HESMATR				O-A	
TAROFFI				R	
ALLPETI				O	
SYMPHY. SP.				O	
GEUCANA				O	
POA SP.				R	
ARCTIUM SP.				R	
CIRLUTE				R	
PER VIRG				R	
GALIUM				R	
SOL of ALTI				O	

ELC — COMMUNITY DESCRIPTION & CLASSIFICATION

PROJECT NAME: 7502		POLYGON: 15	
SURVEYOR(S):		DATE: JUNE 14-18	PHOTO:
START:	END:	UTM:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☐ MINERAL SOIL	☐ RIVERINE	☐ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN.	☐ BOTTOMLAND		☐ FLOATING-LVD.	☐ RIVER
	☐ ACIDIC BEDRK.	☐ TERRACE		☐ GRAMINOID	☐ STREAM
SITE	☐ BASIC BEDRK.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
☐ OPEN WATER	☐ CARB. BEDRK.	☐ TABLELAND		☐ LICHEN	☐ SWAMP
☐ SHALLOW WATER		☐ ROLL. UPLAND		☐ BRYOPHYTE	☐ FEN
☐ SURFICIAL DEP.		☐ CLIFF		☐ DECIDUOUS	☐ BOG
☐ BEDROCK		☐ TALUS		☐ CONIFEROUS	☐ BARREN
		☐ CREVICE / CAVE	COVER	☐ MIXED	☐ MEADOW
		☐ ALVAR	☐ OPEN		☐ PRAIRIE
		☐ ROCKLAND	☐ SHRUB		☐ THICKET
		☐ BEACH / BAR	☐ TREED		☐ SAVANNAH
		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	1	
2	SUB-CANOPY			
3	UNDERSTOREY	3-4	4	
4	GRD. LAYER	5-6	4	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤50% 4=CVR>50%

SIZE CLASS ANALYSIS:	O	<10	R	10 – 24	N	25 – 50	N	>50
STANDING SNAGS:	R	<10	R	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	R	<10	R	10 – 24	R	25 – 50	R	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4	SOIL PROFILE
TEXTURE:					
DEPTH TO MOTTLES (g):					
DEPTH TO GLEY (G):					
DEPTH OF ORGANICS:					
DEPTH TO BEDROCK:					
MOISTURE REGIME:					

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE:
VEGETATION TYPE:		CODE:
INCLUSION	BUCKTHORN	CODE: CUT 1
COMPLEX		CODE:

Notes:

PLOT 1 PICS @ 2:58 (x2)

PLOT 2 PICS @ 3:40 (x2)

PLOT 3 PICS @ 3:55 (x2)

PLOT 4 PICS @ 4:15 (x2)

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
ULMAMER	R		R		
FRAPEN	R		O		
LIN BENZ			R		
LIG VUL				O	
CAROBL			R		
ROSMULT			R		
CRATAEGUS			R	R	
RUB CF OCCI			R		
PRU VIRG				O	
TOX RYDB				R	
VITLIP				R	
LONCBEV				R	
RHA CATH			A		
RHA FRAN			R-O		
COR RACE			O		

SPECIES CODE	LAYER 1	2	3	4	COLL.
OP-EVE				O	
GEUMRIVE				O	
CAMCAC				O	
SPIR ALB				R	
PRUVULG				R	
SYM OF NOVA				R	
CAR BLAN				O-A	
EUP MACU				R	
SP. DOGBANE				R	
CIRLUTE				O	
ERI PHIL				O	
SYMPHYO SP.				R	
CAR DENSE				R	
ARI TRIP				R-O	
VIOLA SP				R	

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

PROJECT NAME: 7602		POLYGON: 16	
SURVEYOR(S): SZ		DATE: JUNE 14-15	PHOTO:
START:	END:	UTM:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☐ MINERAL SOIL	☐ RIVERINE	☐ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN.	☐ BOTTOMLAND		☐ FLOATING-LVD.	☐ RIVER
	☐ ACIDIC BEDRK.	☐ TERRACE		☐ GRAMINOID	☐ STREAM
	☐ BASIC BEDRK.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
SITE	☐ CARB. BEDRK.	☐ TABLELAND		☐ LICHEN	☐ SWAMP
☐ OPEN WATER		☐ ROLL. UPLAND		☐ BRYOPHYTE	☐ FEN
☐ SHALLOW WATER		☐ CLIFF		☐ DECIDUOUS	☐ BOG
☐ SURFICIAL DEP.		☐ TALUS		☐ CONIFEROUS	☐ BARREN
☐ BEDROCK		☐ CREVICE / CAVE	COVER	☐ MIXED	☐ MEADOW
		☐ ALVAR	☐ OPEN		☐ PRAIRIE
		☐ ROCKLAND	☐ SHRUB		☐ THICKET
		☐ BEACH / BAR	☐ TREED		☐ SAVANNAH
		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	1	
2	SUB-CANOPY			
3	UNDERSTOREY	3-4	4	
4	GRD. LAYER	5-7	4	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

SIZE CLASS ANALYSIS:	O <10	R 10 – 24	M 25 – 50	M >50
STANDING SNAGS:	R <10	R 10 – 24	M 25 – 50	M >50
DEADFALL/LOGS:	O <10	R 10 – 24	M 25 – 50	R >50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4		SOIL PROFILE
TEXTURE:						
DEPTH TO MOTTLES (g):						
DEPTH TO GLEY (G):						
DEPTH OF ORGANICS:						
DEPTH TO BEDROCK:						
MOISTURE REGIME:						

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE:
VEGETATION TYPE:		CODE: CUT 1
INCLUSION		CODE:
COMPLEX		CODE:

Notes:

PICS @ 5:25 (x2)

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
FRAPEN			D		
CARLAT				R	
POPDEL	R				
ULMAME	R				
MALUS			R		
RIBCRUC				R	
TOXRYD				O	
LIGVUL				O	
PANVIR				O	
RHACATH			A		
CRATAEGUS			O		

SPECIES CODE	LAYER 1	2	3	4	COLL.
FRAVIR				O	
POP TRE				O	
ACER SAC				O	
CIR LUTE				O	
SYMPHYO SP				R-O	
CAR BLAN				R	
CAR DEWE				R	
CIR LAT				R	
GLY STRI				R	
MYOLAXA				R	
TAROFF				O	
CAR GRAN				R	
CAR RADI				R	
CAR PHIL				R	

ELC COMMUNITY DESCRIPTION & CLASSIFICATION	PROJECT NAME: 7652		POLYGON: 18
	SURVEYOR(S):	DATE: JUNE 14 '18	PHOTO:
	START:	END:	UTM:

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☐ MINERAL SOIL	☐ RIVERINE	☐ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN.	☐ BOTTOMLAND		☐ FLOATING-LVD.	☐ RIVER
	☐ ACIDIC BEDRK.	☐ TERRACE		☐ GRAMINOID	☐ STREAM
	☐ BASIC BEDRK.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
SITE	☐ CARB. BEDRK.	☐ TABLELAND		☐ LICHEN	☐ SWAMP
☐ OPEN WATER		☐ ROLL. UPLAND		☐ BRYOPHYTE	☐ FEN
☐ SHALLOW WATER		☐ CLIFF		☐ DECIDUOUS	☐ BOG
☐ SURFICIAL DEP.		☐ TALUS		☐ CONIFEROUS	☐ BARREN
☐ BEDROCK		☐ CREVICE / CAVE	**COVER**	☐ MIXED	☐ MEADOW
		☐ ALVAR	☐ OPEN		☐ PRAIRIE
		☐ ROCKLAND	☐ SHRUB		☐ THICKET
		☐ BEACH / BAR	☐ TREED		☐ SAVANNAH
		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	4	
2	SUB-CANOPY	/	/	
3	UNDERSTOREY	3-4	4	
4	GRD. LAYER	5-7	4	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m
CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

SIZE CLASS ANALYSIS:	O	<10	O	10 – 24	R	25 – 50	N	>50
STANDING SNAGS:	R	<10	R	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	O	<10	O	10 – 24	N	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4	SOIL PROFILE
TEXTURE:					
DEPTH TO MOTTLES (g):					
DEPTH TO GLEY (G):					
DEPTH OF ORGANICS:					
DEPTH TO BEDROCK:					
MOISTURE REGIME:					

COMMUNITY CLASSIFICATION:

ECOSITE:	CODE:	
VEGETATION TYPE:	CODE:	CUT
INCLUSION	CODE:	
COMPLEX	CODE:	

Notes:
PLOT 1 PICS @ 10:51 (x2)
→ MAINLY MALUS IN CANOPY / PYRUS
PLOT 2 PICS @ 11:34 (x2)
PLOT 3 PICS @ 12:59 (x2)
PLOT 4 PICS @ 1:26 (x2)

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
CRAPENN			O		
MALUS	O				
ACENEGU			R		
PRUSERO	R				
CYRCOMM	O				
TOX RYDB				R	
LONXBEL			R		
TOX RADI	R-O				
VIB RAFI			R		
RIB cf RUBR				R	
VIB OPUL				R	
RHACATH			O	O	
PRUVIRG				O	
COR RACE			O-A	O	
RUBIDST			R		
CRATAEGUS	O		O		

SPECIES CODE	LAYER 1	2	3	4	COLL.
CIRLUTE				O	
TAROFFIC				O	
PAR VIRG cf				O	
ALLPETI				O	
LAPCOMM				O	
FRAVIRG				O	
POA SP.				R	
CARBLAN				R	
CAR cf PSEU				R	
LYSCILI				R	
GEU CANA				O	
EQUARVE				R	
ARR GRYP				R	
ERI ANNU				R	
CINLATI				R	
GLY STRI				R	
POT SIMP				R	
DRY CART				R	

ELC — COMMUNITY DESCRIPTION & CLASSIFICATION

PROJECT NAME: 7602	POLYGON: PLOT CUT 20		
SURVEYOR(S): JTL	DATE: AUG 2-18	PHOTO:	
START:	END:	UTM:	

WEST

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☐ MINERAL SOIL	☐ RIVERINE	☐ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN.	☐ BOTTOMLAND		☐ FLOATING-LVD.	☐ RIVER
	☐ ACIDIC BEDRK.	☐ TERRACE		☐ GRAMINOID	☐ STREAM
	☐ BASIC BEDRK.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
SITE	☐ CARB. BEDRK.	☐ TABLELAND	COVER	☐ LICHEN	☐ SWAMP
☐ OPEN WATER		☐ ROLL UPLAND	☐ OPEN	☐ BRYOPHYTE	☐ FEN
☐ SHALLOW WATER		☐ CLIFF	☐ SHRUB	☐ DECIDUOUS	☐ BOG
☐ SURFICIAL DEP.		☐ TALUS	☐ TREED	☐ CONIFEROUS	☐ BARREN
☐ BEDROCK		☐ CREVICE / CAVE		☐ MIXED	☐ MEADOW
		☐ ALVAR			☐ PRAIRIE
		☐ ROCKLAND			☐ THICKET
		☐ BEACH / BAR			☐ SAVANNAH
		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY			
2	SUB-CANOPY			
3	UNDERSTOREY	3-4	4	
4	GRD. LAYER	5-7	3	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m
CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤50% 4=CVR>50%

SIZE CLASS ANALYSIS:	O	<10	N	10 – 24	C	25 – 50	N	>50
STANDING SNAGS:	N	<10	R	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	N	<10	N	10 – 24	N	25 – 50	A	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4	SOIL PROFILE
TEXTURE:					
DEPTH TO MOTTLES (g):					
DEPTH TO GLEY (G):					
DEPTH OF ORGANICS:					
DEPTH TO BEDROCK:					
MOISTURE REGIME:					

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE:
VEGETATION TYPE:		CODE: CUT1
INCLUSION		CODE:
COMPLEX		CODE:

SPECIES CODE	LAYER 1	2	3	4	COLL
ELAEAG			O	R	
ULMAMER			R		
PAR VITA				R	
VITRIPA				R	
CORRACE			O		
CRATAEGUS			A		
RHACATH			O		

SPECIES CODE	LAYER 1	2	3	4	COLL
ACER SACC				O	
SYMPHOT. SP.				O	
PER VIRG				O	
CAREX SP.				O	
ACER VULG				R	
POA SP.				R	
SOL OF CANA				R	
CIR CANA				O	
LAP COMM				R	
FRAVIRG				O	
CAR CRAC				R	

Notes:

PICS @ 1:34 (x2) & 1:53 + 54

PLOT 1 – DENSE w/ CRATAEGUS, HEIGHTS IN 4-5 m
– TALL DEAD ASH IN VICINITY OF PLOT

PLOT 2 – STILL CRATAEGUS IN CANOPY (MORE MATURE THAN P1) w/ RHACATH
– MANY DEAD ASH IN AND OUTSIDE OF PLOT.

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

PROJECT NAME: 7602		POLYGON: PLOT CUW22 NWE ST	
SURVEYOR(S): JTL	DATE: AUG 2-18		PHOTO:
START:	END:	UTM:	

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☐ MINERAL SOIL	☐ RIVERINE	☐ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN.	☐ BOTTOMLAND		☐ FLOATING-LVD.	☐ RIVER
	☐ ACIDIC BEDRK.	☐ TERRACE		☐ GRAMINOID	☐ STREAM
	☐ BASIC BEDRK.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
SITE	☐ CARB. BEDRK.	☐ TABLELAND	COVER	☐ LICHEN	☐ SWAMP
☐ OPEN WATER		☐ ROLL UPLAND	☐ OPEN	☐ BRYOPHYTE	☐ FEN
☐ SHALLOW WATER		☐ CLIFF	☐ SHRUB	☐ DECIDUOUS	☐ BOG
☐ SURFICIAL DEP.		☐ TALUS	☐ TREED	☐ CONIFEROUS	☐ BARREN
☐ BEDROCK		☐ CREVICE / CAVE		☐ MIXED	☐ MEADOW
		☐ ALVAR			☐ PRAIRIE
		☐ ROCKLAND			☐ THICKET
		☐ BEACH / BAR			☐ SAVANNAH
		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	1-2	3	
2	SUB-CANOPY	3	4	
3	UNDERSTOREY	4-5	3	
4	GRD. LAYER	6-7	2	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m
CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

SIZE CLASS ANALYSIS:	O	<10	O	10 – 24	O	25 – 50	O	>50
STANDING SNAGS:	O	<10	O	10 – 24	O	25 – 50	R	>50
DEADFALL/LOGS:	O	<10	O	10 – 24	R	25 – 50	R	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	YOUNG	MID-AGE	X MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4	SOIL PROFILE
TEXTURE:					
DEPTH TO MOTTLES (g):					
DEPTH TO GLEY (G):					
DEPTH OF ORGANICS:					
DEPTH TO BEDROCK:					
MOISTURE REGIME:					

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE:
VEGETATION TYPE:		CODE: CUW1
INCLUSION		CODE:
COMPLEX		CODE:

Notes:
PICS @ 2:25 (x7)
CANOPY COVER ~40%

SPECIES CODE	LAYER 1	2	3	4	COLL
POPDELT	O	/	/		
ULMAMER	O	O	R		
PRUSERO	R	R	/		
FRAPENN	/	R	R		
POPTREM	R	/	/		
ULMAMER	/	/	O		
VIB OPUL				O	
PAR VITI				O	
TOX RYDB				O	
CRATAEGUS		O	O		
RHACATH		A	O		
LIGVUL				O	

SPECIES CODE	LAYER 1	2	3	4	COLL
EQUARVE				O	
FRAVIRG				O	
CIR CANA				O	

ELC

COMMUNITY DESCRIPTION & CLASSIFICATION

PROJECT NAME: 7602		POLYGON: PLOT CVW	SWEST		
SURVEYOR(S): JTL	DATE: AUG 2-18		PHOTO: 23		
START:	END:	UTM:			

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL ☐ WETLAND ☐ AQUATIC	☐ ORGANIC ☐ MINERAL SOIL ☐ PARENT MIN. ☐ ACIDIC BEDRK. ☐ BASIC BEDRK. ☐ CARB. BEDRK.	☐ LACUSTRINE ☐ RIVERINE ☐ BOTTOMLAND ☐ TERRACE ☐ VALLEY SLOPE ☐ TABLELAND ☐ ROLL. UPLAND ☐ CLIFF ☐ TALUS ☐ CREVICE / CAVE ☐ ALVAR ☐ ROCKLAND ☐ BEACH / BAR ☐ SAND DUNE ☐ BLUFF	☐ NATURAL ☐ CULTURAL	☐ PLANKTON ☐ SUBMERGED ☐ FLOATING-LVD. ☐ GRAMINOID ☐ FORB ☐ LICHEN ☐ BRYOPHYTE ☐ DECIDUOUS ☐ CONIFEROUS ☐ MIXED	☐ LAKE ☐ POND ☐ RIVER ☐ STREAM ☐ MARSH ☐ SWAMP ☐ FEN ☐ BOG ☐ BARREN ☐ MEADOW ☐ PRAIRIE ☐ THICKET ☐ SAVANNAH ☐ WOODLAND ☐ FOREST ☐ PLANTATION
SITE ☐ OPEN WATER ☐ SHALLOW WATER ☐ SURFICIAL DEP. ☐ BEDROCK			**COVER** ☐ OPEN ☐ SHRUB ☐ TREED		

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	3	
2	SUB-CANOPY	3	3	
3	UNDERSTOREY	4-5	4	
4	GRD. LAYER	6-7	4	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

		<10		10 – 24		25 – 50		>50
SIZE CLASS ANALYSIS:	O	<10	O	10 – 24	R	25 – 50	N	>50
STANDING SNAGS:	R	<10	O	10 – 24	R	25 – 50	N	>50
DEADFALL/LOGS:	O	<10	R	10 – 24	N	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	YOUNG	☒ MID-AGE	MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4	SOIL PROFILE
TEXTURE:					
DEPTH TO MOTTLES (g):					
DEPTH TO GLEY (G):					
DEPTH OF ORGANICS:					
DEPTH TO BEDROCK:					
MOISTURE REGIME:					

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE:
VEGETATION TYPE:		CODE: CUT 1
INCLUSION		CODE:
COMPLEX		CODE:

Notes:

- APPROX 30% LIVE CANOPY, HEIGHT ~15-20m ; HIGH DENSITY OF SHRUBS
- PICS @ 4:14 & 15

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL.
FRAAMER	O	O	R		
SALI FRAG	R	/	/		
FRAPENN	R	/	O		
JUG NIGR	R	/	/		
RUB IDSTR			R		
COR RACE			O		
SPICEBUSH			R		
TOX RYDB				O-A	
PHA CATH		O	A		
PAR VITA				A	

SPECIES CODE	LAYER 1	2	3	4	COLL.
CAREX (cf LEXTON)				O	
ELY STRI				O	
[illegible] STRI				O	
EQU ARVE				O	
GEU CANA				O	
SOL ALT				O	
SYM NOVA				R	
ERI ANNU				O	
PER VIRG				R	
LAP COMM					

ELC COMMUNITY DESCRIPTION & CLASSIFICATION

PROJECT NAME: 7602 | POLYGON: PLOT CUT. (EAST)

SURVEYOR(S): JTL | DATE: AUG 2-18 | PHOTO: 24

START: | END: | UTM:

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☒ MINERAL SOIL	☐ RIVERINE	☐ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN.	☐ BOTTOMLAND		☐ FLOATING-LVD.	☐ RIVER
	☐ ACIDIC BEDRK.	☐ TERRACE		☐ GRAMINOID	☐ STREAM
	☐ BASIC BEDRK.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
	☐ CARB. BEDRK.	☐ TABLELAND		☐ LICHEN	☐ SWAMP
SITE		☐ ROLL. UPLAND	COVER	☐ BRYOPHYTE	☐ FEN
☐ OPEN WATER		☐ CLIFF	☐ OPEN	☐ DECIDUOUS	☐ BOG
☐ SHALLOW WATER		☐ TALUS	☐ SHRUB	☐ CONIFEROUS	☐ BARREN
☐ SURFICIAL DEP.		☐ CREVICE / CAVE	☐ TREED	☐ MIXED	☐ MEADOW
☐ BEDROCK		☐ ALVAR			☐ PRAIRIE
		☐ ROCKLAND			☐ THICKET
		☐ BEACH / BAR			☐ SAVANNAH
		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	2	
2	SUB-CANOPY	3	3	
3	UNDERSTOREY	4	4	
4	GRD. LAYER	5-7	4	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m
CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤50% 4=CVR>50%

SIZE CLASS ANALYSIS:	O	<10	R	10 – 24	N	25 – 50	N	>50
STANDING SNAGS:	R	<10	N	10 – 24	N	25 – 50	N	>50
DEADFALL/LOGS:	R	<10	R	10 – 24	N	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	X YOUNG	MID-AGE	MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4	SOIL PROFILE
TEXTURE:					
DEPTH TO MOTTLES (g):					
DEPTH TO GLEY (G):					
DEPTH OF ORGANICS:					
DEPTH TO BEDROCK:					
MOISTURE REGIME:					

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE: CUT1
VEGETATION TYPE:		CODE:
INCLUSION		CODE:
COMPLEX		CODE:

Notes:

SPECIES CODE	LAYER 1	2	3	4	COLL.
RHACATH		O	O		
VITRIPA				R	
CRATAEGUS		O	O		
RHUS TYPH				R	
CORYLE			A		
LON XBEC			O		

SPECIES CODE	LAYER 1	2	3	4	COLL.
SOL CANA				R	
SYMPHORA				R	
PRUVIRG				O	
RHAVIRG				O	
SYMPHT. SP				O-A	
ERI STR1				O	
CAR SPIC				O	
RUMACET				R	
CENT. JACE				R	
INFOUDL				R	
PER VIRG				R	
POA SP.				O	
GLY STR1				R	
CIRCANA				R-O	
EQUCANA				O	
LAP COMM				R	
SOL ALT1				A	

- PICS @ 10:23 (JL)
- CANOPY HEIGHT ~ 12-15m, COVER ~ 15-20%
- NO DEAD ASH IN PLOT, THOUGH DIEBACK OBSERVED IN POLYGON

ELC
COMMUNITY DESCRIPTION & CLASSIFICATION

PROJECT NAME: 7602		POLYGON: PLOT CUM 25 (EAST)	
SURVEYOR(S): JTZ	DATE: AUG 2-18	PHOTO:	
START:	END:	UTM:	

POLYGON DESCRIPTION

SYSTEM	SUBSTRATE	TOPOGRAPHIC FEATURE	HISTORY	PLANT FORM	COMMUNITY
☐ TERRESTRIAL	☐ ORGANIC	☐ LACUSTRINE	☐ NATURAL	☐ PLANKTON	☐ LAKE
☐ WETLAND	☐ MINERAL SOIL	☐ RIVERINE	☐ CULTURAL	☐ SUBMERGED	☐ POND
☐ AQUATIC	☐ PARENT MIN.	☐ BOTTOMLAND		☐ FLOATING-LVD.	☐ RIVER
	☐ ACIDIC BEDRK.	☐ TERRACE		☐ GRAMINOID	☐ STREAM
	☐ BASIC BEDRK.	☐ VALLEY SLOPE		☐ FORB	☐ MARSH
SITE	☐ CARB. BEDRK.	☐ TABLELAND		☐ LICHEN	☐ SWAMP
☐ OPEN WATER		☐ ROLL UPLAND	COVER	☐ BRYOPHYTE	☐ FEN
☐ SHALLOW WATER		☐ CLIFF	☐ OPEN	☐ DECIDUOUS	☐ BOG
☐ SURFICIAL DEP.		☐ TALUS	☐ SHRUB	☐ CONIFEROUS	☐ BARREN
☐ BEDROCK		☐ CREVICE / CAVE	☐ TREED	☐ MIXED	☐ MEADOW
		☐ ALVAR			☐ PRAIRIE
		☐ ROCKLAND			☐ THICKET
		☐ BEACH / BAR			☐ SAVANNAH
		☐ SAND DUNE			☐ WOODLAND
		☐ BLUFF			☐ FOREST
					☐ PLANTATION

STAND DESCRIPTION:

	LAYER	HT	CVR	SPECIES IN ORDER OF DECREASING DOMINANCE (>>MUCH GREATER THAN; >GREATER THAN; = ABOUT EQUAL TO)
1	CANOPY	2	3	
2	SUB-CANOPY	3	4	
3	UNDERSTOREY	4-5	4	
4	GRD. LAYER	6-7	4	

HT CODES: 1=>25m 2=10<HT≤25m 3=2<HT≤10m 4=1<HT≤2m 5=0.5<HT≤1m 6=0.2<HT≤0.5m 7=HT<0.2m

CVR CODES: 0=NONE 1=0%<CVR≤10% 2=10<CVR≤25% 3=25<CVR≤60% 4=CVR>60%

SIZE CLASS ANALYSIS:	A	<10	O	10 – 24	R	25 – 50	N	>50
STANDING SNAGS:	R	<10	O	10 – 24	R	25 – 50	N	>50
DEADFALL/LOGS:	O	<10	R	10 – 24	R	25 – 50	N	>50

ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT

WOODLAND MATURITY:	YOUNG	Y MID-AGE	MATURE	OLD GROWTH

SOIL ASSESSMENT:	#1	#2	#3	#4	SOIL PROFILE
TEXTURE:					
DEPTH TO MOTTLES (g):					
DEPTH TO GLEY (G):					
DEPTH OF ORGANICS:					
DEPTH TO BEDROCK:					
MOISTURE REGIME:					

COMMUNITY CLASSIFICATION:

ECOSITE:		CODE: CUM1
VEGETATION TYPE:		CODE:
INCLUSION		CODE:
COMPLEX		CODE:

Notes: PICS @ 11:16 & 11:17
- CANOPY HEIGHT ~13-16M, COVER W/O CRATAEGUS ~35%
- FEW DEAD ASH, MANY SHOWING MODERATE DIEBACK

LAYERS: 1=CANOPY>10m 2=SUB-CANOPY 3=UNDERSTOREY 4=GROUND (GRD.) LAYER
ABUNDANCE CODES: N=NONE R=RARE O=OCCASIONAL A=ABUNDANT D=DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COLL
FRAPEN	R	O	O	O	
ACERAC	R	R	R		
CARLOBOV	R	R	R		
MAC POMI	R	R	R		
LIGVULG			R		
TOX RYDB				R	
RIB RUBE				R	
CORRACE			O		
RUB IDST.				R	
CRATAEGUS	R	D-A	O		
RHACATH	R	O	A		

SPECIES CODE	LAYER 1	2	3	4	COLL
SYMPHY SP.				O	
LAPCOMM				O	
EQUCAMA				O	
CIRCANA				O	
PRUVULG				R	
WILD COFFEE				R	
PENTH. SERRIDIS				R	
RHUS ACEI				R	
SPIRAEA STRI				R	

Woodland Analysis - Polygon 25

Stem Density Assessment

Plot #	Species	DBH (cm)				Total	Snags (no DBH)
		>20	13-20	6-12	≤5		
1	FRAPENN	1	2	7	61		
	Crataegus Sp.	3	2	12	6		
	Malus	1		1			
	ULMAMER	1	1				
	ACEFREE	1			1		
	MACLURA POMIFERA	3	1				
	FRAAMER			2			
	CAROBOV	1					
sum all		11	6	22	68	107	
sum, less exclusions		7	4	9	62	82	

ELC Code	CUW
Plot radius (m)	15
Plot area (ha)	0.07
Total plot area (ha)	0.07
Polygon area in footprint (ha)*	0.073
Polygon area total (ha)	0.66
% of surveyed polygon	96.84
% of overall polygon	10.71

Exclusion Trees:	Crataegus
	Malus
	PYRCOMM

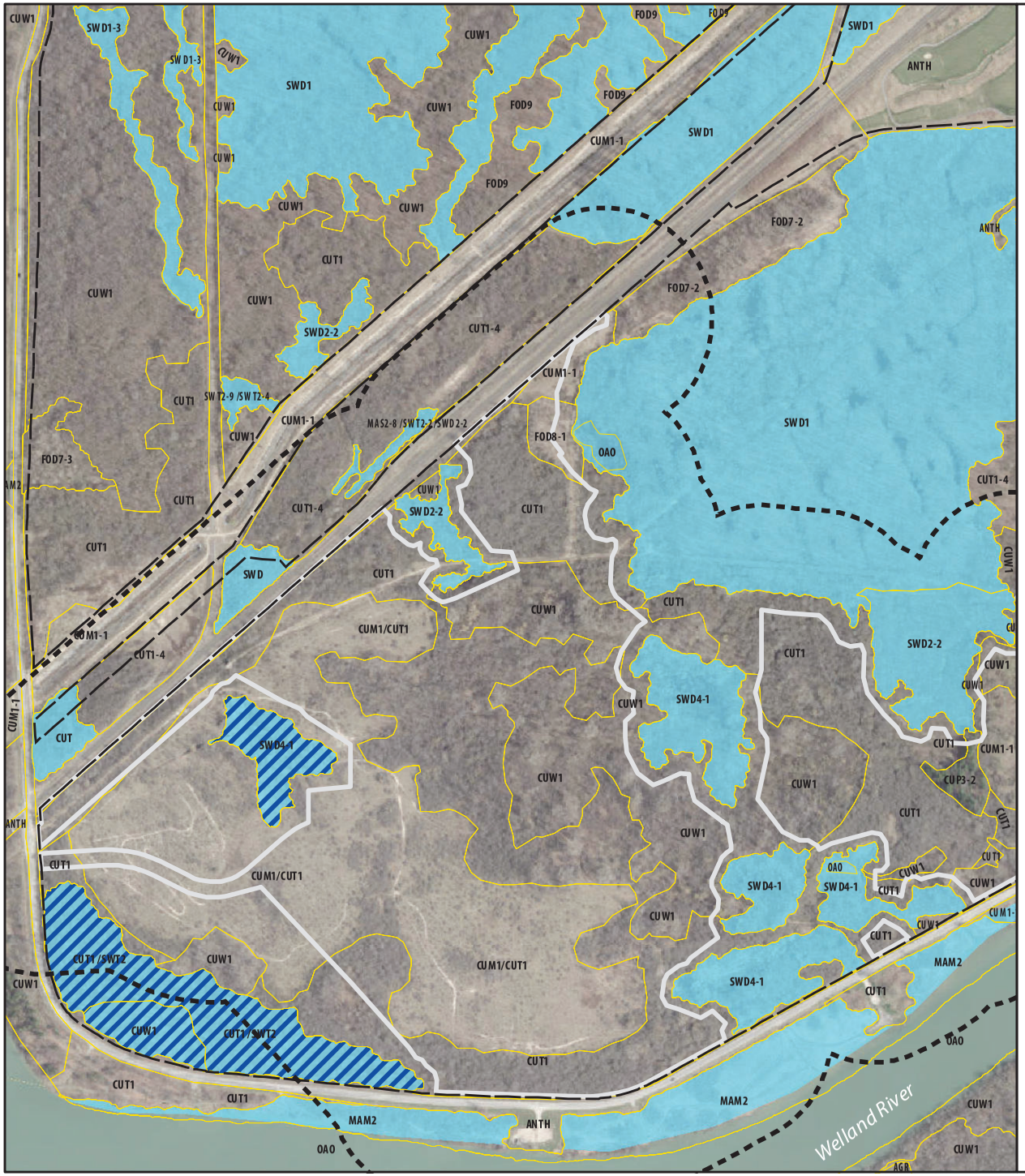
Woodland Analysis Criteria - Polygon 25

Analysis of All Trees (sum all)

Trees/ha	Criteria met? (all trees)	Woodland Criteria
1514	Yes	(a) 1,000 trees, of any size, per hectare,
311	No	(b) 750 trees, measuring > 5 centimetres in diameter, per hectare,
85	No	(c) 500 trees, measuring > 12 centimetres in diameter, per hectare, or
156	No	(d) 250 trees, measuring > 20 centimetres in diameter, per hectare,

Analysis of Assessed Trees without Exclusions (sum, less exclusions)

Trees/ha	Criteria met? (exclusions)	Woodland Criteria
1160	Yes	(a) 1,000 trees, of any size, per hectare,
127	No	(b) 750 trees, measuring > 5 centimetres in diameter, per hectare,
57	No	(c) 500 trees, measuring > 12 centimetres in diameter, per hectare, or
99	No	(d) 250 trees, measuring > 20 centimetres in diameter, per hectare,



Study Area

Riverfront Residential

Adjacent Lands (120 m from Riverfront Residential)

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Provincially Significant Wetland (MNRF)

Western PSW units with updated botanical inventory (2018)

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Enrironmental Impact Statement

Western PSW Units with Updated Botanical Inventory (2018)

0 100 Meters

N

SAVANTA

Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2018 11 17 EIS report figures\Appendix C\Western PSW Units with Updated Botanical Inventory (2018).mxd REVISED: November 28, 2018

Administrative Information

PROJECT NAME	ROUND	DATE & TIME	OBSERVER(S)
Riverfront	1	3 August 2018	CZ

Polygon Description

POLYGON NUMBER	SYSTEM	SITE	SUBSTRATE
CUT1/SWT1/CUW1			

TOPOGRAPHIC FEATURE	HISTORY	COVER

PLANT FORM

- [ ] Plankton
- [ ] Submerged
- [ ] Floating-LVD
- [ ] Deciduous
- [ ] Coniferous
- [ ] Bryophyte
- [ ] Graminoid
- [ ] Forb
- [ ] Lichen
- [ ] Mixed

COMMUNITY

- [ ] Marsh
- [ ] Swamp
- [ ] Fen
- [ ] River
- [ ] Bog
- [ ] Barren
- [ ] Meadow
- [ ] Prairie
- [ ] Forest
- [ ] Thicket
- [ ] Savannah
- [ ] Plantation
- [ ] Stream
- [ ] Lake
- [ ] Pond
- [ ] Woodland

Stand Description / Species in Decreasing Order of Dominance

LAYER	HT	CVR	#1	#2	#3	#4	#5
Canopy							
Sub-Canopy							
Understorey							
Ground Layer							

HT: 1= > 25m, 2= 10 < HT ≤ 25m, 3= 2 < HT ≤ 10m, 4= 1 < HT ≤ 2m ,5= 0.5 < HT ≤ 1m, 6= 0.2 < HT ≤ 0.5m , 7= HT < 0.2m
CVR: 0= None, 1= 0% < CVR ≤ 10% , 2= 10% < CVR ≤ 25%, 3= 25% < CVR ≤ 60%, 4= CVR > 60%

Feature Characterization

		< 10	10 - 24	25 - 41	> 50
Size Class Analysis	☐ Not Applicable				
Standing Snags	☐ Not Applicable				
Deadfall/Logs	☐ Not Applicable				

Woodland Maturity ☐ Young ☐ Mid-Age ☐ Mature ☐ Old-Growth

Soil Assessment

	#1	#2	#3	#4	
Effective Texture					
Depth to Mottles (cm)					
Depth to Gley (cm)					
Depth of Organics (cm)					
Depth to Bedrock (cm)					DEPTH OF SAMPLE (CM)
Moisture Regime					DEPTH TO WATER TABLE (CM)

Community Classification

CODE - CLASS/SERIES/ECOSITE

CODE - VEGETATION TYPE

TYPE	CODE

Add Row

Species List - Trees

SPECIES	LAYER 1	LAYER 2	LAYER 3	LAYER 4	NOTES
Fraxinus pennsylvanica					
Quercus bicolor					
Quercus palustris					
Carya ovata var. ovata					
Quercus alba					
Acer saccharinum					
Ulmus americana					
Populus tremuloides					
Quercus rubra					
Acer rubrum					

Add Row

Species List - Shrubs

SPECIES	LAYER 1	LAYER 2	LAYER 3	LAYER 4	NOTES
Rhamnus cathartica					
Cornus racemosa					
Crataegus sp.					
Vitis riparia					
Toxicodendron radicans var. radicans					
Viburnum lentago					
Viburnum opulus ssp. opulus					
Parthenocissus quinquefolia					
Ligustrum vulgare					
Rhamnus alnifolia					
Toxicodendron radicans var. rydbergii					
Ribes rubrum					
Viburnum rafinesquianum					
Ribes americanum					
Rosa multiflora					

Add Row

Species List - Herbs

SPECIES	LAYER 1	LAYER 2	LAYER 3	LAYER 4	NOTES
Prunella vulgaris ssp. vulgaris					
Symphyotrichum lateriflorum var. lateriflorum					
Persicaria virginiana					
Equisetum arvense					
Carex crinita var. crinita					
Scirpus atrovirens					
Fragaria virginiana ssp. virginiana					
Agrimonia gryposepala					
Apocynum androsaemifolium ssp. androsaemifolium					
Solidago altissima var. altissima					
Carex cristatella					
Lapsana communis					
Glyceria striata					
Onoclea sensibilis					
Eutrochium maculatum var. maculatum					
Lythrum salicaria					
Geum canadense					
Daucus carota					
Lycopus uniflorus					
Boehmeria cylindrica					
Solidago rugosa ssp. rugosa					
Carex stipata var. stipata					
Juncus torreyi					

Add Row

Species Alerts/Incidentals

Edit

Add incidental

COMMON OR LATIN NAME	QTY
	0

Add Row

Other Comments

Type comments for future reference

Administrative Information

PROJECT NAME	DATE	ROUND	TOTAL TIME	OBSERVER(S)
Riverfront	3 August 2018	1	Start Timer	CZ

Polygon Description

POLYGON NUMBER	SYSTEM	SITE	SUBSTRATE
SWD4-1-SpeciesList			

SW Feature in close proximity to Dorchester Rd and Railway Tracks

TOPOGRAPHIC FEATURE	HISTORY	COVER

PLANT FORM

- [ ] Plankton
- [ ] Submerged
- [ ] Floating-LVD
- [ ] Deciduous
- [ ] Coniferous
- [ ] Bryophyte
- [ ] Graminoid
- [ ] Forb
- [ ] Lichen
- [ ] Mixed

COMMUNITY

- [ ] Marsh
- [ ] Swamp
- [ ] Fen
- [ ] River
- [ ] Bog
- [ ] Barren
- [ ] Meadow
- [ ] Prairie
- [ ] Forest
- [ ] Thicket
- [ ] Savannah
- [ ] Plantation
- [ ] Stream
- [ ] Lake
- [ ] Pond
- [ ] Woodland

Stand Description

Species in Decreasing Order of Dominance

LAYER	HT	CVR	#1	#2	#3	#4
Canopy						
Sub-Canopy						
Understorey						
Ground Layer						

HT: 1= > 25m, 2= 10 <HT≤ 25m, 3= 2 <HT≤ 10m, 4= 1 <HT≤ 2m ,5= 0.5<HT≤1m, 6= 0.2 <HT ≤0.5m , 7= HT < 0.2m
CVR: 0= None, 1= 0% <CVR≤ 10% , 2= 10% <CVR≤ 25%, 3= 25% <CVR≤60%, 4= CVR>60%

Feature Characterization

		< 10	10 - 24	25 - 49	> 50
Size Class Analysis	☐ Not Applicable				
Standing Snags	☐ Not Applicable				
Deadfall/Logs	☐ Not Applicable				

Woodland Maturity ☐ Young ☐ Mid-Age ☐ Mature ☐ Old-Growth

Soil Assessment

	#1	#2	#3	#4	
Effective Texture					
Depth to Mottles (cm)					
Depth to Gley (cm)					
Depth of Organics (cm)					
Depth to Bedrock (cm)					DEPTH OF SAMPLE (CM)
Moisture Regime					DEPTH TO WATER TABLE (CM)

Community Classification

CODE - CLASS/SERIES/ECOSITE

CODE - VEGETATION TYPE

TYPE	CODE

Add Row

Species List - Trees

SPECIES	LAYER 1	LAYER 2	LAYER 3	LAYER 4	UTM	NOTES
Salix amygdaloi...						
Fraxinus pennsy...						
Ulmus americana						
Populus deltoid...						
Quercus palustris						
Carya ovata var....						
Salix x fragilis						

Add Row

Species List - Shrubs

SPECIES	LAYER 1	LAYER 2	LAYER 3	LAYER 4	UTM	NOTES
Cornus racemosa						
Rhamnus cathar...						
Crataegus sp.						
Salix bebbiana						
Vitis riparia						
Viburnum lentago						
Parthenocissus...						
Toxicodendron r...						
Viburnum opulu...						
Salix bebbiana						
Viburnum rafine...						
Rhamnus alnifolia						

Add Row

Species List - Herbs

SPECIES	LAYER 1	LAYER 2	LAYER 3	LAYER 4	UTM	NOTES
Agrostis gigantea						
Poa compressa						
Solidago juncea						
Solidago altissi...						
Centaurea jacea						
Equisetum arve...						
Hypericum perf...						
Prunella vulgari...						
						solidago nermoralis v....
Melilotus albus						
Eutrochium mac...						
Carex gracillima						
Symphyotrichu...						
Asparagus offici...						
Euthamia grami...						
Carex cristatella						
Rumex crispus						
Persicaria virgini...						
Juncus torreyi						
Melilotus officin...						
Solidago rugosa...						
Lycopus america...						
Cinna arundinacea						
Carex tribuloide...						
Carex vulpinoidea						
Epilobium parvi...						
Glyceria striata						
Penstemon digit...						
Carex flava						
Juncus dudleyi						
Onoclea sensibilis						

Add Row

Species Alerts/Incidentals

Add incidental

Edit

COMMON OR LATIN NAME	QTY
	0

Add Row

Other Comments

Type comments for future reference

VEGETATION SPECIES LIST FOR SWD2-2 AND SWD4-1 PSW UNITS CLOSEST TO THE RAILWAY (Riverfront Residential)

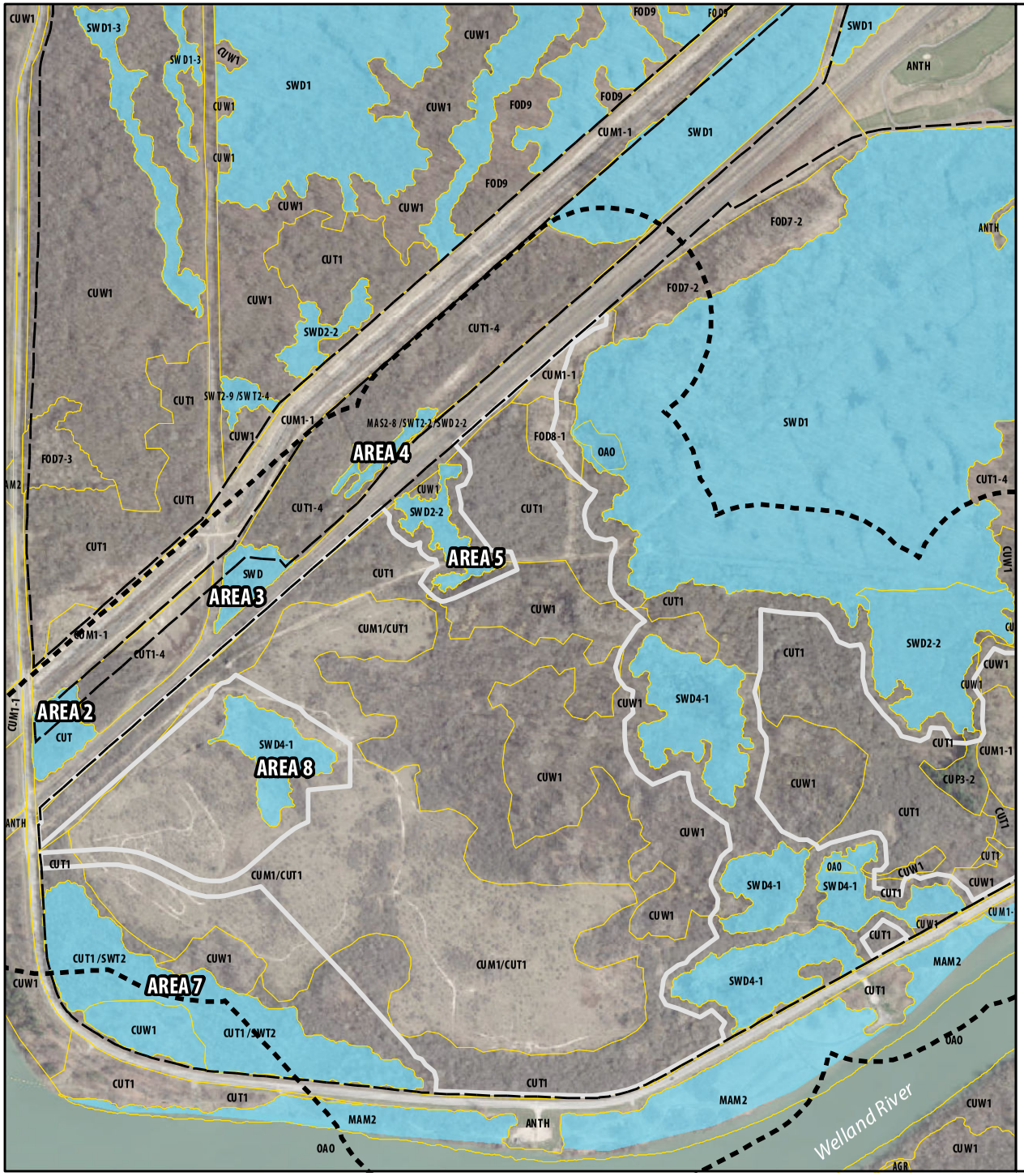
COMMON NAME	SCIENTIFIC NAME	PROVINCIAL STATUS (S-RANK)	GLOBAL STATUS (G-RANK)	COSSARO (MNRF)	COSEWIC (FEDERAL)	LOCAL STATUS NIAGARA (OLDHAM 2010)	AUTHORITY
Alder-Leaved Buckthorn	Rhamnus alnifolia	S5	G5			R	L'Héritier
American Water-Horehound	Lycopus americanus	S5	G5			C	Muhlenb. ex Bartram
Awl-Fruited Sedge	Carex stipata var. stipata	S5	G5			C	Muhlenb. ex Willdenow
Bebb's Willow	Salix bebbiana	S5	G5			C	Sargent
Blunt Broom Sedge	Carex tribuloides var. tribuloides	S4	G5			U	Wahlenberg
Brown Knapweed	Centaurea jacea	SNA	GNR			IU	L.
Calico Aster	Symphyotrichum lateriflorum var. lateriflorum	S5	G5T5			C	(L.) Á. & D. Löve
Canada Bluegrass	Poa compressa	SNA	GNR			IC	L.
Common Nipplewort	Lapsana communis	SNA	GNR			IC	L.
Common Self-Heal	Prunella vulgaris ssp. vulgaris	SNA	G5T?				L.
Common St. John's-Wort	Hypericum perforatum ssp. perforatum	SNA	GNR			IC	L.
Cranberry Viburnum	Viburnum opulus ssp. opulus	SNA	G5			IC	L.
Crested Sedge	Carex cristatella	S5	G5			U	Britton
Curled Dock	Rumex crispus	SNA	GNR			IC	L.
Dark-Green Bulrush	Scirpus atrovirens	S5	G5?			C	Willdenow
Downy Arrowwood	Viburnum rafinesquianum	S5	G5			U	Schult.
Dudley's Rush	Juncus dudleyi	S5	G5			C	Wiegand
Early Goldenrod	Solidago juncea	S5	G5			C	Aiton
Eastern Cottonwood	Populus deltoides ssp. deltoides	S5	G5T5			C	Bartram ex Marshall
Eastern Poison Ivy	Toxicodendron radicans var. radicans	S5	GNR			C	(L.) Kuntze
European Buckthorn	Rhamnus cathartica	SNA	GNR			IC	L.
European Privet	Ligustrum vulgare	SNA	GNR			IC	L.
European Red Currant	Ribes rubrum	SNA	G4G5			IC	L.
Field Horsetail	Equisetum arvense	S5	G5			C	L.
Fowl Mannagrass	Glyceria striata	S5	G5T5			C	(Lam.) Hitchcock
Fox Sedge	Carex vulpinoidea	S5	G5			C	Michaux

VEGETATION SPECIES LIST FOR SWD2-2 AND SWD4-1 PSW UNITS CLOSEST TO THE RAILWAY (Riverfront Residential)

COMMON NAME	SCIENTIFIC NAME	PROVINCIAL STATUS (S-RANK)	GLOBAL STATUS (G-RANK)	COSSARO (MNRF)	COSEWIC (FEDERAL)	LOCAL STATUS NIAGARA (OLDHAM 2010)	AUTHORITY
Foxglove Beardtongue	Penstemon digitalis	SNA	G5			U	Nutt. ex Sims
Fringed Sedge	Carex crinita var. crinita	S5	G5			C	Lamarck
Garden Asparagus	Asparagus officinalis	SNA	G5?			IC	L.
Graceful Sedge	Carex gracillima	S5	G5			C	Schweinitz
Grass-Leaved Goldenrod	Euthamia graminifolia	S5	G5			C	(L.) Nutt.
Grey Dogwood	Cornus racemosa	S5	G5?			C	Lamarck
Hooked Agrimony	Agrimonia gryposepala	S5	G5			C	Wallroth
Hybrid Crack Willow	Salix x fragilis	HYB	GNR			HYB	L.
Multiflora Rose	Rosa multiflora	SNA	GNR			IC	Thunberg
Nannyberry	Viburnum lentago	S5	G5			C	L.
New England Aster	Symphyotrichum novae-angliae	S5	G5			C	(L.) G.L. Nesom
Northern Red Oak	Quercus rubra	S5	G5			C	L.
Northern Water-Horehound	Lycopus uniflorus	S5	G5			C	Michaux
Peach-Leaved Willow	Salix amygdaloides	S5	G5			C	Andersson
Pin Oak	Quercus palustris	S4	G5			C	Münchhausen
Purple Loosestrife	Lythrum salicaria	SNA	G5			IC	L.
Red Ash	Fraxinus pennsylvanica	S4	G5			C	Marshall
Red Maple	Acer rubrum	S5	G5			C	L.
Redtop	Agrostis gigantea	SNA	G4G5			IC	Roth
Riverbank Grape	Vitis riparia	S5	G5			C	Michaux
Rough-Stemmed Goldenrod	Solidago rugosa ssp. rugosa	S5	G5T5			C	Miller
Sensitive Fern	Onoclea sensibilis	S5	G5			C	L.
Shagbark Hickory	Carya ovata var. ovata	S5	G5			C	(Miller) K. Koch
Silver Maple	Acer saccharinum	S5	G5			C	L.
Small-Flowered Willowherb	Epilobium parviflorum	SNA	GNR			IU	Schreber
Small-Spike False Nettle	Boehmeria cylindrica	S5	G5			C	(L.) Swartz
Spotted Joe Pye Weed	Eutrochium maculatum var. maculatum	S5	G5T5			C	(L.) E.E. Lamont
Spreading Dogbane	Apocynum androsaemifolium ssp. androsaemifolium	S5	G5T?			C	L.

VEGETATION SPECIES LIST FOR SWD2-2 AND SWD4-1 PSW UNITS CLOSEST TO THE RAILWAY (Riverfront Residential)

COMMON NAME	SCIENTIFIC NAME	PROVINCIAL STATUS (S-RANK)	GLOBAL STATUS (G-RANK)	COSSARO (MNRF)	COSEWIC (FEDERAL)	LOCAL STATUS NIAGARA (OLDHAM 2010)	AUTHORITY
Stout Woodreed	Cinna arundinacea	S4	G5			C	L.
Swamp White Oak	Quercus bicolor	S4	G5			C	Willdenow
Tall Goldenrod	Solidago altissima var. altissima	S5	GNR			C	L.
Thicket Creeper	Parthenocissus vitacea	S5	G5			C	(Knerr) Hitchcock
Torrey's Rush	Juncus torreyi	S5	G5			U	Coville
Trembling Aspen	Populus tremuloides	S5	G5			C	Michaux
Virginia Creeper	Parthenocissus quinquefolia	S4?	G5			U	(L.) Planchon ex DC.
Virginia Smartweed	Persicaria virginiana	S4	G5			C	(L.) Gaertner
Western Poison Ivy	Toxicodendron radicans var. rydbergii	S5	G5			C	(Small ex Rydberg) Erskine
White Avens	Geum canadense	S5	G5			C	Jacquin
White Elm	Ulmus americana	S5	G5?			C	L.
White Oak	Quercus alba	S5	G5			C	L.
White Sweet-Clover	Melilotus albus	SNA	GNR			IC	Medik.
Wild Black Currant	Ribes americanum	S5	G5			C	Miller
Wild Carrot	Daucus carota	SNA	GNR			IC	L.
Wild Strawberry	Fragaria virginiana ssp. virginiana	SU	G5T5				Miller
Yellow Sedge	Carex flava	S5	G5			R	L.
Yellow Sweet-Clover	Melilotus officinalis	SNA	GNR			IC	(L.) Pallas



Study Area

Riverfront Residential

Adjacent Lands (120 m from Riverfront Residential)

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Provincially Significant Wetland (MNRF)

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Enrironmental Impact Statement

PSW Lables for Soil Cards

0 100 Meters

N

SAVANTA

Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2018 11 17 EIS report figures\Appendix C\PSW Labels for Soil Cards.mxd REVISED: November 26, 2018

Area 2

ELC

SOILS ONTARIO

SITE: TW
POLYGON: Area 2
DATE: July 18/18
SURVEYOR(S): OP AS RR

	P/A	PP	Dr	Position	Aspect	Slope %	Slope Type	Slope Class	UTM Z	UTM EASTING	UTM NORTHING
1	A	6	5	6	1	1	Structureless	\	17	653580	4768137
2	D	6	6	6	1	1	Structureless	\	17	653547	4768043
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE & HORIZON	Silty Clay	Silty Clay / * / Clay	34 38		
A TEXTURE	SiCl	SiCl			
COURSE FRAGMENTS	\	\			
B TEXTURE	\	*			
COURSE FRAGMENTS	\	\			
C TEXTURE	\	Cl			
COURSE FRAGMENTS	\	\			
EFFECTIVE TEXTURE	SiCl	SiCl			
SURFACE STONINESS	\	\			
SURFACE ROCKINESS	\	\			
DEPTH TO / OF					
MOTTLES	10 cm	14cm			
GLEY	\	38			
BEDROCK	\	\			
WATER TABLE	\	\			
CARBONATES	\	\			
DEPTH OF ORGANICS	\	*			
PORE SIZE DISC #1	\	\			
PORE SIZE DISC #2	\	\			
MOISTURE REGIME	3-5	5 - Moist			
SOIL SURVEY MAP					
LEGEND CLASS					

18cm

very loose; poor structure → fill!

igneous rock @surface → railway?

* 3 test pits; densley vegetated w buckthorn, algae identified

ELC PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COL.

ELC
SOILS ONTARIO

SITE: Riverfront 7602
POLYGON: Area 3
DATE: July 18/18
SURVEYOR(S): OP, AS + RR

	P/A	PP	Dr	Position	Aspect	Slope %	Slope Type	Slope Class	UTM Z	UTM EASTING	UTM NORTHING
1	A	4	5	4	1	1	Structureless	–	17	653779	4768243
2	A	6	5	4	1	1	Structurless	–	17	653772	4768279
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE + HORIZON	6cm Org(L) / Silty Clay Loam (Root nodules 25cm) / 29cm Silty Clay / 54	Organic (L) 3cm / Silty Clay / 36cm			
A TEXTURE	Organic (L)	Organic (L)			
COURSE FRAGMENTS	Ø	/			
B TEXTURE	SiClLo	SiCl			
COURSE FRAGMENTS	Ø	/			
C TEXTURE	SiCl	\			
COURSE FRAGMENTS	Ø	\			
EFFECTIVE TEXTURE	SiClLo	SiCl			
SURFACE STONINESS	Ø	\			
SURFACE ROCKINESS	Ø	\			
DEPTH TO / OF					
MOTTLES	8cm	6cm			
GLEY	Ø	\			
BEDROCK	Ø	\			
WATER TABLE	Ø	\			
CARBONATES	Ø	\			
DEPTH OF ORGANICS	6	3cm			
PORE SIZE DISC #1	Ø	\			
PORE SIZE DISC #2	Ø	\			
MOISTURE REGIME	2	3-V. fresh			
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COL.

*Anoxic; visible tho @surface adjacent to cores

Area 4

ELC

SOILS ONTARIO

SITE: TW
POLYGON: Area 4
DATE: July 18/19
SURVEYOR(S):

	P/A	PP	Dr	Slope: Position	Slope: Aspect	Slope: %	Slope: Type	Slope: Class	UTM: Z	UTM: EASTING	UTM: NORTHING
1	A	5	7	4	1	1	Structure	—	17	653935	4768405
2	A	5	7	4	1	1	Structure	—	17	653906	4768365
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE + HORIZON	(L) ∇ Organics, 3cm; Clay Loam, 38cm; Clay, 63cm	Organics(F), 40cm; Clay, 72cm			
A TEXTURE	Organic(L)	Organic(F)			
COURSE FRAGMENTS	—	—			
B TEXTURE	ClLo	Clay			
COURSE FRAGMENTS	—	—			
C TEXTURE	Cl	—			
COURSE FRAGMENTS	—	—			
EFFECTIVE TEXTURE	Clay Loam	Clay			
SURFACE STONINESS	—	—			
SURFACE ROCKINESS	—	—			

DEPTH TO / OF

	1	2	3	4	5
MOTTLES	28cm	44 cm			
GLEY	58cm	—			
BEDROCK	—	—			
WATER TABLE	3cm	5cm			
CARBONATES	—	—			
DEPTH OF ORGANICS	3cm	40cm			
PORE SIZE DISC #1	—	—			
PORE SIZE DISC #2	—	—			
MOISTURE REGIME	9-V.wet	9-V wet			
SOIL SURVEY MAP					
LEGEND CLASS					

ELC

PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COL.	SPECIES CODE	LAYER 1	LAYER 2	LAYER 3	LAYER 4	COL.

Area 5

ELC

SOILS ONTARIO

SITE: Riverfront (8125)
POLYGON: Area 5
DATE: July 18 19
SURVEYOR(S): SP, RR, HS

Slope / UTM

	PHA	PP	Dr	Position	Aspect	%	Type	Class	Z	EASTING	NORTHING
1	A	5	5	4	1	1	Boreholes	—	17	654048	4768355
2	A	5	5	4	1	1	Structures	—	17	654046	4768247
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE / HORIZON	Silty clay loam	Silty clay / Clay	7cm		
	29cm				
	Silty clay		~70cm		
	51cm				
A TEXTURE	SiCLo	SiCl			
COURSE FRAGMENTS	Ø	—			
B TEXTURE	SiCl	Cl			
COURSE FRAGMENTS	Ø	—			
C TEXTURE	—	—			
COURSE FRAGMENTS	—	—			
EFFECTIVE TEXTURE	SiCLo	SiCl			
SURFACE STONINESS	Ø	—			
SURFACE ROCKINESS	Ø	—			
DEPTH TO / OF					
MOTTLES	7cm	8cm			
GLEY	NA	28cm			
BEDROCK	NA	—			
WATER TABLE	NA	—			
CARBONATES	Ø	—			
DEPTH OF ORGANICS	Ø	—			
PORE SIZE DISC #1	—	—			
PORE SIZE DISC #2	—	—			
MOISTURE REGIME	3	6 - V. moist			
SOIL SURVEY MAP					
LEGEND CLASS					

ELC PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.

SPECIES CODE	LAYER 1	2	3	4	COL.

( )

Area 7

ELC
SOILS ONTARIO

SITE: 7602
POLYGON: SWD2-2 (SWD2-2)
DATE: Aug 9 2018
SURVEYOR(S): LW & MG

	P/A	PP	Dr	Position	Aspect	Slope %	Slope Type	Slope Class	UTM Z	UTM EASTING	UTM NORTHING
SC5	A	5	5	4	/	27	straight	/	17	653342	4767703
SC30	A	5	6	4	/	41		/	17	653594	4767802
3											
4											
6											

SOIL	1	2	3	4	5
TEXTURE x HORIZON	loam 14cm clay loam 49	clay loam 60 ~~clay~~ loamy ~~clay~~ clay.			
A TEXTURE	L	CL			
COURSE FRAGMENTS	/				
B TEXTURE	CLL	LC			
COURSE FRAGMENTS	/	/			
C TEXTURE	/	/			
COURSE FRAGMENTS	/	/			
EFFECTIVE TEXTURE	clay Loam	Loamy clay.			
SURFACE STONINESS	/	/			
SURFACE ROCKINESS	/	/			
DEPTH TO / OF					
MOTTLES	14cm	51			
GLEY	41cm	51			
BEDROCK	/	/			
WATER TABLE	/	/			
CARBONATES	/	/			
DEPTH OF ORGANICS	/	/			
PORE SIZE DISC #1	/	/			
PORE SIZE DISC #2	/	/			
MOISTURE REGIME	v.v. moist & Mod	Moist			
SOIL SURVEY MAP					
LEGEND CLASS					

ELC
PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYERS: 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GRD.) LAYER
ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.

SPECIES CODE	LAYER 1	2	3	4	COL.

Area 8

ELC

SCHLS ONTARIO

SITE: 7602
POLYGON: SWD4-1
DATE: AUG 10 2018
SURVEYOR(S): LW MG.

	P/A	PP	Dr	Position	Aspect	Slope %	Type	Class	Z	UTM EASTING	UTM NORTHING
SC1	A	4	4	5	/	3%		/	17	653802	4768068
SC2	A	2	5	5	/	2%		/	17	653845	4768057
3											
4											
5											

SOIL	1	2	3	4	5
TEXTURE & HORIZON	clayey loam PP1	clayey loam 12cm			
17	sand vf. PP2	sand vf. 49cm			
62	sandy clay. PP4	sandy clay			
83					
A TEXTURE	clayey loam	clayey loam			
COURSE FRAGMENTS					
B TEXTURE	sand (fine)	sand vf.			
COURSE FRAGMENTS					
C TEXTURE	sandy clay	sandy clay.			
COURSE FRAGMENTS					
EFFECTIVE TEXTURE	sandy clay vf sand.				
SURFACE STONINESS					
SURFACE ROCKINESS	/	/			
DEPTH TO / OF					
MOTTLES	65 cm	17cm			
GLEY	65 cm	49cm			
BEDROCK	/	/			
WATER TABLE	/	/			
CARBONATES	/	/			
DEPTH OF ORGANICS	/	/			
PORE SIZE DISC #1	/	/			
PORE SIZE DISC #2	/	/			
MOISTURE REGIME	3 v. fresh	5 moist			
SOIL SURVEY MAP					
LEGEND CLASS					

ELC

PLANT SPECIES LIST

SITE:
POLYGON:
DATE:
SURVEYOR(S):

LAYER(S): 1 = CANOPY 2 = SUB-CANOPY 3 = UNDERSTOREY 4 = GROUND (GND.) LAYER

ABUNDANCE CODES: R = RARE O = OCCASIONAL A = ABUNDANT D = DOMINANT

SPECIES CODE	LAYER 1	2	3	4	COL.

SPECIES CODE	LAYER 1	2	3	4	COL.

Appendix D – Conceptual Ecological Restoration Plan

SAVANTA

Riverfront Community Natural Heritage System

Conceptual Ecological Restoration Plan

JANUARY 2019

SAVANTA

Riverfront Community Natural Heritage System

Conceptual Ecological Restoration Plan

REPORT PREPARED FOR

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Table of Contents

1.0 INTRODUCTION

This Conceptual Ecological Restoration Plan (CERP) provides details regarding the impact mitigation, restoration and enhancement program associated with the proposed Riverfront Residential development. This Plan has been prepared as input to the successful establishment of a viable Settlement Area NHS. The limits of the GR (CAN) Riverfront Residential lands, including the proposed NHS, are depicted within the approved OPA 128 and are shown on **Figure 1** (**Appendix D1**).

The establishment of an NHS in a Settlement Area requires an understanding of a number of important objectives, including the need for:

- Long Term Core Natural Area Protection;
- Appropriate Linkages and Connections;
- Viability and Sustainability of Natural Features and Functions; and
- Compatibility and Integration with Healthy, Livable and Safe Communities.

This CERP provides more detail regarding how these NHS and ecological objectives will be achieved. These measures have considered the need to create refugia for species and habitats that may be affected by aspects of climate change (e.g., those that are less tolerant to extended periods of drought). Specific consideration was also given to the importance of better understanding, integrating and managing relationships and interactions amongst community residents, visitors and the NHS. Rather than an NHS serving simply as a repository for nature conservation, fenced off and managed with limited human access, it is important to consider an NHS in terms of a resource that interacts with and contributes to healthy communities.

The proposed Riverfront NHS includes a variety of natural heritage feature types, including: provincially significant wetland, significant wildlife habitat, significant woodlands, and habitat of threatened and endangered species. As explained in the Riverfront Residential Block Plan EIS (cover document to this Appendix), the limits of the development footprint avoid and minimize impacts to significant natural features and associated functions and concentrate proposed development in areas of greater disturbance, where vegetation communities and fauna assemblages are generally reflective of highly altered soil/topographic conditions. Ecological enhancement and restoration opportunities have been developed with an understanding of the current and historic ecological features and functions within the Subject Lands.

This CERP addresses the retention, restoration and enhancement of biodiversity, and the promotion of a viable and sustainable NHS. This will be achieved through the: creation of a variety of habitats (general and specialized); establishment of protective and restored buffers; propagation and increase in populations of species at risk; and

the development and integration of a Wetland Discovery Centre. That Centre will in part manage access to the NHS, while at the same time educating community residents and visitors of the important benefits we derive from natural areas (i.e., ecosystem goods and services).

The objectives of this Conceptual Ecological Restoration Plan are defined in detail in **Table D.1** (**Appendix D2**) and are summarized in the following list:

- Create a viable, connected NHS with appropriate core natural areas, linked together in a manner to support internal and external ecological connections;
- Ensure the NHS is adapted to Settlement Area conditions and that it possesses a level of resilience in the face of climate change;
- Enhance retained woodlands and wetlands through invasive species management and native plantings;
- Protect and enhance Species at Risk habitat and significant wildlife habitat;
- Create habitat to serve the life processes of turtles, open-wetland amphibian species and odonates; and
- Implement measures to manage post-development human use and associated potential impacts.

Details regarding the project background/history, existing ecological conditions, impact assessment and associated mitigation are provided in the Riverfront Residential EIS (cover document to this Appendix). Section 2 of this CERP summarizes existing conditions on the Subject Lands, both within the proposed development areas and within the retained NHS where restoration activities are proposed to occur. Restoration areas are illustrated on **Figure 2** (**Appendix D1**) and are described in sections 3 to 5. The conceptual NHS trail network is described in section 6. The proposed Riverfront Wetland Discovery Centre and a Native Plant Nursery are discussed in sections 7 and 8, respectively.

2.0 EXISTING ECOLOGICAL CONDITIONS

2.1 Background

The following studies were referenced in the preparation of this CERP:

- Preliminary Natural Heritage Characterization (Draft), Thundering Waters Secondary Plan, Dougan & Associate November 2015;
- Characterization and Environmental Impact Study, Thundering Waters Secondary Plan, Dougan & Associates June 2016;
- Response to Peer Review Comments, Dougan & Associates July 27, 2016;
- Environmental Impact Study, Savanta Inc. September 2017;
- Environmental Impact Study Addendum, Riverfront Community OPA, Savanta Inc. March 2018; and
- Riverfront Residential Block Plan Environmental Impact Statement, Savanta Inc, November 2018.

2.2 Physical Setting

The Subject Lands are situated in the Haldimand Clay physiographic region (Chapman and Putnam 1984). The Lower Welland River and South Niagara Falls watersheds generally possess low groundwater vulnerability due to the thick deposits of the Haldimand Clay Plain (NPCA 2012), resulting in poorly drained lands. The surface horizons range from 15 cm to 20 cm deep and have a clay loam to clay texture while subsoils are heavy clay.

2.3 Biological Setting

The Subject Lands occur within the Carolinian or Deciduous Forest Zone, at the northern geographic limit of many warmer climate vegetation species. Dominant upland vegetation communities found within this zone include maple-beech-elm-basswood and butternut-chestnut-white ash-black cherry. The lowland vegetation communities in the Carolinian or Deciduous Forest Zone are dominated by single species such as white cedar, willow, tamarack, alder, red or silver maple or black ash (Rowe 1972). There are also a variety of locally rare species known in the vicinity of the Subject Lands, including Black Gum (*Nyssa sylvatica*) and Pignut Hickory (*Carya glabra*).

2.3.1 Ecological Land Classification and Botanical Inventory

2.3.1.1 Existing Vegetation Communities

The Subject Lands contain a mix of natural and disturbed features, the former being associated with older woodlands which exhibit the typical slough ridge topography associated with the Haldimand Clay Plain. Within the Subject Lands, the more intact forest cover is concentrated in the oak mineral deciduous swamps (SWD1) located within the NHS (based upon historical aerial photograph review). These more intact forested areas exhibit relatively fewer signs of disturbance aside from some trails, debris disposal and some evidence of hunting.

The proposed development area exhibits a relatively higher degree of disturbance, with evidence of substantial grading and filling associated with the historic alteration of the original Welland River alignment, fill deposition from the creation of the Chippewa Power Canal and the Conrail Drain, the rail line installation and operation, and associated deforestation. Broad areas of disturbed lands include an early successional matrix of cultural woodland (in-decline due to Emerald Ash Borer), cultural thicket, and old-field meadows. The cultural woodland and cultural thicket areas contain abundant Common Buckthorn, which is a highly invasive shrub species.

There is one provincially rare vegetation community within the Oak Mineral Deciduous Swamp (SWD1) within the NHS. Buttonbush Mineral Deciduous Thicket Swamp (SWT2-4) occurs as small inclusions within some sections of slough inside the SWD1, specifically occupying some sections of slough within the swamp. SWT2-4 is provincially rare (S3) and apparently secure at the global level (G4; NHIC 2013). This rare vegetation community will be retained and can serve as a potential location for the sustainable harvest of propagules (e.g., seeds, cuttings).

2.3.1.2 Plant Species and Habitats

One Species at Risk plant was found on the Subject Lands, outside the development area: Dense Blazing Star (*Liatris spicata var. spicata*), which is Threatened in Ontario and Canada. This species does not occur naturally in Niagara and populations in this area are considered introduced (Oldham 2010). This will be confirmed with MNRF through the Information Gathering Form process.

Two provincially rare plants occur in the retained NHS:

- Schreber's Aster (*Eurybia schreberi)* - S2, G4 (NHIC 2016), located in the large oak mineral deciduous swamp (SWD1) in the centre of the Subject Lands; and

- Honey-locust (*Gleditsia triacanthos*) – S2?, G5 (NHIC 2016), located in the oak mineral deciduous swamp (SWD1) within a ravine at the east end of the Subject Lands.

One provincially rare plant occurs in the proposed west development area: Great Plains Ladies'-tresses (*Spiranthes magnicamporum*) (S3? G4; NHIC 2016). This species was found in open, early-successional vegetation communities on disturbed soils.

Various significant wildlife habitat types specific to provincially rare plants and rare vegetation communities/older growth forest, are present within the retained NHS. One SWH type is present within the proposed residential area - the rare species SWH type. The presence of that habitat (with Great Plains Ladies'-tresses) is present in the proposed west development area.

Three other species with a high coefficient of conservatism (values of 9 or 10) were recorded within the Subject Lands: Pin Oak (*Quercus palustris)*, Elk Sedge (*Carex garberi*), and Drooping Sedge (*Carex prasina*). The latter two species occur only within significant wetland units that will be retained. Pin Oak occurs within a variety of the retained vegetation types and some Pin Oak stems occur within the proposed development areas. A Tree Saving Plan, completed at the draft plan stage by a qualified arborist, will identify Pin Oak stems suitable for retention within the Riverfront Residential area.

As detailed in the EIS, a variety of locally rare plant species occur within the retained significant wetlands, with some species occurring both within PSW units and within proposed development areas. Five locally rare (Oldham 2010) plant species, listed below, occur on the Subject Lands only within ELC polygons that are proposed for partial or complete removal. Mitigation measures are provided in the EIS and summarized below. Further detail is provided in section 5 regarding flora salvage.

- Great Plains Ladies'-tresses – transplant to secure, permanent native meadow;
- Creeping Spike-rush (*Eleocharis palustris)* – collect and distribute seed in appropriate habitat*;*
- American Plum (Prunus americana) – plant nursery stock;
- Woolly Sedge (*Carex pellita*) – collect and distribute seed in appropriate habitat; and
- Yellow Indian-grass (*Sorghastrum nutans*) – include this species in groundcover terraseed mix to be applied in native meadow restoration areas.

2.3.2 Wildlife Species and Habitats

The EIS provides a detailed account of Species at Risk (SAR) and species of conservation concern. In summary, nine Species at Risk (SAR) fauna were recorded within the Subject Lands:

- Little Brown Myotis *(Myotis lucifugus)* – Endangered in Ontario and Canada;
- Northern Myotis (*Myotis septentrionalis*) – Endangered in Ontario and Canada;
- Small-footed Myotis (*Myotis leibii)* – Endangered in Ontario and Canada;
- Acadian Flycatcher (*Empidonax virescens*) – Endangered in Ontario and Canada;
- Barn Swallow (*Hirundo rustica*) – Threatened in Ontario and Canada;
- Monarch (*Danaus plexippus*) – Special Concern in Ontario and Endangered in Canada;
- Wood Thrush (*Hylocichla mustelina*) – Special Concern in Ontario and Threatened in Canada; and
- Eastern Wood-Pewee (*Contopus virens*) – Special Concern in Ontario and Canada; and
- Snapping Turtle (*Chelydra serpentina*) – Special Concern in Ontario and Canada.

Special Concern species are addressed as part of significant wildlife habitat analysis, which is summarized briefly below. Species at Risk will be addressed with the MNRF in detail through the *Information Gathering Form* process.

A variety of significant wildlife habitat types specific to fauna are present within the retained NHS. As discussed in the EIS, no SWH types for fauna are present within the proposed development areas.

Four fauna species recorded on the Subject Lands are considered locally rare (NPCA 2010):

- Tufted Titmouse *(Baeolophus bicolor);*
- Yellow-throated Vireo *(Vireo flavifrons);*
- Acadian Flycatcher *(Empidonax virescens);* and
- Blue-spotted Salamander (*Ambystoma laterale*).

These four, wildlife species were recorded within retained wetlands/woodlands. Low numbers of Blue-spotted Salamander were also recorded within portions of the proposed west development during early spring movement between overwintering habitat and breeding areas (no suitable breeding habitat is present within the proposed development areas).

2.3.3 Vegetation/Habitat Proposed for Removal

Development of the Subject Lands has been planned in a manner that avoids removal of significant wetlands and habitat of threatened and endangered species; and minimizes the removal of significant woodland and significant wildlife habitat.

Removal of rare species SWH for the provincially rare plant Great Plains Ladies'-tresses is proposed - this species' occurrence overlaps with portions of the west development area and it will not be sustained as thicket and woodland cover succeeds over the disturbed meadow. A transplantation and propagation program is proposed to relocate and expand this plant population into a permanently secure, native meadow restoration area inside the NHS. This meadow will be managed to prevent/halt successional advancement, allowing the species to persist over the long term.

A portion of significant woodland (7.27 ha) is proposed for removal. This area is comprised of cultural woodland in severe/advancing decline due to loss of the tree canopy layer to Emerald Ash Borer, and the invasion of the understory by the exotic shrub Common Buckthorn. These cultural woodland patches will not meet significant woodland criteria in the near-term (two to five years) due to the loss of tree density in these ash-dominated areas. Woodland restoration is proposed to demonstrate no negative impact.

Below, a summary is provided of the area of vegetation types proposed for removal to implement this development:

- Cultural woodland in declining health that will not meet significance criteria in the near-term: 7.27 ha;
- Treed patches that do not meet significant woodland criteria under existing conditions (certain cultural woodland and cultural plantation patches): 0.73 ha; and
- Early successional vegetation (cultural thicket, cultural meadow, disturbed cultural meadow): 31.70 ha.

The restoration areas within the NHS target the replacement of low-quality Common Buckthorn/Hawthorn shrub thickets – situated adjacent to retained natural features - with the establishment of the vegetation community types listed below. These restoration trajectories are intended to establish over the next five to 30 years. The restoration treatment types are described in detail in section 3 and **Appendix D2** and include woodland restoration treatments (types WR1 to WR5), native meadow restoration treatments (types NM1 to NM3), and the creation of two open wetlands. In addition, buffer planting treatments (types BP1 and BP2) are proposed for two

PSWs located outside of OPA 128 on other lands owned by the applicant that front the proposed development. Those restoration treatments include:

- Woodland restoration areas (WR1 to WR5): 7.4 ha;
- Permanent native meadow restoration areas (NM1 to NM3): 2.4 ha;
- Created open wetlands: 0.1 ha (final size to be determined through refinement at the stormwater management plan stage based on water availability to sustain each wetland); and
- Buffer plantings on other lands owned by the applicant (BP1 and BP2): 1.75 ha.

3.0 ECOLOGICAL RESTORATION AREAS & TREATMENT TYPES

Restoration areas have been identified where the tree canopy layer has died back, is in a stage of severe/advancing decline due to Emerald Ash Borer (EAB), and/or Common Buckthorn warrants management. The decline and/or absence of the forest canopy layer has facilitated the establishment and spread of shrub thicket in the understory that contains a high density of Common Buckthorn (*Rhamnus cathartica*) and, to a lesser extent, Glossy Buckthorn (*Rhamnus frangula*). Both of these shrub species are highly invasive (Category 1 invasive; Urban Forest Associates 2002). Without intervention, the rapid decline of the Ash canopy layer on the Subject Lands and the abundance of Common Buckthorn will continue to hamper the establishment of healthy, native forest cover in these areas.

The restoration measures outlined in this plan are designed to help establish an ecological trajectory that favours the recovery of native woodland and meadow communities. Woodland and native meadow restoration areas are illustrated on **Figure 3** (**Appendix D1**). Restoration within these areas will occur in two phases. Multi-year Common Buckthorn management will be conducted first to remove/control this highly invasive shrub and then native plantings will be installed. The following sections outline the approaches proposed for Common Buckthorn management and for native plant re-establishment. Additional measures are then discussed regarding to limit disturbance within the restoration areas and adjacent, retained woodlands/wetlands.

3.1 Common Buckthorn Management

The following characteristics of Common Buckthorn were considered when selecting suitable treatment options to manage this invasive species within the restoration areas:

- The high invasive success of Common Buckthorn is largely attributed to its high metabolic rate and litter production facilitating the relatively rapid transformation of its growing environment. Common Buckthorn uses allelopathic properties to alter soil nitrogen concentrations (CVC 2016). This is accomplished through the development of leaves with high nitrogen content that allow Common Buckthorn to accelerate rates of photosynthesis and growth. Common Buckthorn further extends its growing season through the use of an early leaf flush and late leaf drop (University of Minnesota 2016). The nitrogen-rich leaf litter often decomposes and can destroy fungi, beneficial to other plant species, causing a shift in ecosystem processes (MDNR 2012; Knight et al. 2007).

- Juglone, an allelopathic chemical used by members of the *Juglandaceae* family (species include Black Walnut and Butternut trees), has toxic properties that affect adjacent vegetation. One symptom of exposure to Juglone in susceptible plants is respiratory inhibition leading to decreased metabolic activity. Depending on the sensitivity of the plant species, respiratory inhibition can result in stunted growth, wilting or death (Pascoe 2002). Common Buckthorn is not tolerant of Juglone, therefore, the application of Juglone-containing mulch to removal sites may further discourage the recolonization of Common Buckthorn if used in conjunction with Juglone-tolerant, native shrub underplantings.

- Well-established Common Buckthorn stands will contain a prolific seed bank; native underplantings will provide competition with this seed bank and, with time, create shading that can further reduce the colonization of Common Buckthorn (UTRCA 2016). In large treatment areas where a strategic approach may be required, fruit-bearing (female) Common Buckthorn shrubs should be the highest priority for removal in order to combat further establishment of the seed bank. The female trees are best identified in late autumn when the fruits are readily visible. This step is then followed by the removal of male plants and re-treating any regrowth.

- The removal of Common Buckthorn in large, open environments is a multi-year process that can require several different removal techniques. Identifying the degree of treatment is guided by the Ontario Invasive Plant Council Best Management Practices for this species (Anderson 2012).

Management areas that will target Common Buckthorn are illustrated on **Figure 4** (**Appendix D1**). Two treatment types have been selected, both of which follow "The Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) Publication 75, Guide to Weed Control 2012-2013" (Anderson 2012). For both treatment types:

- All Common Buckthorn material is to be removed from the Subject Lands and landfilled;
- Ideally, Common Buckthorn treatment should occur in the spring (before native plant leaf out) or fall, however, treatment timing may be adjusted since MNRF requires that herbicide application in/near wetlands occur when no standing water is present;
- Following the first treatment, monitoring and repeated cutting/herbicide application will occur twice annually (if needed) for two to four years; and
- Native plants will be installed at the end of this period – detailed native planting prescriptions are provided for woodland restoration in **Table D.2**, native meadow restoration in **Table D.3**, and cover crops in **Table D.5** (**Appendix D2**).

Type 1 Common Buckthorn Treatment

Targeted areas for his treatment are illustrated by green-shaded areas on **Figure 4** (**Appendix D1**): This approach is suited to areas with low to moderate Common Buckthorn density and/or in areas that are more ecologically sensitive. Type 1 treatment areas are located within: retained upland woodland patches; buffer lands within 7.5 m of a significant wetland boundary; and the entire 20 m buffer applied to the large Oak Mineral Deciduous Swamp (SWD1), in the centre of the Subject Lands.

The Type 1 approach retains existing, native vegetation to the extent feasible. Common Buckthorn stems are to be cut with chainsaws and then the cut stems are to be immediately treated with herbicide (glyphosate). For Common Buckthorn seedlings, a targeted foliar spray can be used (i.e., wicking method).

Select areas within the Type 1 treatment area will have Juglone-containing mulch or leaf litter applied within Common Buckthorn treatment sites to a depth of 25 cm to 30 cm.

Type 2 Common Buckthorn Treatment

Targeted areas for his treatment are illustrated by orange-shaded areas on **Figure 4** (**Appendix D1**): The Type 2 treatment approach is well-suited to areas where the tree canopy layer is in severe/advancing decline (due to EAB) and where Common Buckthorn abundance is high. This approach relies upon heavy machinery. Type 2 treatment areas are located within: the outer half of significant wetland buffers (with the exception of the large SWD1 in the centre of the Subject Lands where only type 1 treatment is applied); and all other restoration areas that do not meet the location criteria for the Type 1 treatment.

The majority of existing vegetation will be cleared, for the Type 2 approach, in order to provide effective Common Buckthorn control. Several protective measures are proposed as a result:

- A tree preservation plan will be completed by a qualified arborist within the Type 2 treatment areas to identify eligible native trees that are feasible to retain;
- Approved erosion and sediment control (ESC) fencing should be installed at the edge of the adjacent Type 1 treatment area (where existing, native vegetation is to be retained) prior to initiation of the Type 2 treatment; and
- The integrity of the ESC measures must be regularly monitored, particularly following storm events.

During the first year of treatment, stems are to be cut with heavy machinery and then herbicide (glyphosate) applied immediately to the cut stems. In open areas, mowing can be done if Common Buckthorn plants are less than two years of age. The treatment area will then be roto-tilled to partially bury the nitrogen-rich soil created by Common Buckthorn. Nitrogen-rich soil can encourage re-establishment of this and other invasive/exotic species. Ideally, deep-tilling would occur however the highly disturbed, clay soils would inhibit the effectiveness of this action.

Following the first year of treatment, mowing (followed by immediate application of herbicide to the cut stems) or foliar spray are two suitable options to address regrowth. A cover crop will be applied following each treatment to assist with Common Buckthorn seed bank competition. Cover crops are addressed in further detail in section 3.5.

3.2 Woodland Restoration

Cross-section examples of the proposing woodland restoration planting prescriptions are provided on **Figures 5a** to **5e** (**Appendix D1**). Detailed native species planting lists and implementation notes are provided in **Table D.2** (**Appendix D2**) for each of the five woodland restoration treatment types. The proposed native plant assemblages have been tailored to suit adjacent, retained features along with available light, soil and growing conditions. Since the tree canopy and herbaceous layers will remain largely intact in the Common Buckthorn Type 1 treatment areas, in-planting of native trees and/or shrubs will occur where openings are created, and groundcover seed mix/cover crop will not be applied since the herbaceous layer will be largely retained. The Common Buckthorn Type 2 treatment areas will be planted with trees/shrubs, native groundcover and cover crop.

Juglone-containing mulch or standard mulch will be applied to a depth of 25 cm to 30 cm: (1) around tree/shrub in-plantings; and (2) within Common Buckthorn treatment Type 1 areas where larger openings are created due to the removal of larger nodes of this invasive shrub. Mulch serves to reduce vegetation competition while native plantings establish.

Tree seed collection/planting is also proposed for oak species (Red Oak, Pin Oak, Swamp White Oak) in targeted locations within certain woodland restoration areas (i.e., WR2 and WR3; **Table D.2**, **Appendix D2**). The success of oak seed planting would be improved by collecting acorns from mature specimens on-site since they are adapted to local growing conditions. The potential creation of a native plant nursery within the Riverfront Land Holdings (section 8) would serve to responsibly collect and store seed from mature specimens and propagate target tree, shrub and

herbaceous species for use within restoration areas both on-site and, potentially, at future off-site restoration projects.

Woodland restoration will benefit a variety of significant wildlife habitat types, generalist and specialist species that utilize the Subject Lands, including woodland birds, calling amphibians and salamanders that rely on woodland breeding pools, bats, and overwintering deer. The protection of retained woodland/swamp features and improvements to woodland patch quality, size and shape are expected to benefit several Species at Risk, including Endangered bat species, Acadian Flycatcher, Wood Thrush and Eastern Wood-Pewee. Schreber's Aster, which is a provincially rare plant, is a woodland species that may also benefit over time as woodland area expands within the NHS.

3.3 Native Meadow Restoration

Permanent meadow restoration is proposed within areas that will be subject to the Common Buckthorn Type 2 treatment, which will clear existing vegetation. The purpose of native meadow restoration is to establish a restoration trajectory that favours the development of a diverse, resilient and self-supporting open vegetation community, that provides habitat for a variety of provincially and locally rare species, such as: Great Plains Ladies'-tresses, Dense Blazing Star, Yellow Indian-grass, Monarch, bees, other pollinators and fauna that utilize early successional areas. This community will be managed in favour of open native meadow over the long term to ensure species and communities dependent upon open native meadows are sustained in this post-development landscape.

The proposed native plant assemblages have been tailored to suit adjacent, retained features along with available light, soil and growing conditions. The groundcover seed mix used in the native meadow restoration area includes pollinator foraging/host plants, prairie associate species, and will be applied with a cover crop within the native meadow restoration areas. Flora salvage/transplant will also occur in targeted locations for Dense Blazing Star and Great Plains Ladies'-tresses, as explained in section 5.2. These transplanted species will be the subject of specialized propagation work (at the on-site native plant nursery), to continually increase the population size and extent of distribution.

Detailed native species planting lists and implementation notes are provided in **Table D.3** (**Appendix D2**) for the three types of meadow restoration treatments. A brief summary of each is offered below.

Native meadow treatment Type 1 (NM1) is the largest open habitat restoration area and will contain one created open wetland (section 3.4) and pockets of hummocky

topography. These specialized features will hold water for variable lengths of time and over time, are expected to provide a diversity of microhabitats that will benefit an array of flora and fauna, including Great Plains Ladies'-tresses (NM1 is the primary, recommended transplant location proposed for this rare plant), Dense Blazing Star and prairie associate plants, pollinators, amphibians, turtles, butterflies and odonates. Native meadow treatment Type 2 (NM2) focuses on two wetland buffers that border the east development area. A different groundcover seed mix is prescribed in NM2 (compared to NM1) to reflect different soil conditions. A created wetland (section 3.4) is also proposed within NM2.

Native meadow treatment Type 3 (NM3) is situated within the open space/parkland of the proposed west development area. NM3 will also serve as a recommended transplant location for Great Plains Ladies'-tresses as it shares similar soils to the existing location. The groundcover seed mix applied to this area will include prairie associate grasses/flowering plants, such as Big Bluestem, so that the NM3 restoration areas can serve as public education examples of pollinator/prairie gardens. Interpretive signage is recommended to explain the value and unique character of these restoration areas. The edge of the NM3 treatment areas must be clearly defined so that grass mowing within the park does not infringe into the restoration areas. Since NM3 is proposed adjacent to the railway, dialogue with the rail operator is required to ensure plantings are compatible with their requirements.

3.4 Open Wetland Creation

Two created wetlands are proposed in order to augment limited open wetland breeding, foraging and overwintering habitat types for turtles and open-wetland amphibians. The created wetlands are proposed in the vicinity of two existing open aquatic ponds within the retained NHS that, based on baseline inventories, support SWH for open-wetland calling amphibians, overwintering turtles and Snapping Turtle (Special Concern in Ontario and Canada). This allows the created wetlands to also serve as refugia or stepping-stone habitats to facilitate movement of reptiles and amphibians across the local landscape within this north-south movement corridor of the NHS.

One created wetland is proposed within each of native meadow restoration treatment Types NM1 and NM2. The intent is for each wetland to support suitable overwintering habitat (i.e., ice-free conditions at the bottom of the pond during the winter) for turtles and open-wetland amphibians that hibernate aquatically (i.e., Bullfrog, Green Frog, Northern Leopard Frog).

Both created wetlands will be graded to contain a littoral zone, which will support meadow marsh vegetation that transitions to shallow aquatic marsh, and an open

water zone. Planting details for the created wetlands are provided in **Table D.4** (**Appendix D2**). The selected herbaceous and shrub species will provide shelter, egg attachment sites, leaf litter, attract insects, and help regulate the temperature of the wetland. Installation of coarse woody debris (i.e., logs and large branches) will provide additional egg attachment sites and refugia.

The base of the created wetlands should be constructed of native clay soil with a 300 mm deep layer of hydric soil to support growth of moist-wet vegetation communities. Hydric soil exhibits the following characteristics:

- Thoroughly blended and friable, consisting of 45% sand, 35% silt and 20% clay;
- pH of 6.5 to 7.5;
- Bulk density of 951 kg/m^3 to 1069 kg/m^3;
- Minimum 12% organic matter and 3% organic carbon; and
- Free from subsoil, roots, vegetation, debris, toxic materials and stones over 50 mm in diameter.

The open water zone of each created wetland will contain one to two plunge pools that reach at least 1 m depth to provide suitable overwintering conditions, including during drier years. The open water areas should contain water through most or all of the year. Meadow marsh requires ephemeral flooding that lasts less than two weeks. Meadow marshes can dry to ground-level for much of the year, with saturated/moist soils within the rooting zone, outside of flooded events. The water inundation requirements of shallow aquatic marsh include:

- Maximum water depth - 60 cm;
- Average depth - 30 cm to 45 cm;
- Minimum depth - saturated soils (followed by flooded conditions);
- Inundation duration - return to average depth within about 40 days of flooding; and
- Duration of flooding - tolerant of frequent inundation (maximum water depth to saturated soil conditions), if left inundated greater than 2 years the vegetation community will change (i.e., to hybrid cattail or other species), a late summer drawdown period is recommended to encourage seed germination and avoid establishment of hybrid/glaucous cattail.

Ensuring that appropriate hydroperiod will be sustained in the created wetlands will be demonstrated at the stormwater management plan stage pre-development. The detail available at the stormwater management plan stage will also allow for the exact size of each created wetland and target vegetation community to be determined based on water availability.

3.5 Cover Crop Selection

The purpose of the cover crop is to: (1) provide prompt competition with non-native species during the Common Buckthorn removal period for the Type 2 treatment areas (**Figure 2**, **Appendix D1**); and, (2) enable the native groundcover seed mix to establish over two to three years with reduced competition from non-native species.

At the end of the Common Buckthorn removal period, a cover crop will be included in the native groundcover seed mix. To improve success of the cover crop, seed planting windows must be adhered to and weekly watering should occur during peak summer periods. The recommended cover crop species are intolerant of drought conditions.

Recommended cover crop options are provided in **Table D.5** (**Appendix D2)**. Cover crop species choice depends on timing of planting. Each cover crop species has specific germination and growth requirements (i.e., growing degree days, temperature).

3.6 Buffer Plantings on Other Lands Owned by the Applicant (outside OPA 128)

Two PSW units and their associated 15 m buffer are located on other lands owned by the applicant east of Dorchester Road (outside of OPA 128) that will front the proposed development. A cross-section example of the proposing buffer planting prescriptions (BP1 and BP2) for these wetlands is provided on **Figure 5f** (**Appendix D1**). Detailed native species planting lists and implementation notes are provided in **Table D.6** (**Appendix D2**). The proposed native plant assemblages have been tailored to suit adjacent, retained features along with available light, soil and growing conditions. Both of these 15 m wetland buffers will be subject to Common Buckthorn Type 1 treatment. Since the tree canopy and herbaceous layers will remain largely intact, in-planting of native trees and/or shrubs will occur where openings are created. Groundcover seed mix/cover crop will not be applied since the herbaceous layer will be largely retained.

3.7 Informal Site Access Control

The Subject Lands are presently subject to considerable recreational use by off-road vehicles. These activities risk introducing invasive seeds into restoration areas. The off-road vehicles may drive through restoration areas and disturb or destroy planted native stock. The use of fencing or armour stone/boulders at common informal access sites is recommended to limit access to the site by motorized vehicles.

The presence of deer overwintering habitat in the central portion of the Subject Lands (within retained woodland/swamp) may pose a challenge to the establishment of native vegetation with the restoration areas. Winter herbivory is more likely to result in the loss of planted woody stock. The use of wildlife exclusionary fencing may be warranted if monitoring identifies areas where considerable planted stock has been lost to herbivory. Monitoring is described in the EIS.

4.0 SPECIALIZED WILDLIFE HABITAT RESTORATION

4.1 Turtle and Amphibian Habitat Enhancement

In addition to the creation of two open wetlands (section 3.4) that target the habitat preferences of Midland Painted Turtle, Snapping Turtle and open-wetland calling amphibians, several other ecological enhancement measures are proposed to benefit amphibians and turtles within the NHS. The opportunity to direct additional surface water to the two existing, retained open aquatic ponds (that support turtle and amphibian SWH) should be explored at the stormwater management plan stage. Both ponds were observed to dry down in 2017 and 2018 to levels that would make the provision of suitable overwintering habitat challenging. Augmenting the hydroperiod of these ponds, (i.e., through the use of LID and BMP techniques), could improve the overwintering habitat quality for turtles and open-wetland amphibians. Similarly, additional surface water could be directed to select woodland amphibian breeding pools within the retained oak swamp (SWD1) in the centre of the NHS. All pools/sloughs within approximately 100 m of the western edge of the SWD1 were observed to be dry by early summer 2018. Directing additional water to select woodland pools must be carefully managed to ensure a late summer or fall dry-down period occurs during most years. This ensures that predatory fish do not establish within the pools that would decrease habitat viability for sensitive woodland amphibians such as salamanders, Wood Frog, Spring Peeper and Western Chorus Frog.

Two artificial turtle nesting beaches are proposed in proximity to the two created wetlands and the two existing, retained open aquatic pond features that provide turtle and amphibian SWH. Conceptual design details for the turtle nesting beaches are provided on **Figure 5g** (**Appendix D1**).

Management of the invasive shrub Common Buckthorn and subsequent restoration of native early-successional and woodland communities will help improve habitat quality within movement corridors. The provision of native early-successional communities (i.e., native meadow) will also augment overwintering habitat for amphibian species that hibernate terrestrially, such as Gray Treefrog, American Toad and Spring Peeper.

The provision of one or more wildlife ecopassages beneath Chippawa Parkway would improve connectivity between the Subject Lands and City lands/wetlands associated with the Welland River south of the roadway. Ecopassage location(s) would need to be identified prior to any major road improvements (e.g., resulting from the Chippawa Parkway EA process). If an ecopassage is installed then wildlife fencing (i.e., *Animex* fencing) should be considered extending 30 m to 100 m from the NHS/roadway

interface to direct amphibians, reptiles and small to medium sized mammals on the Subject Lands towards the ecopassage(s).

4.2 Pollinator Habitat

The insect species observed on the Subject Lands are typical of disturbed areas and will benefit from the establishment of more diverse, native open meadow and early successional vegetation types. The groundcover seed mixes that will be applied in the outer band of woodland restoration areas and throughout native meadow restoration areas (NM1 and NM2; **Table D.3**, **Appendix D2**) were designed to provide a diversity of foraging plants and host plants for pollinator species. All of the groundcover seed mixes include Milkweed species, which is the host plant of Monarch (Special Concern in Ontario and Endangered in Canada).

Planting Shagbark Hickory and Oak species (Red Oak, Pin Oak and Swamp White), both in the form of seed and nursery sapling stock, in woodland restoration areas is expected to benefit a variety of moth species, as Oak and Hickory trees establish across a broader area of the NHS. Moths are an important pollinator group that rely on these tree species for part of their lifecycle. Select portions of woodland restoration areas WR2 and WR3 (**Table D.2**, **Appendix D2**) have been selected for direct tree seeding of the Oak species mentioned above. Shagbark Hickory seed is expected to be naturally introduced to restoration areas as this species is present in a variety of retained woodlands/wetlands and hickory nuts are effectively distributed by squirrels.

5.0 SPECIALIZED PLANT SALVAGE/PROPAGATION

The EIS commits to several flora salvage/transplant opportunities, which are summarized below:

- Great Plains Ladies'-tresses: This species occurs within the proposed west development area on disturbed soils. It is proposed for transplant into permanent native meadow restoration areas; i.e., restoration treatment types NM1 and NM3 (**Table D.3**, **Appendix D2**). The transplant recipient sites have been selected to enable the long-term maintenance of native meadow, preventing the advance of succession. Specific measures will be required to establish soils and microhabitats in those areas to optimize successful outcomes. The sod mat or plug transplant techniques are proposed since this orchid species relies on underlying fungi/soil microbes. Technical methods regarding the transplant approach are discussed in EIS section 7.4.1.

- Dense Blazing Star: This species is an apparent non-native, introduced population that is not part of critical habitat mapping for the endangered population. Pending MNRF agreement that the on-site population is non-native/introduced, corm transplants from the on-site population are proposed once the plant is dormant from October to April. Corm transplants will be moved to permanent native meadow restoration areas (restoration treatment type NM1 in **Table D.3**, **Appendix D2**). Corms will provide a supply of buds for nursery propagation to expand the population. Technical methods regarding the transplant approach are discussed in EIS section 7.5.2.

- Drooping Woodreed (*Cinna latifolia*): This species is present in several retained wetlands on the Subject Lands and also within the proposed west and development areas. Seed collection, nursery production and or seed dispersal is proposed in the retained, central oak swamp (SWD1) on the Subject Lands. Seed should be collected from mature specimens in late summer and grown in nursery conditions for out-planting and/or distributed into shaded areas of the SWD1.

- Finely-nerved Sedge (*Carex leptonervia*): This species is present in several retained wetlands on the Subject Lands and also within the proposed west and east development areas. Seed dispersal is proposed in retained upland forest within the central portion of the NHS (FOD7-2). Seed should be collected from mature specimens in early summer and grown in nursery conditions for out-planting and/or distributed into the FOD7-2.

- Creeping Spike-rush and Woolly Sedge: These two species are present in small, moist depressions or tire ruts within disturbed cultural meadows on-site that are proposed for development. Seed should be collected from mature specimens in late summer and grown in nursery conditions for out-planting and/or dispersed in the outer fringe area of existing open aquatic ponds (i.e., ELC OAO inclusion within the central SWD1 and within a SWD4-1 that borders Chippawa Parkway) or adjacent to the proposed turtle/amphibian ponds in the central portion of the NHS (section 4.1). Seeds and/or out-plantings should be distributed in shallow marsh or meadow marsh habitat where surface water pooling is known to occur for at least part of the season.

6.0 NATURAL HERITAGE SYSTEM TRAIL NETWORK

A trail network is proposed in order to provide residents and visitors with access to natural areas while limiting intrusion into ecologically sensitive areas (**Figure 6**, **Appendix D1**). A raised boardwalk trail with railings (and no bicycle or motorized vehicle access) is proposed within the western edge of the central oak mineral deciduous swamp to limit off-trail intrusion into this sensitive feature. This trail will be accessible from both the east and west development areas and will connect to the proposed Wetland Discovery Centre (section 7). The rest of the trail system is proposed to follow local road networks.

The preliminary location of the raised, boardwalk trail within the oak swamp (green trail on **Figure 6**, **Appendix D1**) was sited to avoid negative impacts to woodland Species at Risk (i.e., Acadian Flycatcher, bats, Wood Thrush, Eastern Wood-Pewee). At the detailed design stage, trail placement should be staked in the field to avoid mature trees, cavity trees, sensitive species (including the provincially rare woodland plant Schreber's Aster) and other sensitive areas, such as natural drainage inlets into the retained woodlands/wetlands.

7.0 RIVERFRONT WETLAND DISCOVERY CENTRE

7.1 Introduction

Understanding the benefits of interactions between community residents and nature, GR(CAN) Investment Co. Ltd. envisions the creation of a Wetland Discovery Centre, imagined to be a unique community destination containing environmental education opportunities with depictions of social and cultural inclusivity.

The conceptual site location and design concepts for the Centre are intended to encourage the exploration of sustainable site designs using low impact development and LEED principles. Ecological restoration efforts around the Wetland Discovery Centre will including plantings of native trees and shrubs and small demonstration areas, including a created wetland, pollinator plant gardens, and First Nations medicinal/food plant gardens. Low impact development technologies to be considered include green roofs, rain gardens and porous pavements for self-contained storm water management.

Accessibility to this destination will use active transportation and transit methods sharing roadway systems with emphasis on cycle paths and walking trails/sidewalks.

Key facility design and site context considerations are provided in the following section.

7.2 Wetland Discovery Centre Design Elements

The Wetland Discovery Centre, as conceptualized, would occupy about 8,000 square feet (750 m^2). Conceptual design elements within the facility, for consideration, include:

- Arrival hall and orientation space;
- Interpretive/education theatre space that can be partitioned for smaller functions;
- Large outdoor gathering space (deck/outdoor teaching area) with a raised deck overlooking an existing, large treed swamp;
- Library/digital resource space with interactive computer monitors for displays and education;
- Washrooms: M/F, accessible gender-neutral stalls, accommodate motorized wheelchairs;
- Gift shop/passive canteen area;
- Wayfinding program that would be visual and tactile; and

- Interpretive display opportunities for First Nations and Riverfront Community natural heritage system information.

The design principles/objectives listed below are offered for the exterior of the Wetland Discovery Centre and connections to the centre. The proposed trail network design and exterior design of the Wetland Discovery Centre site are depicted conceptually on **Figures 6** and **7** (**Appendix D1**), respectively.

- Roadway access – limit to 2 residential lanes with turn-around that would accommodate transit drop-off and loading zones, larger temporary parking could be available off-site;
- Sidewalk connections – 1.2 m wide sidewalks would connect to the Riverfront neighbourhood and regional trail networks;
- Multi-modal (non-motorized) cycling and walking trails – 3 m wide trails with three difficulty levels: (1) porous pavement short loop (AODA compliant), (2) raised boardwalk with railings medium distance loop, and (3) un-paved longer distance loop with barriers to contain users;
- Infinity trail loop – figure 8 shaped loop around therapeutic gardens including raised planting beds that will be accessible to wheelchairs, the gardens will include pollinator plants and a native plant propagation demonstration area;
- Active transportation program – bike share program with bike racks;
- Seating/rest areas with sun shelters – drinking fountains with water bottle fillers at building;
- Site Lighting – LED lights at transitional areas, trailheads and around the facility; and
- First Nations interpretive arrival courtyard – “Meeting Place” feature with a garden featuring indigenous medicinal plants and food plants.

The slough ridge wetland communities on the Niagara (Haldimand Clay Plain) are significant features and are less well-understood that many wetlands elsewhere in Ontario. The Wetland Discovery Centre and the Native Plant nursery together provide an important opportunity for wetland research. The slough features are widespread in Niagara and they are generally dominated by seasonal woodland pools and minor grade differences between the tops of ridges and the bottom of swales.

Those characteristics make them relatively more susceptible to changes under drought conditions. Long term and frequent droughts could have significant effects on the persistence and viability of regional and local flora and fauna that are dependent upon traditional hydroperiods (e.g., amphibians). The Wetland Discovery Centre offers an opportunity to host and lead research into various aspects of slough ridge wetland ecology, including areas of resiliency and adaptation.

8.0 NATIVE PLANT NURSERY

The creation of a native plant nursery within the Subject Lands will support the sustainable harvest of seed and other propagules, storage, experimental propagation technique advancement and the generation of native, locally adapted seed/stock for use within restoration areas both within and outside of the Subject Lands. This initiative could be well-suited to collaboration amongst various stakeholders including academic institutions (e.g., Niagara College School of Environment and Horticulture), NPCA, MNRF/MECP and Niagara Parks School of Horticulture).

The success of native woody stock (trees/shrubs) and seed mixes proposed for use in restoration areas will be enhanced by the use of the on-site native plant nursery. Certain trees (i.e., Oak species) can be challenging to grow from standard nursery stock in disturbed and heavy clay soils, such as those found on the Subject Lands. Collecting acorns from mature Oak specimens on-site would facilitate the success of restoration plantings as these seeds are already better adapted to local growing conditions.

9.0 MONITORING

Ecological monitoring requirements are outlined in the Riverfront Residential EIS.

10.0 CONCLUSION

The proposed restoration efforts on the Subject Lands have been designed to benefit Species at Risk, significant wildlife habitat, and retained significant woodlands and wetlands on the Subject Lands. The efforts outlined herein contribute to the establishment of a viable Riverfront Residential NHS, through the:

- Long term protection of significant, intact natural features;
- Conservation and enhancement of the important local connections from the Welland River, through the extensive natural and restored areas;
- Improved viability and sustainability of retained natural features and functions (e.g., through permanent native meadow creation/maintenance and potential enhanced pond hydrology); and
- The appropriately managed integration of human uses these important natural areas.

Proposed investments in the Wetland Discovery Centre and native plant nursery will contribute significantly, not only to ecological enhancement, but also to the education and inspiration of citizens interested in the conservation and promotion of biodiversity and healthier environmental systems. Long term research into the management and adaptation of the slough ridge wetland systems in Niagara will contribute to ongoing conservation and management knowledge in response to climate change.

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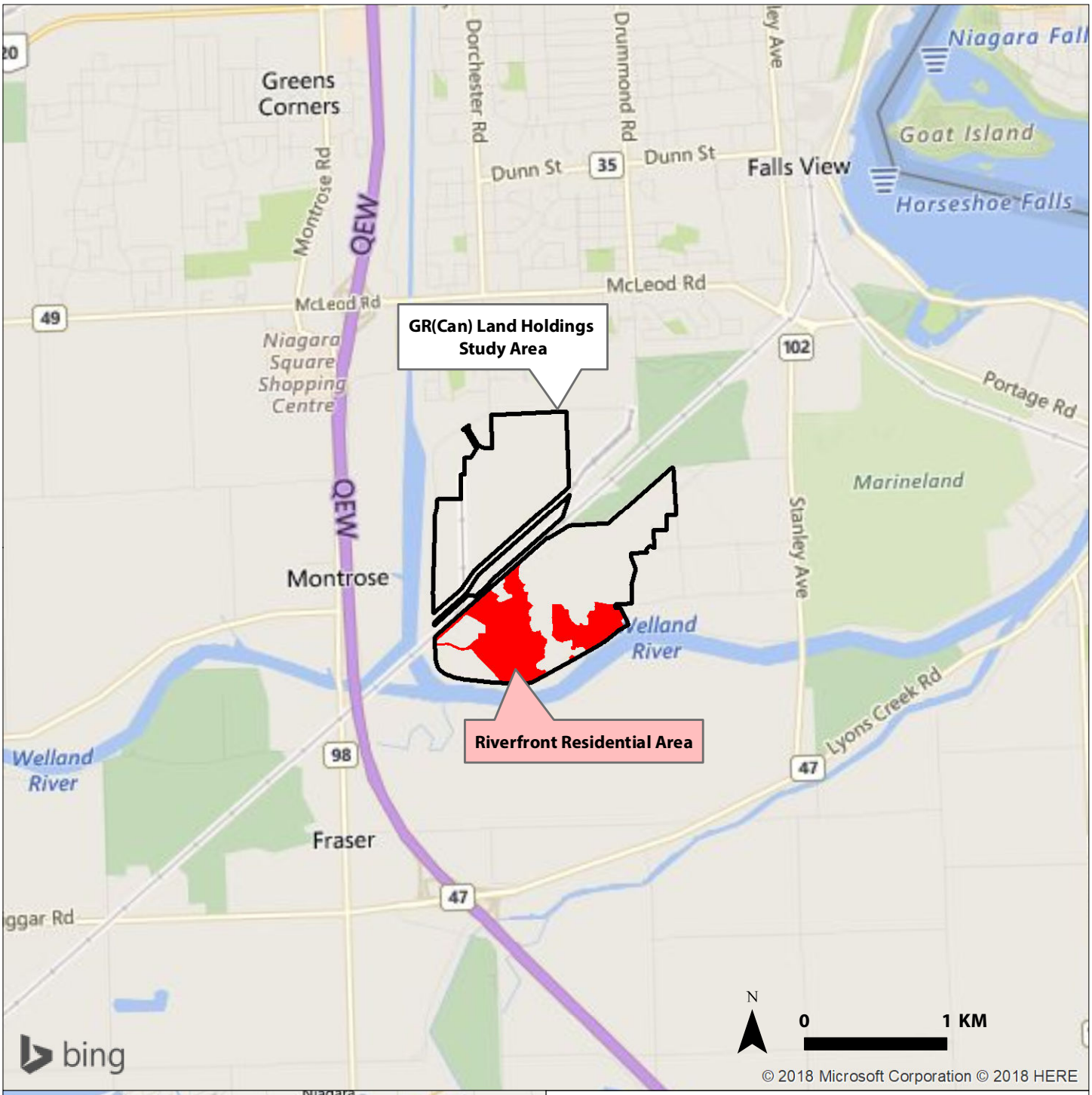
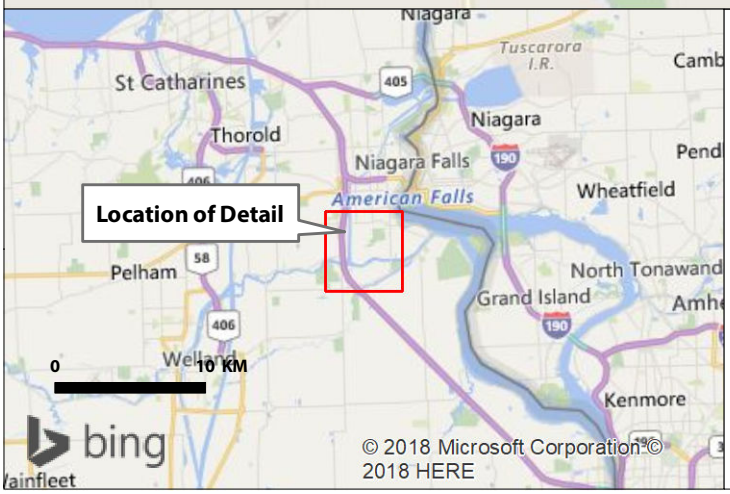
APPENDICES

Appendix D1 – Figures
Appendix D2 – Tables

Appendix D1 – Figures





Riverfront Residential - Conceptual Restoration Plan

Figure 1
Location of Subject Lands

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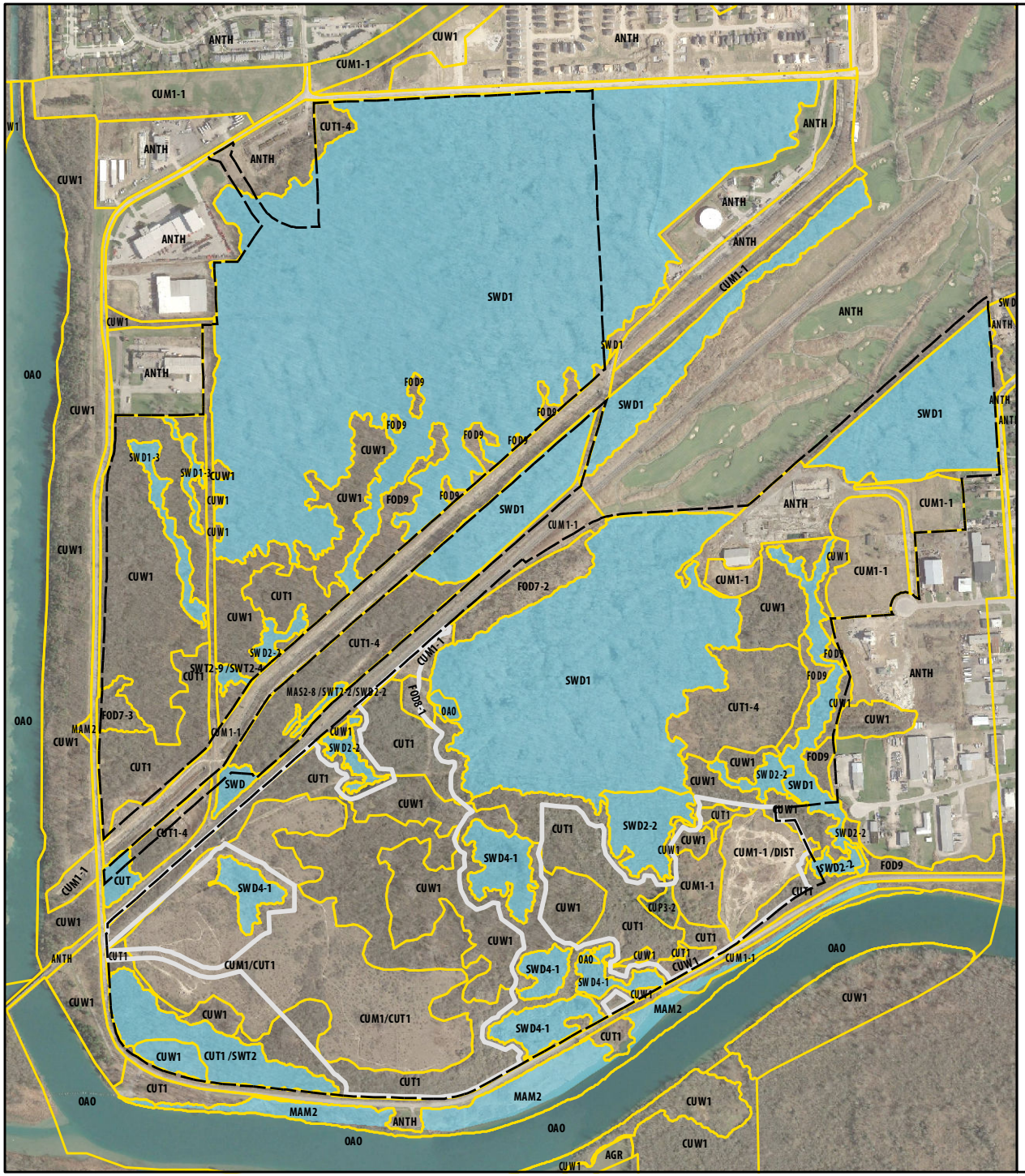

Study Area

Riverfront Residential

Ecological Land Classification (updated area within/ adjacent to Riverfront Residential, Savanta 2018)

Provincially Significant Wetland (MNRF)

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential Block Plan Environmental Impact Statement

Figure 2
Vegetation Commmunities and Provincially Significant Wetlands

0 100 Meters

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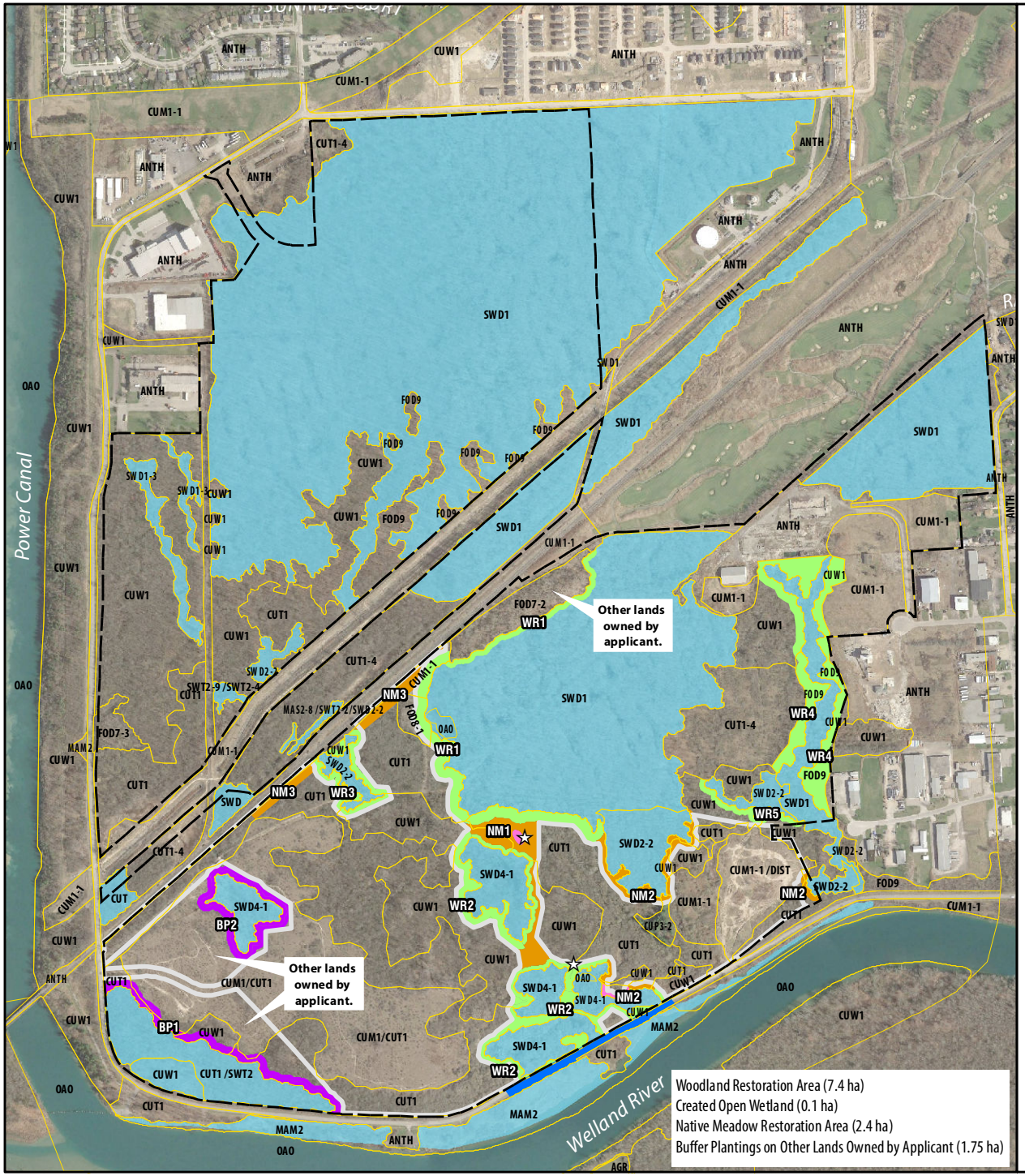

GR(Can) Land Holdings Study Area

Riverfront Residential

Ecological Land Classification (updated area within/adjacent to Riverfront Residential by Savanta 2018)

Provincially Significant Wetland (MNRF)

Restoration Treatment Type

Created Open Wetland

Native Meadow Restoration Area

Candidate Area for Potential Wildlife Ecopassage (to be determined through Chippawa Parkway EA)

Woodland Restoration Area

15 m Buffer Planting (Other lands owned by applicant)

☆ Turtle Nesting Beach

NM1 Restoration Treatment Type - refer to planting prescriptions in Tables D1-3 (Appendix D2)

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential - Conceptual Restoration Plan

Figure 3 Ecological Restoration Treatment Types

0 100 Meters

N

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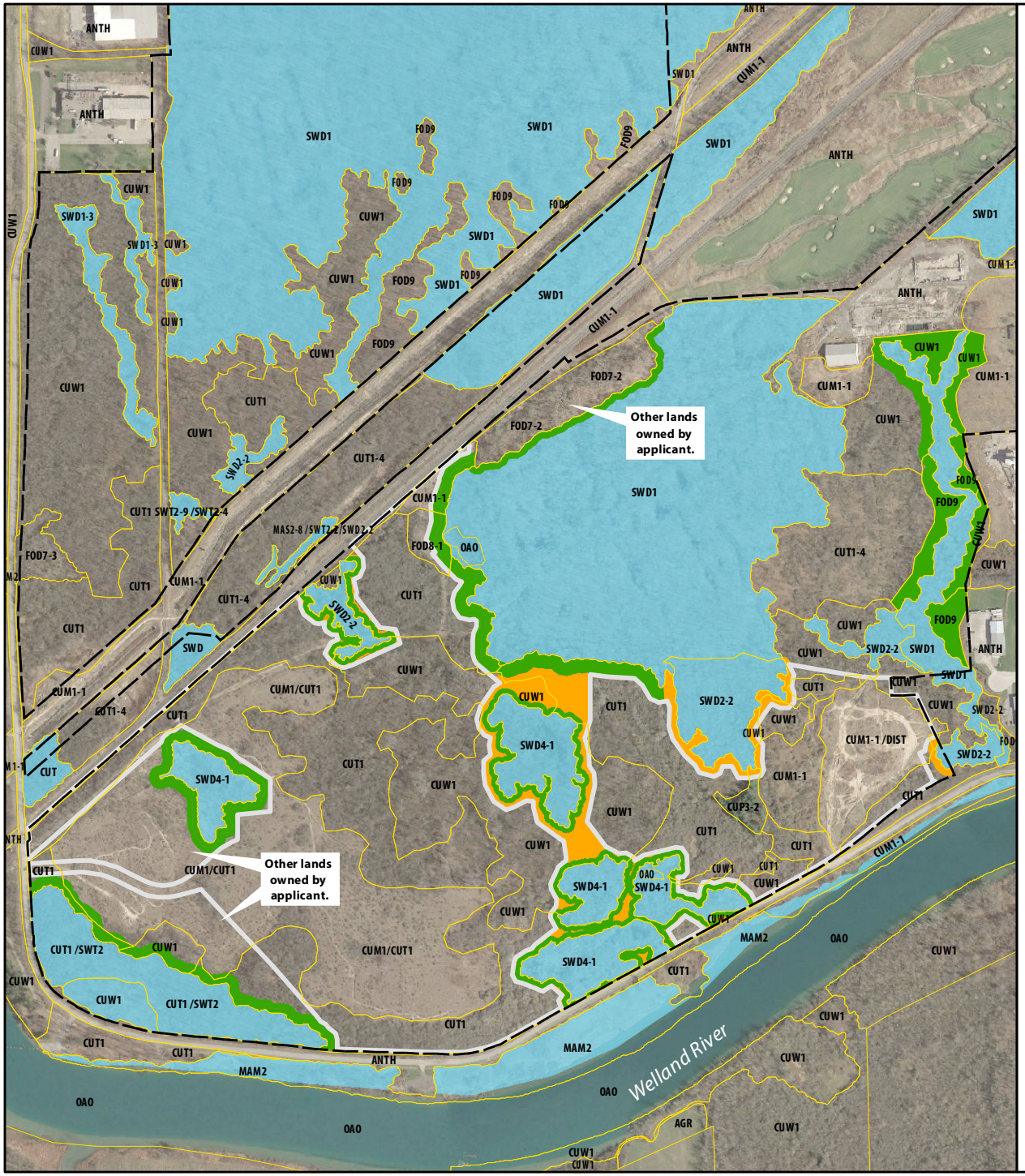
Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2018 11 21 CERP report figures\Figure 3 Ecological Restoration Treatment Types.mxd REVISED: November 25, 2018



GR(Can) Land Holdings Study Area

Riverfront Residential

Ecological Land Classification (updated area within/adjacent to Riverfront Residential Savanta 2018)

Provincially Significant Wetland (MNRF)

Buckthorn Treatment Type 1

Buckthorn Treatment Type 2

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Residential - Conceptual Restoration Plan

Figure 4 Common Buckthorn Removal Areas & Treatments

0 100 Meters

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PLANTING DENSITY

WOODLAND RESTORATION TREATMENT WR1 (20M BUFFER)

- 5 Trees / 100m^2
- 6 Shrubs / 100m^2
- Cover Crop and Native Groundcover Seed Mix

*Refer to Table D1 (Appendix D2) for full planting lists and implementation details

*The 20m buffer width applies only where the SWD1 PSW unit fronts the proposed development

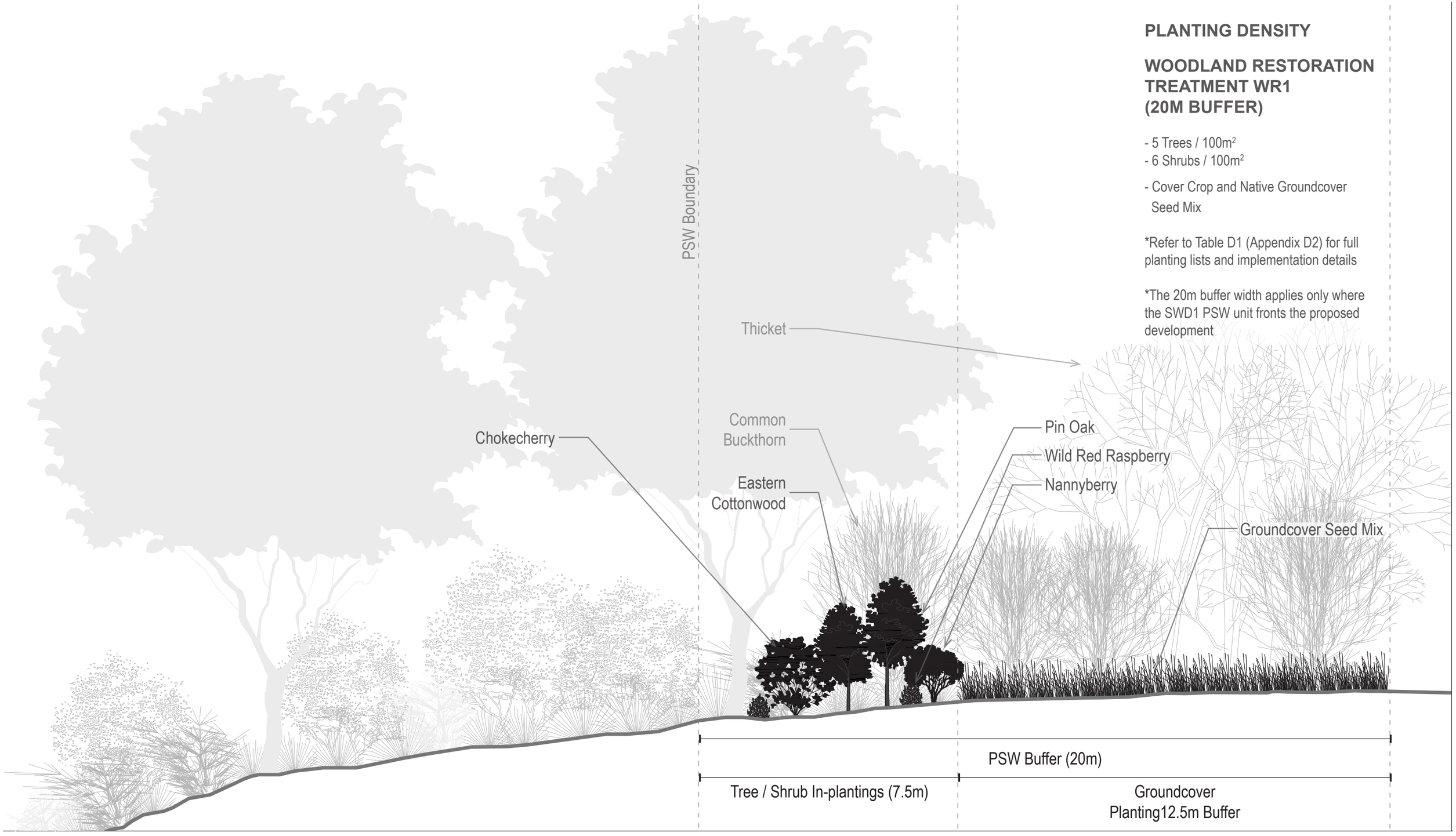


FIGURE 5a

PROPOSED WOODLAND RESTORATION PLANTINGS | TREATMENT WR1

PROPOSED NEW VEGETATION

EXISTING VEGETATION

PLANTING DENSITY

WOODLAND RESTORATION TREATMENT WR2 (15m BUFFER)

- 3 Trees / 100m^2
- 8 Shrubs / 100m^2
- Cover crop and native groundcover seed mix; apply Great Plains Ladies'-tresses sod mat transplants as per Figure 3 (Appendix D1)

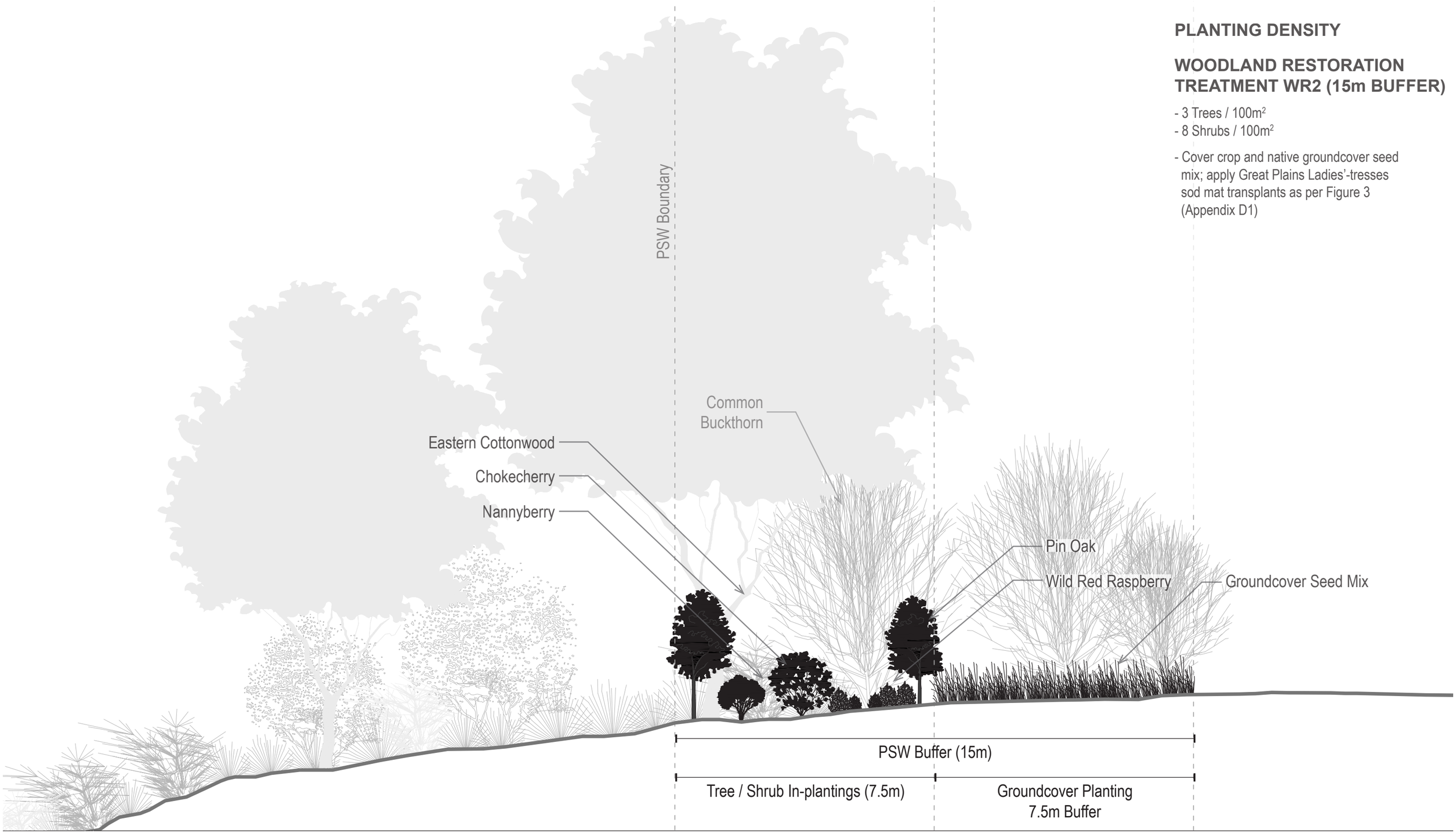


FIGURE 5b

PROPOSED WOODLAND RESTORATION PLANTINGS | TREATMENT WR2

PROPOSED NEW VEGETATION

EXISTING VEGETATION

PLANTING DENSITY

WOODLAND RESTORATION TREATMENT WR2 (10m BUFFER)

- 3 Trees / 100m^2
- 8 Shrubs / 100m^2
- Tree Seed Planting

- Cover Crop and Native Groundcover Seed Mix

WOODLAND RESTORATION TREATMENT WR3 (10m BUFFER)

- 3 Trees / 100m^2
- 8 Shrubs / 100m^2
- Tree Seed Planting

- Cover Crop and Native Groundcover Seed Mix

*Refer to Table D1 (Appendix D2) for full planting lists and implementation details

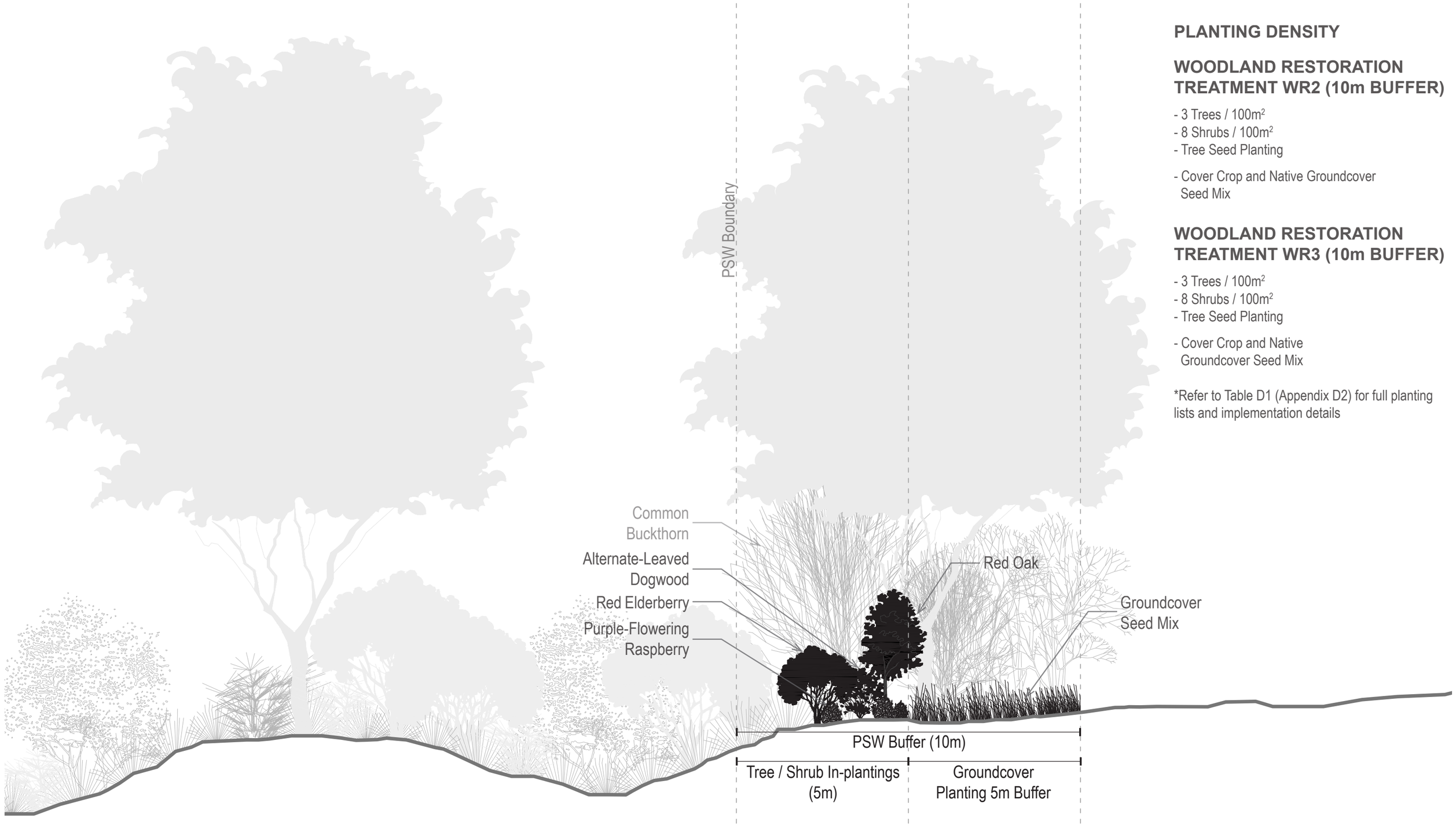
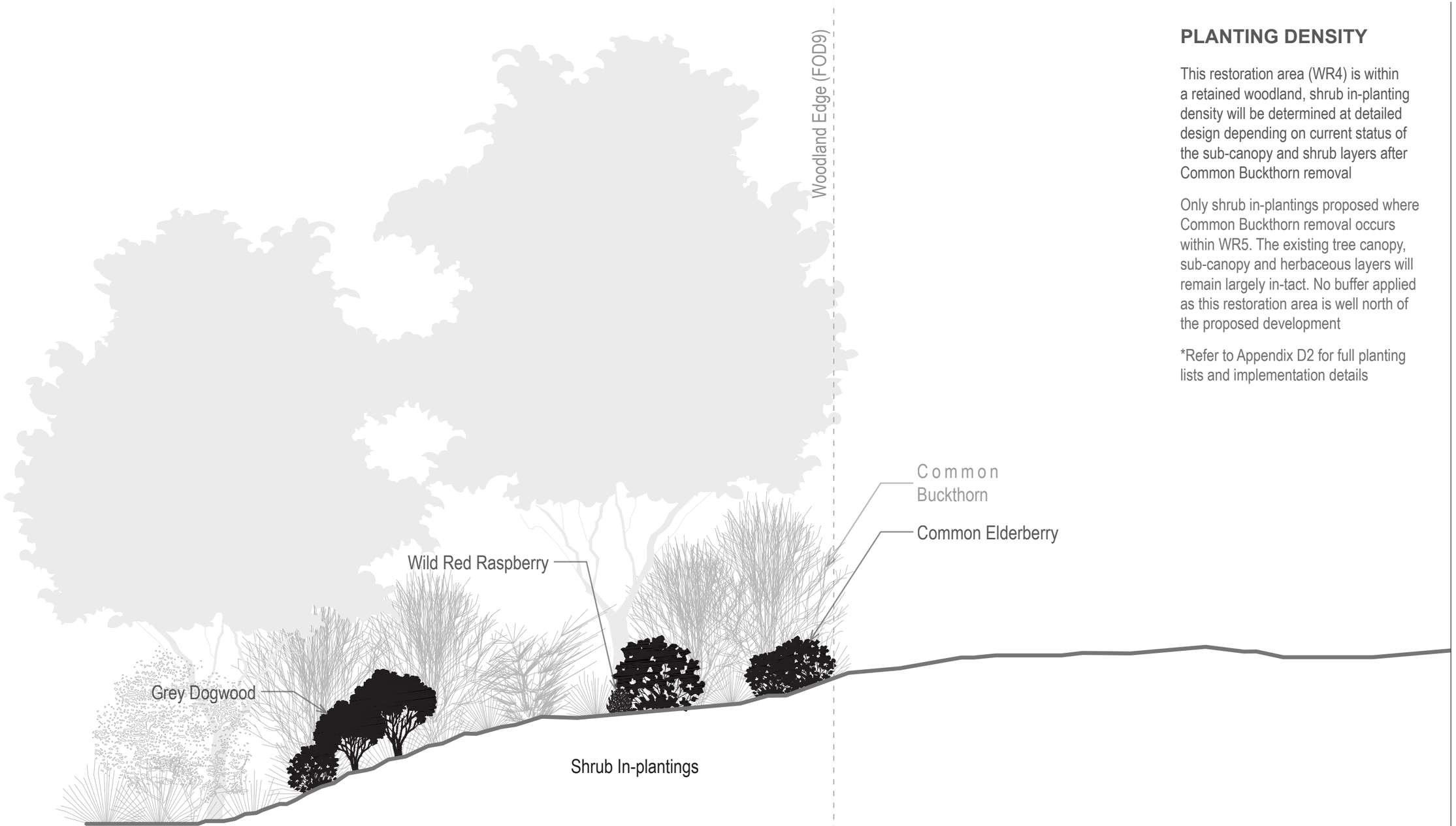


FIGURE 5c

PROPOSED WOODLAND RESTORATION PLANTINGS | TREATMENT WR2 and WR3

PROPOSED NEW VEGETATION

EXISTING VEGETATION



PLANTING DENSITY

This restoration area (WR4) is within a retained woodland, shrub in-planting density will be determined at detailed design depending on current status of the sub-canopy and shrub layers after Common Buckthorn removal

Only shrub in-plantings proposed where Common Buckthorn removal occurs within WR5. The existing tree canopy, sub-canopy and herbaceous layers will remain largely in-tact. No buffer applied as this restoration area is well north of the proposed development

*Refer to Appendix D2 for full planting lists and implementation details

FIGURE 5d

PROPOSED WOODLAND RESTORATION PLANTINGS | TREATMENT WR4

PROPOSED NEW VEGETATION

EXISTING VEGETATION

PLANTING DENSITY

This restoration area (WR5) is within a retained vegetation community, shrub in-planting density will be determined at detailed design depending on current status of the sub-canopy and shrub layers after Common Buckthorn removal

Only shrub in-plantings proposed where Common Buckthorn removal occurs within the WR6 wetland buffer. The existing tree canopy, sub-canopy and herbaceous layers will remain largely in-tact

*Refer to Appendix D2 for full planting lists and implementation details

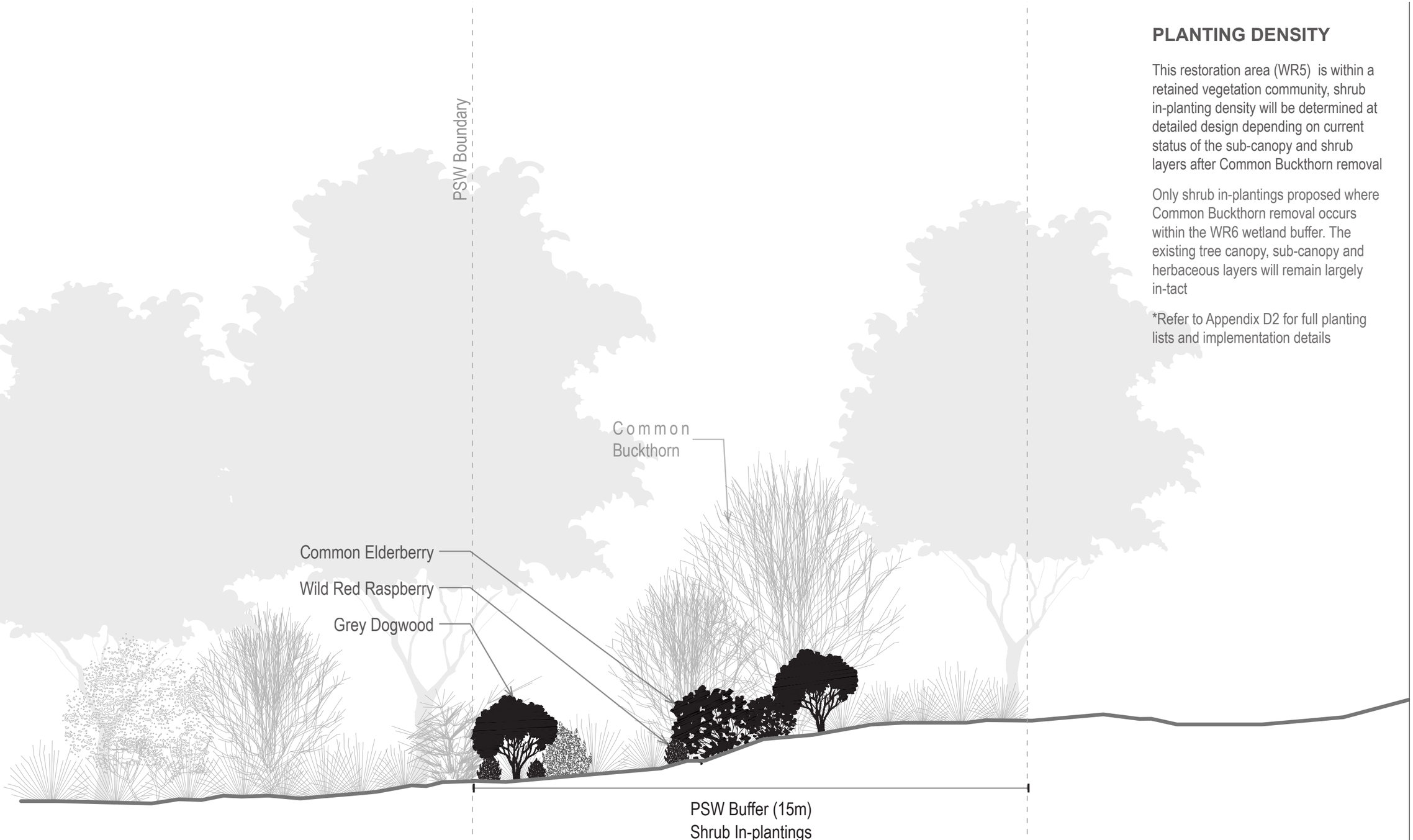


FIGURE 5e

PROPOSED WOODLAND RESTORATION PLANTINGS | TREATMENT WR5

PROPOSED NEW VEGETATION

EXISTING VEGETATION

PLANTING DENSITY

These Buffer Planting Areas are 15m buffers applied to PSW units that are located outside of the Riverfront Residential Area, on other lands owned by the applicant. For both buffer areas (BP1 and BP2) the existing vegetation layers will be retained to the extent feasible by selectively removing Common Buckthorn. Tree and shrub in-plantings will then be conducted.

These buffer areas (BP1 and BP2) front the Riverfront Residential Area however they are located outside of the City of Niagara Falls OPA 128.

*Refer to Appendix D2 for full planting lists and implementation details

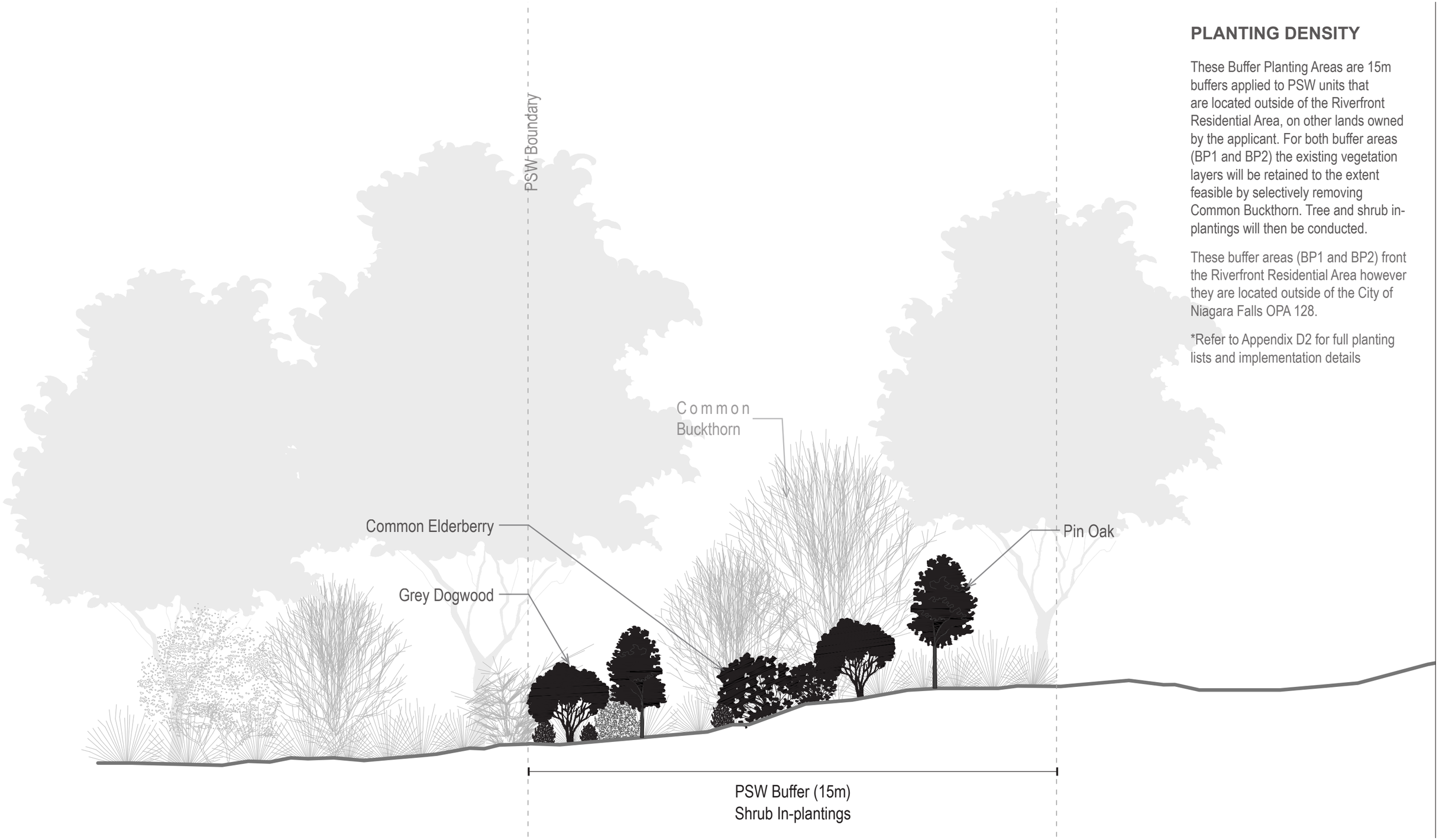


FIGURE 5f

PROPOSED PSW BUFFER PLANTING AREAS (OTHER LANDS OWNED BY APPLICANT)

TREATMENTS BP1 & BP2

PROPOSED NEW VEGETATION

EXISTING VEGETATION

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S

Native Meadow Restoration
Area Groundcover Seed Mix

8.0m

2.5m

2.0m

3.5m

Flat Surface

Slope 40%

Slope 30%

1.0m

0.3m

Native Meadow Restoration
Area Groundcover Seed Mix

CLAY LOAM SOIL OR SAND W/ 1/3BAG OF BENTONITE CLAY IN EACH OF THE MIDDLE AND BOTH ENDS TO INCREASE WATER RETENTION

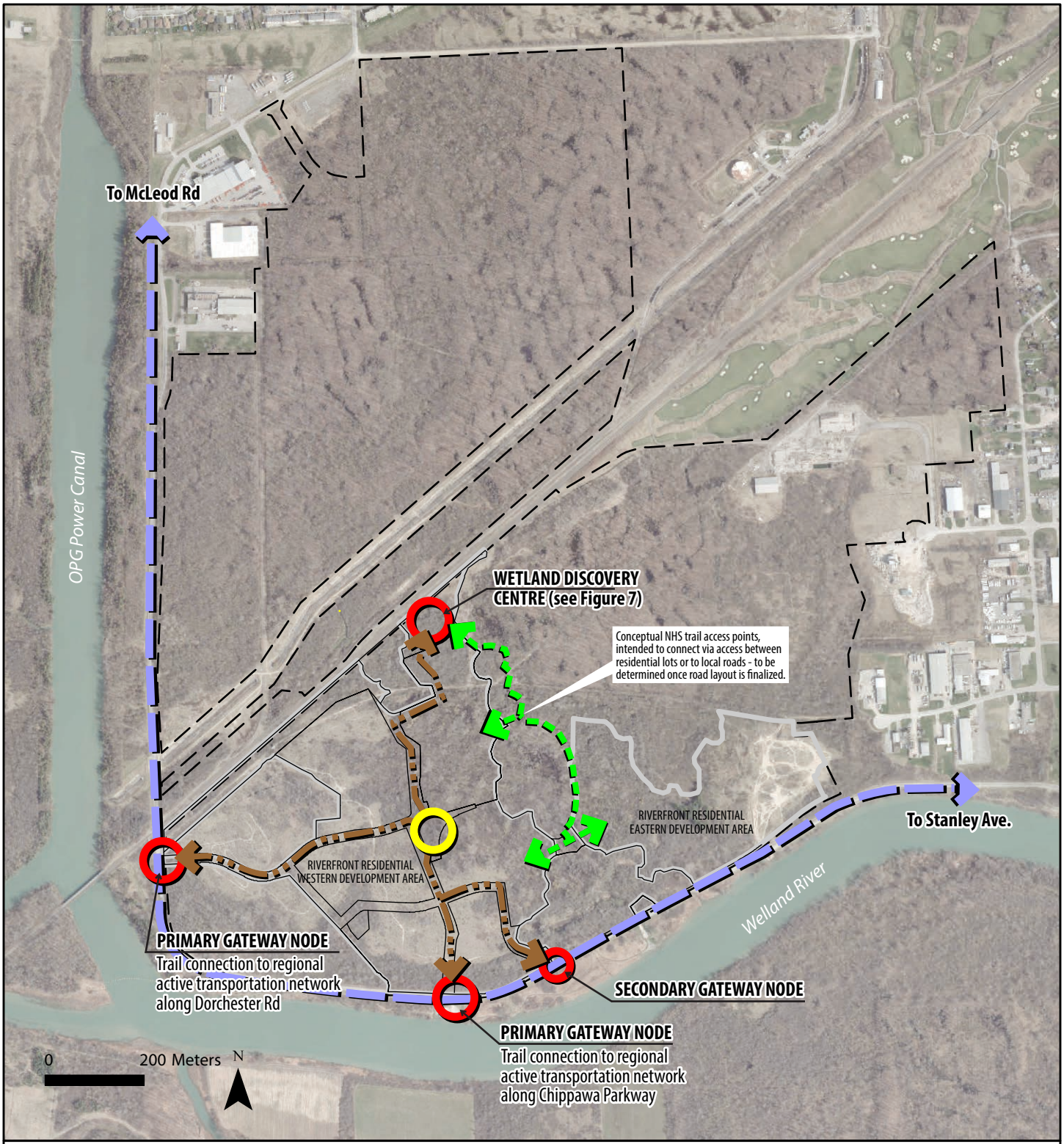
0.1M PEA GRAVEL LAYER FILLS EXCAVATION AND IS MIXED WELL W/ SAND ONCE BEACH IS COMPLETE

LAY OUT GEO TEXTILE CLOTH IN THE EXCAVATION BEFORE ADDING PEA GRAVEL TO REDUCE ROOT GROWTH

FIGURE 5g

CONCEPTUAL TURTLE NESTING BEACH DESIGN

PROPOSED NEW VEGETATION



Riverfront Residential

Figure 6
Conceptual Trail Plan and Connections

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Legend

- Roadway Sidewalk/Trail
- Off-Road NHS Trail (raised boardwalk with railings)
- Primary Regional Access Road
- Destination and Connection
- Proposed Community Open Space
- Riverfront Residential Area
- GR(Can) Land Holdings

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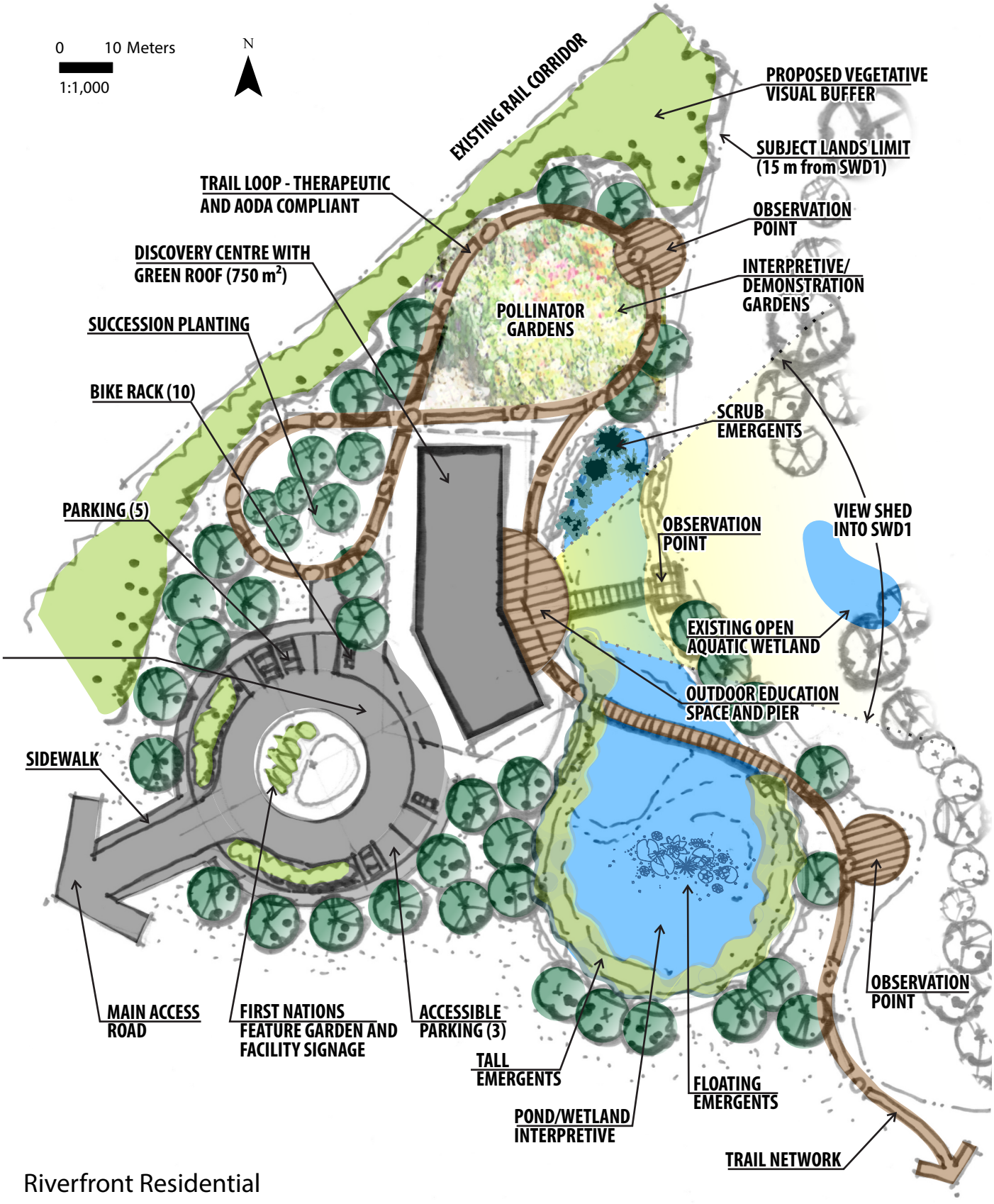

Riverfront Residential

Figure 7 Wetland Discovery Centre Concept Sketch

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Appendix D2 – Tables

TABLE D1: Restoration Goals and Objectives, Proposed Riverfront Residential Community

GOAL	OBJECTIVES	TARGETS
Establish an NHS that will be viable and sustainable within the proposed Riverfront Community	• Consider and plan for the degree of human use associated with the future community • Ensure internal and external connections are maintained/established to promote ongoing movement of plants, wildlife and genetic material and to sustain life cycle function-depended areas • Improve the resilience of specialized habitats that may be more vulnerable to climate change	• The conceptual location and plan for a Wetland Discovery Centre will encourage interest in the natural environment generally and specifically related to examples such as: - sustainable site design using low impact development and LEED principles - Stewardship of ecological resources - Importance of native plants as an integral component of community landscaping; and - Indigenous values and traditional understanding • Identify potentially suitable locations for trails, interpretive signage and/or viewing platforms that will reduce potential impacts on natural features and provide important opportunities for individual and community interactions with nature • Establish one or more wildlife ecopassages (and associated Animex fencing) beneath Chippawa Parkway to improve connectivity between the Subject Lands and City lands/wetlands associated with the Welland River • Create and enhance habitat to serve the life processes of turtles, open-wetland amphibian species and odonates, including pond habitat that suits their habitat preferences, turtle nesting beaches, turtle overwintering habitat and movement corridors • Include deeper pools as refugia for drought periods • Increase the diversity and health of native vegetation communities. Increase cover of open meadow and early successional vegetation types (i.e., host plants for pollinator

GOAL	OBJECTIVES	TARGETS
		species; range of moisture classes and microclimates to increase insect diversity).
Conserve and enhance Retained Provincially Significant Wetlands	• Conserve and increase native biodiversity through invasive species management and control and through the propagation of local native species	• Implement an extensive multi-year program to remove problematic invasive plant species including Common Buckthorn and Reed Grass • Plan and implement diverse native meadow communities inclusive of open wetland and pockets of hummocky topography • Ensure specialized features will hold water for variable lengths of time. This will better support a diversity of microhabitats and flora and fauna • Two created wetlands are proposed in order to augment limited open wetland breeding, foraging and overwintering habitat types for turtles and open-wetland amphibians (i.e., reduction of a limiting factor to diversity) • The creation of a native plant nursery within the Subject Lands (likely in proximity to the Wetland Discovery Center to promote education and research) will encourage the sustainable harvest of seed and other propagules, storage, experimental propagation technique advancement and the generation of native, locally adapted seed/stock for use within restoration areas both within and outside of the Subject Lands.
	• Ensure the urbanization of the Riverfront Lands recognizes and respects the current hydrology of wetland units • Complete Feature-based Water Balance exercises to match pre and post development conditions	• Establish protective buffers suited to the sensitivities of each wetland • Control and eliminate invasive species within significant wetlands • Monitor the features over time to identify potential enhancement treatments where acceptable to regulatory authorities (e.g., hydrologic enhancements to mitigate against drought)

GOAL	OBJECTIVES	TARGETS
Protect and enhance Retained Significant Woodlands	• Improve the management and health of woodlands within the NHS to promote diversity and resilience to insects and disease	• Implement direct afforestation and invasive species management within and/or along the edge of retained woodlands • Enhance retained woodlands through Common Buckthorn invasive species control and native plantings
Protect and enhance Significant Wildlife Habitat (SWH)	• Ensure SWH continues to be present and function in a sustainable manner. • Increase the population size of rare species wherever practical.	• Plant visual barrier vegetation (such as bramble and thorny species) to deter off-trail access into retained features • Reduce the potential for wildlife road mortality • Improve the accessibility of various habitats suiting the life processes of target wildlife within the NHS. • Create artificial turtle nesting beaches and open wetlands - both of which are limited habitat types on the Subject Lands • These specialized features will provide a diversity of microhabitats that will benefit an array of flora and fauna, including Great Plains Ladies'-tresses. NM1 is the primary, recommended transplant location proposed for this rare plant, Dense Blazing Star and grassland associate plants, pollinators, amphibians, turtles, butterflies and odonates
Habitat of Endangered and Threatened Species	• Ensure Habitat of Endangered and Threatened Species is conserved and enhanced where feasible • Updated submission of the MNRF Information Gathering Form (IGF) to address potential impacts to Species at Risk	• Develop mitigation measures for Dense Blazing Star, focused on transplantation/division and propagation to increase the population size and distribution throughout the broader Riverfront Community retained natural features (i.e., in suitable micro-habitat locations) • Minimize potential (trail, access) impacts to Acadian Flycatcher, endangered bat species, Dense Blazing Star and their habitats

GOAL	OBJECTIVES	TARGETS
		• Plant visual barrier vegetation (such as bramble and thorny species) that deters off-trail access into retained significant wildlife habitat
Species at Risk	• Maintain and enhance Species at Risk habitat and increase population size where feasible	• Identify Pin Oak stems suitable for retention within the Riverfront Residential area. • Establish native meadow (subject to the Common Buckthorn Type 2 treatment), that favours the development of a diverse, resilient and self-supporting open vegetation community. It will provide habitat for a variety of provincially and locally rare species, such as: Great Plains Ladies'-tresses, Dense Blazing Star, Yellow Indian-grass, Monarch, bees, other pollinators and fauna that utilize early successional areas • Implement Great Plains Ladies'-tresses transplant and propagation program • Collect and distribute Creeping Spike-rush (*Eleocharis palustris*) seed in appropriate habitat • Plant American Plum (*Prunus americana*) nursery stock • Collect and distribute Woolly Sedge (*Carex pellita*) seed in appropriate habitat • Include Yellow Indian-grass (*Sorghastrum nutans*) in the groundcover terraseed mix to be applied in native meadow restoration areas.
Fish Habitat	• Ensure fish habitat is conserved and improved through construction and post construction activities	• Proposed buffers from WC1 and WC2 will result in long-term protection for the feature.

GOAL	OBJECTIVES	TARGETS
		• Following implementation of mitigation, no net effects on fish habitat are anticipated due to potential indirect effects during construction (e.g., erosion and sedimentation) • No net effects on fish habitat due to stormwater management within the Riverfront Residential lands are anticipated provided the SWM plan is effective in maintaining or enhancing existing watercourse hydrology • Long-term enhancements to fish habitat may result from proposed invasive species management and associated restoration in the vicinity of the watercourses, including within buffer areas

Table D.2 Woodland Restoration Area Planting Details

WR1: SWD1 and FOD7-2		
Implementation Notes: • Common Buckthorn removal type 1 • Apply Woodland Restoration Treatment 1 throughout the WR1 identified area on **Figure 3** (**Appendix D1**) • Concentrate tree/shrub plantings in the first 5 m of the buffer (against the retained feature edge) • Woody stock planting density: 5 trees/100 m^2, 6 shrubs/100 m^2 • Portions of WR1 that are presently cultural thicket (CUT1) are expected to have more abundant Common Buckthorn, the removal of which will create larger openings. In these larger open areas, apply groundcover seed mix and cover crop. Exact areas where seed mix should be applied will be determined at detailed design. • Apply native groundcover seed mix at terraseed rate: 10 kg/ha to 15 kg/ha • Cover crop applied with the groundcover seed mix (application rate kg/ha depends on cover crop species choice, refer to **Table D4**, **Appendix D2**) • Two herbaceous species are identified for seed collection and dispersal into mature portions of the SWD1/FOD7-2: (1) distribute seed collected from on-site Drooping Woodreed (*Cinna latifolia*) in late summer into shaded areas of the SWD1; and (2) distribute seed collected from on-site Finely-nerved Sedge (*Carex leptonervia*) in early summer into the FOD7-2.		
TREES	**SHRUBS**	**GROUNDCOVER SEED MIX**
Swamp White Oak (*Quercus bicolor*) Pin Oak (*Quercus palustris*) Northern Red Oak (*Quercus rubra*) Shagbark Hickory (*Carya ovata*) Red Maple (*Acer rubrum*) Sugar Maple (*Acer saccharum*) Basswood (*Tilia americana*) Eastern Cottonwood (*Populus deltoides spp. deltoides*) Paper Birch (*Betula papyrifera*)	Choke Cherry (*Prunus virginiana*) Red-osier Dogwood (*Cornus stolonifera*) Alternate-leaved Dogwood (*Cornus alternifolia*) Wild Red Raspberry (*Rubusidaeus ssp. strigosus*) Nannyberry (*Viburnum lentago*) Red Elderberry (*Sambucus racemosa ssp. pubens*)	Virginia Rye (*Elymus virginicus*) Slender Wheat Grass (*Elymus trachycaulis*) Butterfly Milkweed (*Asclepias tuberosa*) Sand Dropseed (*Sporobolus cryptandrus*) Wild Columbine (*Aquilegia canadensis*) Dwarf Blazing Star (*Liatris cylindracea*) Rough Dropseed (*Sporobolus aspera*) Virginia Mountain Mint (*Pycnanthemum virginianum*) White Vervain (*Verbena urtriculata*) Gold Fruited Sedge (*Carex aurea*) Soft Agrimony (*Agrimona pubescens*) Poverty Oatgrass (*Danthonia spicate*) Early Goldenrod (*Solidago juncea*) Slender Mountain Mint (*Pycnanthemum tenuifolia*)
WR2: SWD4-1 Units		
Implementation Notes: • Common Buckthorn removal type 1 within 7.5 m adjacent to the wetland boundary and removal type 2 within the outer 7.5 m of the wetland buffer • Apply Woodland Restoration Planting Treatment 2 (WR2) within the SWD4-1 wetland buffer areas shown on **Figure 3** (**Appendix D1**) • Concentrate tree/shrub plantings in the first 5 m of the buffer (against the retained feature edge) • Woody stock planting density: 3 trees/100 m^2, 8 shrubs/100 m^2 • Apply tree seed in 6 to 12 pods (locations to be identified at detailed design) within the retained vegetation zone adjacent to the wetland edge. Three Oak species are targeted within the pods: Red Oak, Swamp White Oak and Pin Oak. The tree seed pods should be situated beneath existing canopy cover ('shelter wood') to provide semi-shade conditions. For Red Oak, three acorns should be placed together in each planting hole to		

yield (approximately) one seedling. For Pin Oak and Swamp White Oak, five acorns should be placed together in each planting hole to yield (approximately) one seedling. Apply standard mulch to 25 cm to 30 cm depth after seed planting is complete to retain moisture and to reduce competition from other plants

- Apply groundcover seed mix and cover crop within the type 2 treatment area; no groundcover seed mix or cover crop application in the type 1 treatment area (majority of existing herbaceous layer will be retained in the latter)
- Apply native groundcover seed mix at terraseed rate: 10 kg/ha to 15 kg/ha
- Cover crop applied with the groundcover seed mix (application rate kg/ha depends on cover crop species choice refer to **Table D4**, **Appendix D2**)

TREES	SHRUBS	GROUNDCOVER SEED MIX
Pin Oak (*Quercus palustris*) Northern Red Oak (*Quercus rubra*) Shagbark Hickory (*Carya ovata*) Eastern Cottonwood (*Populus deltoides spp deltoides*) Refer to Implementation Note regarding Oak seed planting	Cottony Willow (*Salix eriocephala*) Nannyberry (*Viburnum lentago*) Wild Red Raspberry (*Rubus idaeus ssp. strigosus*) Purple-flowering Raspberry (*Rubus odoratus*) Alleghany Blackberry (*Rubus allegheniensis*) Dotted Hawthorn (*Crataegus punctata*)	Virginia Rye (*Elymus virginicus*) Slender Wheat Grass (*Elymus trachycaulis*) Butterfly Milkweed (*Asclepias tuberosa*) Sand Dropseed (*Sporobolus cryptandrus*) Wild Columbine (*Aquilegia canadensis*) Dwarf Blazing Star (*Liatris cylindracea*) Rough Dropseed (*Sporobolus aspera*) Virginia Mountain Mint (*Pycnanthemum virginianum*) White Vervain (*Verbena urtriculata*) Gold Fruited Sedge (*Carex aurea*) Soft Agrimony (*Agrimona pubescens*) Poverty Oatgrass (*Danthonia spicate*) Early Goldenrod (*Solidago juncea*) Slender Mountain Mint (*Pycnanthemum tenuifolia*)

WR3: SWD2-2 (west development area)

Implementation Notes:

- Common Buckthorn removal type 1 within 7.5 m adjacent to wetland boundary and removal type 2 within the outer 7.5 m of the wetland buffer
- Apply Woodland Restoration Planting Treatment 3 (WR3) throughout the 10 m buffer applied to this SWD2-2 wetland
- Concentrate tree/shrub plantings in the first 5 m of the buffer (against the retained feature edge)
- Woody stock planting density: 3 trees/100 m^2, 8 shrubs/100 m^2
- Apply tree seed in 6 pods to 12 pods (locations to be identified at detailed design) within the retained vegetation zone adjacent to the wetland edge. Three Oak species are targeted within the pods: Red Oak, Swamp White Oak and Pin Oak. The tree seed pods should be situated beneath existing canopy cover ('shelter wood') to provide semi-shade conditions. For Red Oak, three acorns should be placed together in each planting hole to yield (approximately) one seedling. For Pin Oak and Swamp White Oak, five acorns should be placed together in each planting hole to yield (approximately) one seedling. Apply standard mulch to 25 cm to 30 cm depth after seed planting is complete to retain moisture and to reduce competition from other plants.
- Apply groundcover seed mix and cover crop only within the type 2 treatment area; no groundcover seed mix or cover crop application in the type 1 treatment area (majority of existing herbaceous layer will be retained in the latter)
- Apply native groundcover seed mix at terraseed rate: 10 kg/ha to 15 kg/ha
- Cover crop applied with the groundcover seed mix (application rate kg/ha depends on cover crop species choice refer to **Table D4**, **Appendix D2**)

TREES	SHRUBS	GROUNDCOVER SEED MIX
Swamp White Oak (*Quercus bicolor*) Northern Red Oak	Nannyberry (*Viburnum lentago*) Alternate-leaved Dogwood (*Cornus alternifolia*)	Virginia Rye (*Elymus virginicus*) Slender Wheat Grass (*Elymus trachycaulis*) Butterfly Milkweed (*Asclepias tuberosa*)

(*Quercus rubra*) Shagbark Hickory (*Carya ovata*) Sugar Maple (*Acer saccharum*) Red Maple (*Acer rubrum*) White Elm (*Ulmus americana*) Refer to Implementation Note regarding Oak seed planting	Downy Arrowwood (*Viburnum rafinesquianum*) Purple-Flowering Raspberry (*Rubus odoratus*) Wild Red Raspberry (*Rubus idaeus ssp. strigosus*) Eastern Prickly Gooseberry (*Ribes cynosbati*)	Sand Dropseed (*Sporobolus cryptandrus*) Wild Columbine (*Aquilegia canadensis*) Dwarf Blazing Star (*Liatris cylindracea*) Rough Dropseed (*Sporobolus aspera*) Virginia Mountain Mint (*Pycnanthemum virginianum*) White Vervain (*Verbena urtriculata*) Gold Fruited Sedge (*Carex aurea*) Soft Agrimony (*Agrimona pubescens*) Poverty Oatgrass (*Danthonia spicate*) Early Goldenrod (*Solidago juncea*) Slender Mountain Mint (*Pycnanthemum tenuifolia*)

WR4: CUW and FOD9 Units (eastern ravine)

Implementation Notes:

- Common Buckthorn removal type 1
- Apply Woodland Restoration Planting Treatment 4 (WR4) throughout the Common Buckthorn removal areas in the CUW and FOD9 units within the ravine northeast of the Riverfront Residential Area
- Where nodes of Common Buckthorn are removed and create openings, apply shrub plantings along with Juglone-containing mulch or standard mulch to a depth of 25 cm to 30 cm
- Woody stock planting density will be determined at detailed design based on the current abundance of Common Buckthorn and predicted amount of sub-canopy openings that will be created due to management of this invasive shrub
- No groundcover treatment or cover crop (in-planting of shrubs only)

TREES	SHRUBS	GROUNDCOVER SEED MIX
No tree planting proposed since WR5 is within a retained woodland patch	Northern Spicebush (*Lindera benzoin*) Smooth Rose (*Rosa blanda*) Purple-Flowering Raspberry (*Rubus odoratus*) Eastern Prickly Gooseberry (*Ribes cynosbati*) Canada Fly Honeysuckle (*Lonicera canadensis*) Red Elderberry (*Sambucus racemosa ssp. pubens*) Nannyberry (*Viburnum lentago*) Choke Cherry (*Prunus virginiana*)	No groundcover treatment as existing herbaceous layer will be retained (in-planting of shrubs only)

WR5: SWD2-2 Unit (east development area)

Implementation Notes:

- No Common Buckthorn removal within this treatment area as it is a wetland buffer that is set back from development with existing woodland between the buffer and the development area
- Apply Woodland Restoration Treatment 5 (WR65 within the SWD2-2 wetland buffer
- This restoration area is within a retained vegetation community, shrub in-planting density will be determined at detailed design depending on current status of the sub-canopy and shrub layers
- No groundcover treatment or cover crop (in-planting of shrubs only)

TREES	SHRUBS	GROUNDCOVER SEED MIX
No tree planting proposed since WR6 is within a retained woodland patch	Northern Spicebush (*Lindera benzoin*) Smooth Rose (*Rosa blanda*) Purple-Flowering Raspberry (*Rubus odoratus*)	No groundcover treatment as existing herbaceous layer will be retained (in-planting of shrubs only)

	Eastern Prickly Gooseberry (*Ribes cynosbati*) Canada Fly Honeysuckle (*Lonicera canadensis*) Red Elderberry (*Sambucus racemosa ssp. pubens*) Nannyberry (*Viburnum lentago*) Choke Cherry (*Prunus virginiana*)	

Table D.3 Native Meadow Restoration Area Planting Details

NM1: Native meadow restoration in south-central portion of NHS	
Implementation Notes: • Common Buckthorn removal type 2 • Apply Native Meadow Restoration Treatment 1 throughout the NM1 identified area on **Figure 3** (**Appendix D1**) • A diverse, native meadow is the target for this restoration area, which is intended to provide habitat for a variety of provincially or locally rare species, including: Great Plains Ladies'-tresses, Yellow Indian-grass, Monarch, bees, and other pollinators. After multi-year Common Buckthorn treatment is complete, soil testing and site-preparation are required before planting occurs in NM1: (1) collect soil sample and submit to an accredited soil laboratory for testing, (2) in autumn apply amendments as per soil testing results and terraseed with the native seed mix and cover crop. Soil amendments could include alterations to soil chemistry, texture, or addition of mycorrhizal inoculants. • Conduct transplants into NM1: (1) accurately demarcate existing specimens of Great Plains Ladies'-tresses (within the SWH polygons) in the field in late September and perform plug/sod mat transplants once the plant is dormant in late October; and (2) corm transplants from the introduced on-site population of Dense Blazing Star once dormant October - April (latter pending MNRF agreement). • Apply groundcover seed mix (outside of sod mat transplant areas) at terraseed application rate of 15 kg/ha to 20 kg/ha (use a low-height groundcover seed mix to reduce shading of Great Plains Ladies'-tresses) • Some of the species in the groundcover seed mix require more moist soil conditions, planting of these species should target areas adjacent to the proposed amphibian / turtle ponds within NM1 • Apply cover crop with the groundcover seed mix (application rate kg/ha depends on cover crop species choice, refer to **Table D4**, **Appendix D2**) • No tree / shrub planting proposed	
GROUNDCOVER SEED MIX	
Virginia Rye (*Elymus virginicus*) Indian Grass (*Sorghastrum nutans*) Slender Wheat Grass (*Elymus trachycaulis*) Canada Rye (*Elymus canadensis*) Sand Dropseed (*Sporobous cryptandrus*) Giant Yellow Hyssop (*Agastache nepetoides*) Swamp Milkweed (*Asclepias incarnata*) Common Milkweed (*Asclepias syriaca*) Butterfly Milkweed (*Asclepias tuberosa*) Spiked Blazing Star (*Liatris spicata*) Ironweed (*Vernonia missurica*)	Virginia Mountain Mint (*Pycnanthemum virginianum*) Green Headed Coneflower (*Rudbekia laciniata*) Early Goldenrod (*Soldiago juncea*) Grey Goldenrod (*Solidago nemoralis*) Heath Aster (*Symphyotrichum ericoides*) Bergamot (*Monarda fistulosa*) Blue Vervain (*Verbena hastata*) White Vervain (*Verbena urticifolia*) Hoary Vervain (*Verbena stricta*)
NM2: Native meadow restoration in eastern portion of the NHS	
Implementation Notes: • Common Buckthorn removal type 2 • Apply Native Meadow Restoration Treatment 2 within the wetland buffers identified as NM2 on **Figure 3** (**Appendix 1**) • Apply woody stock within interior 5 m of the wetland buffer (against the wetland boundary) • Woody stock planting density: 2 trees/100 m^2, 8 shrubs/100 m^2 • Concentrate tree/shrub plantings in the first 5 m of the buffer (against the retained feature edge) • Apply groundcover seed mix at terraseed application rate of 7 kg/ha to 10 kg/ha • Apply cover crop with the groundcover seed mix (application rate kg/ha depends on cover crop species choice refer to **Table D4**, **Appendix D2**)	

TREES	SHRUBS	GROUNDCOVER SEED MIX
Northern Red Oak (*Quercus rubra*) Red Maple (*Acer rubrum*) Shagbark Hickory (*Carya ovata*)	American Plum (*Prunus americana*) Grey Dogwood (*Cornus foemina*) Staghorn Sumac (*Rhus typhina*) Dotted Hawthorn (*Crataegus punctata*)	Virginia Rye (*Elymus virginicus*) Riverbank Rye (*Elymus riparius*) Canada Rye (*Elymus canadensis*) Indian Grass (*Sorghastrum nutans*) Slender Wheat Grass (*Elymus trachycaulis*) Common Milkweed (*Asclepias syriaca*) Sweet Ox-eye (*Heliopsis helianthoides*) Giant Yellow Hyssop (*Agastache nepetoides*) Indian Hemp (*Apocynum cannabinum*) Blue Vervain (*Verbena hastata*) Sand Dropseed (*Sporobolus cryptandrus*) Poverty Oatgrass (*Danthonia spicate*) Brown-Eyed Susan (*Rudbeckia hirta*) Early Goldenrod (Solidago juncea) Path Rush (*Juncus tenuis*) Bergamot (*Monarda fistulosa*) Grey Goldenrod (*Solidago nemoralis*) New England Aster (*Symphyotrichum novae-angliae*)

NM3: Pollinator plant restoration areas within Open Space / Parkland

Implementation Notes:

- Apply Native Meadow Restoration Treatment 3 throughout the NM3 identified areas on **Figure 3** (**Appendix D1**)
- NM3 will be a recipient location for sod mat transplants of Great Plains Ladies'-tresses; areas between sod mat transplants will be terraseeded with a low-height groundcover seed mix to reduce shading of this plant.
- The location of the NM3 polygons should be clearly demarcated in the field ahead of site clearing for development. Existing vegetation will be cleared within the open space / parkland designated area however disturbance to existing soils should be minimized to the extent feasible within the NM3 polygons. Apply the measures outlined in the NM1 implementation notes to demarcate and transplant the Great Plains Ladies'-tresses.
- Apply groundcover seed mix (outside of sod mat transplant areas) at terraseed application rate of 15 kg/ha to 20 kg/ha
- Apply cover crop with the groundcover seed mix (application rate kg/ha depends on cover crop species choice, refer to **Table D4**, **Appendix D2**)
- No tree/shrub planting proposed

GROUNDCOVER SEED MIX	
Key species to include: Indian Grass (*Sorghastrum nutans*) Big Bluestem (*Andropogon gerardii)* Common Milkweed (*Asclepias syriaca*) Butterfly Milkweed (*Asclepias tuberosa*)	Early Goldenrod (*Soldiago juncea*) Grey Goldenrod (*Solidago nemoralis*) Bergamot (*Monarda fistulosa*) Spiked Blazing Star (*Liatris spicata*) Ironweed (*Veronia missurica*)

Table D.4 Created Open Wetland Planting Details

Created open wetlands within native meadow restoration areas NM1 and NM2		
Implementation Notes: • Shrub planting density: 4 shrubs/100m^2 within the littoral zone • Apply cover crop with the groundcover seed mix (application rate kg/ha depends on cover crop species choice, refer to **Table D4**, **Appendix D2**) • Collect and distribute native floating aquatic vegetation samples from the existing open aquatic ponds that are retained within the NHS		
TREES	**SHRUBS**	**GROUNDCOVER SEED MIX**
No tree planting proposed	Pale Dogwood (*Cornus obliqua*) Buttonbush (*Cephalanthus occidentalis)* Willow shrub species *(Salix spp.*)	Spotted Jewelweed (*Impatiens capensis)* Broad-fruited Burreed (*Sparaganium eurycarpum)* Creeping Spike-rush (*Eleocharis palustris)* Soft-stemmed Bulrush (*Schoenoplectus tabernaemontani*) Variegated Pond-lily (*Nuphar variegata*) Broad-leaved Arrowhead (*Sagittaria latifolia*) Water-plantain (*Alisma plantago-aquatica*)

Table D.5 Recommended Cover Crop Options

Common Name	Scientific Name	Planting Window	Seed Rate when applied with native seed mix	Seed rate when applied without native seed mix*	Comments
Canada Wild Rye	*Elymus canadensis*	September 15 to October 20	15 kg/ha	67-224 kg/ha	
Oats	*Avena sativa*	Late April to mid-May and August to September	20 kg/ha	90-157 kg/ha	Leave standing dead in winter
Buckwheat	*Fagopyrun escelentum*	June and July	20 kg/ha	56-78 kg/ha	If applying later in timing window, apply with Oats to provide fall and winter cover (standing dead)
Winter Wheat	*Triticum aestivum*	Mid to late September	20 kg/ha	78-224 kg/ha	

Notes:

*Pure cover crop (with no additional native seed mix) will be applied to the Common Buckthorn type 2 removal areas following each herbicide treatment to provide cover and competition with the Common Buckthorn seed bank

Cover crop species selection, application seed rate and timing windows based on professional experience and Bjorkman, T. no date. New York Cover Crop Decision Support Tool. Cornell University, Horticulture Section.

Table D.6 15 m Buffer Planting Areas (Other Lands Owned by Applicant)

BP1: SWD4-1

Implementation Notes:

- Common Buckthorn removal type 1
- Apply BP1 treatment throughout the 15 m buffer assigned to this wetland (which is located on other lands owned by the applicant)
- Concentrate tree/shrub plantings in the first 5 m of the buffer (against the retained feature edge)
- Woody stock planting density: 3 trees/100 m^2, 8 shrubs/100 m^2
- Apply tree seed in 6 pods to 12 pods (locations to be identified at detailed design) within the retained vegetation zone adjacent to the wetland edge. Three Oak species are targeted within the pods: Red Oak, Swamp White Oak and Pin Oak. The tree seed pods should be situated beneath existing canopy cover ('shelter wood') to provide semi-shade conditions. For Red Oak, three acorns should be placed together in each planting hole to yield (approximately) one seedling. For Pin Oak and Swamp White Oak, five acorns should be placed together in each planting hole to yield (approximately) one seedling. Apply standard mulch to 25 cm to 30cm depth after seed planting is complete to retain moisture and to reduce competition from other plants.
- No groundcover treatment or cover crop (existing vegetation is present throughout most of this buffer area)

TREES	SHRUBS	GROUNDCOVER SEED MIX
Pin Oak (*Quercuspalustris*) Northern Red Oak (*Quercus rubra*) Shagbark Hickory (*Carya ovata*) Eastern Cottonwood (*Populus deltoides spp deltoides*) Refer to Implementation Note regarding Oak seed planting	Cottony Willow (*Salix eriocephala*) Nannyberry (*Viburnum lentago*) Wild Red Raspberry (*Rubus idaeus ssp.strigosus*) Purple-flowering Raspberry (*Rubus odoratus*) Alleghany Blackberry (*Rubus allegheniensis*) Dotted Hawthorn (*Crataegus punctata*)	No groundcover treatment as existing herbaceous layer will be retained (in-planting of trees and shrubs only)

BP2: SWT2/CUT1

- Common Buckthorn removal type 1
- Apply BP2 treatment throughout the 15m buffer assigned to this wetland (which is located on other lands owned by the applicant)
- Concentrate tree/shrub plantings in the first 5 m of the buffer (against the retained feature edge)
- Woody stock planting density: 2 trees/100 m^2, 10 shrubs/100 m^2
- No groundcover treatment or cover crop (existing vegetation is present throughout most of this buffer area)

TREES	SHRUBS	GROUNDCOVER SEED MIX
Eastern Cottonwood (*Populus deltoides spp. deltoides*) Northern Red Oak(*Quercus rubra*) Black Cherry (*Prunus serotina*)	Grey Dogwood (*Cornus foemina*) Choke Cherry (*Prunus virginiana*) Nannyberry (*Viburnum lentago*) Red Elderberry (*Sambucus racemosa ssp. pubens*) Wild Red Raspberry (*Rubus idaeus ssp.strigosus*) Purple-Flowering Raspberry (*Rubus odoratus*) Eastern Prickly Gooseberry (*Ribes cynosbati*)	No groundcover treatment as existing herbaceous layer will be retained (in-planting of trees and shrubs only)

Appendix E – EIS Terms of Reference

SAVANTA

October 16, 2018 (revised December 1, 2018)

City of Niagara Falls
4310 Queen Street
Niagara Falls, ON
L2E 6X5

Attention: Andrew Bryce
Planner

Dear Mr. Bryce:

RE: Terms of Reference for 2018 Riverfront Residential Block Plan Scoped Environmental Impact Study, Riverfront Community, Niagara Falls, ON

On May 8, 2018, Niagara Falls City Council approved the Official Plan Amendment Application submitted by GR (CAN) Investment Co. Ltd. for the Riverfront Community in Niagara Falls, subject to the recommendations contained within the staff report dated May 8, 2018. That approval was based upon detailed multi-year technical analyses and reports prepared on behalf of the applicant. Some of the recommendations contained within the staff report referenced additional natural heritage study requirements that need to be satisfied prior to subsequent project approvals. The natural heritage related recommendations in the staff report focused on the following topics:

- Wetlands and their proposed buffers;
- Endangered Species Act permitting;
- Significant wildlife habitat; and
- Woodlands.

This Terms of Reference (ToR) specifically addresses those matters raised by staff, and how they have been addressed since the May approvals (i.e., some seasonal technical investigations have been completed, as required). Results of technical investigations and ongoing analyses will be presented in the Scoped Riverfront Residential Block Plan EIS, which is an addendum to the September 2017 EIS and builds upon and makes reference to earlier reporting.

The Riverfront Residential Area is comprised of the OPA development areas south of the railway, as shown on **Figure 1** (attached). This Scoped Block Plan EIS addresses the natural heritage recommendations contained within the City staff report and provides updated information on matters that have been discussed with regulatory agencies, including MNRF, since the submission of the Savanta EIS Addendum on March 28, 2018.

The Riverfront Residential Block Plan EIS is scoped to address key matters that were not addressed in previous EIS documents; i.e., Thundering Waters Secondary Plan Characterization and Environmental Impact Study (Dougan and Associates 2016), Environmental Impact Study Riverfront Community Private OPA EIS (Savanta September 2017) and Riverfront Community

Private OPA EIS Addendum (Savanta March 2018). Technical investigations completed in 2018 followed the methods defined in this ToR document.

The agency group, comprised of the City, the Region and NPCA, provided input to the content of the ToR through pre-consultation meetings at City Hall, Niagara Falls, on July 19, October 4, and November 21, 2018 along with a technical discussion completed by phone between Savanta and Region staff on November 19, 2018. The Scoped EIS ToR provided below reflects changes requested by the agency group to prior versions of the ToR.

The Riverfront Residential Block Plan Scoped EIS will address the following:

- Methodology and Findings (2018 surveys and select 2017 surveys);
- Analyses – Natural Heritage Features and Associated Functions;
- Impacts Avoidance, Mitigation, Restoration/Enhancement;
- Conceptual Trail and Human Use Planning; and
- Monitoring.

Methodology and Findings

Woodland Canopy Cover Surveys (2018):

Woodland canopy cover/stem density surveys examined all communities identified as either cultural woodland (CUW1) or cultural thicket (CUT1) to determine if they met the Ecological Land Classification (ELC) woodland definition (according to live canopy cover) and the Forestry Act definition of woodland. All trees that had attained a height of over 1.37 m were included in the inventory (Hawthorn species, which are tall shrubs, were included in the inventory at the Region's request; fruit trees were excluded from the inventory).

The stem density assessment was completed using circular plots with a radius of 15 m or 5 m, depending on the size/shape of the vegetation community. For cultural woodland or cultural thicket communities that occurred within the proposed development area and also extended outside of this limit, the portion occurring within the footprint was assessed and imagery interpretation was used to delineate outside the footprint. This ensured the calculation of stem densities was of the ELC community as a whole, rather than just the area within the proposed development footprint. ELC live canopy cover was also determined within each plot and for the overall ELC polygon as a whole. ELC cards and stem density survey results will be appended to the EIS.

Ecological Land Classification Updates (2018):

Within each plot examined as part of the woodland canopy cover assessment, ELC data was collected and appropriate forms were completed. Methods for this revised ELC followed the standard requirements outlined in the ELC Manual for Southern Ontario (Lee et al. 1998). When determining appropriate ELC community codes, consideration was given to live canopy density and species composition within the canopy.

ELC community codes were also updated within select PSW units to reflect current conditions (i.e., species composition and community type). The boundaries of the PSW units were not altered and continue to match the MNRF staking. ELC cards will be appended to the EIS.

Select wetland hydroperiod monitoring (woodland amphibian SWH refinement) (2018):

Several candidate significant wildlife habitat types were previously identified (2016 EIS; 2017 EIS; March 2018 EIS Addendum) within the retained NHS based on ELC type and aerial interpretation, including the woodland calling amphibian SWH type. Staff gauges were installed in seven PSW units on the Subject Lands and monitored from mid-summer through November 2018 to assist in characterization of these wetlands (note: this work is separate from wetland water balance work completed by Wood). Through the course of staff gauge monitoring and site visits to these wetlands, observations were made regarding hydroperiod and presence of suitable topography (i.e., suitable depressions to support spring/summer pooling for breeding woodland amphibians). Staff gauges were installed in pools holding water or, where a wetland held no apparent water at the time of installation, within a depressional area.

Wildlife Movement Surveys (2017 and 2018):

Wildlife road-crossing surveys were conducted in spring and autumn 2017 and autumn 2018 to further understand wildlife movement on and immediately adjacent to the Subject Lands. The key animal movement periods are the early spring (April to May) when turtles mobilize to seek nesting habitat, and autumn (September to October) when amphibians/reptiles return to overwintering sites. These surveys were conducted on foot to document (including UTM coordinates) signs of wildlife/road interactions, such as dead specimens, live specimens and other evidence (tracks, scat, feathers, etc.).

Salamander movement surveys (visual encounter/transect method) were also conducted on-site in late-February 2017 to assist with identification of potential ecological linkages (i.e., between overwintering and breeding habitats). The results of these salamander movement surveys were provided in the 2017 EIS. A summary of the latter will be provided in this Scoped EIS for context and to aid in discussion regarding ecological linkages.

Rare Vegetation Community SWH Layer Refinement (2018):

Previous reporting (2016 EIS; 2017 EIS) identified candidate rare vegetation community SWH within and adjacent to the Subject Lands. The candidate rare vegetation community SWH layer includes older growth forest. Older growth forest delineation was updated using Google Earth historical aerial imagery from 1934. In addition, a targeted survey was conducted within the PSW (comprised of CUT1/SWT2 and CUW1) in the southwest corner of the Subject Lands to confirm the presence/absence of a candidate rare vegetation community polygon shown within this PSW in prior reports.

Rare Species SWH Layer Refinement (2018):

Monarch - Surveys were conducted in September 2018 to document/update the abundance of Milkweed plants within the Riverfront Residential Area.

Eastern Wood-Pewee and Wood Thrush – The rare species SWH layer for Wood Thrush and Eastern Wood-Pewee previously identified in the 2016 EIS was refined to match more accurately with ELC boundaries and the birds' occurrence data from the breeding bird surveys completed as part of the 2016 EIS.

Provincially rare plants - The 2016 EIS reported the presence of a provincially rare tree, Honey-locust (*Gleditsia triacanthos*) (S2?, G5; NHIC 2016), along the eastern boundary of the Subject Lands. A targeted survey was conducted to determine whether any stems of this species occur within the proposed development area. Field observations will be updated in the Scoped EIS to ensure the species list and associated analyses are current.

Candidate Turtle Nesting SWH Refinement (2018):

Potentially suitable turtle nesting SWH is present on City lands located off-site, south of Chippawa Parkway. Candidate turtle nesting SWH was mapped in this area in the March 2018 EIS Addendum. Targeted surveys were conducted within the City lands during the hatchling turtle emergence period (mid-August through September). The objectives of the surveys were to document any evidence of turtle hatchling emergence or nest predation, and to assess the suitability of nesting habitat (i.e., through completion of field observations and soil auger samples).

Bat Habitat Assessments (2018):

A bat habitat assessment, consisting of a cavity density survey, was completed within the overall GR(Can) Land Holdings, including the Subject Lands. The surveys were completed using a combination of MNRF survey guidelines as outlined in "Bats and Bat Habitats: Guidelines for Wind Power Projects" (MNR 2011) and "Survey Protocols for Species at Risk Bats within Treed Habitats: Little Brown Myotis, Northern Myotis, and Tri-Coloured Bat" (MNRF 2017), in conjunction with professional experience.

Areas to be surveyed were determined using ELC mapping of the Subject Lands. Targeted ELC communities on the Subject Lands were Deciduous Forests (FOD) and Deciduous Swamp (SWD). For the purposes of these surveys, Cultural Woodlands (CUW) were also targeted as they can provide SAR bat habitat. In certain instances, Cultural Thicket (CUT) communities were also included where there was a standing-dead canopy layer of Ash trees, which provide potential habitat for SAR bats. Cultural Woodlands and Cultural Thickets are not eligible vegetation types for bat significant wildlife habitat. Surveys were conducted during the leaf-off period on days when visibility was good. Each community that was surveyed was assigned a unique polygon identification number.

For all vegetation communities less than 1 ha, the entire community was surveyed using a transect approach, where transects were 5 m to 20 m apart (depending on visibility). ELC communities greater than 1 ha in size were surveyed using a plot-based approach, which consisted of randomly selecting 10 or more plots within the community. Each plot had a radius of 12.6 m (0.05 ha) and a GPS waypoint was recorded at each plot center. Within each plot, all trees greater than or equal to 10 cm diameter at breast height (DBH) were visually inspected using binoculars to document any suitable roosting features (such as cavities, crevices, loose bark) along the trunk or large branches. Each tree containing suitable roosting features had the following information recorded: UTM, species, DBH, approximate height, decay class, canopy cover, total number of cavities and height information for the top three cavities. Each vegetation

community that was surveyed was photographed to give a representation of the habitat potential.

The results were then used to assess the quality of the area for bat maternity roost SWH. A minimum density of >10 suitable roosting trees with >25 cm DBH/ha is required for a feature to be considered candidate bat maternity roost SWH. MNRF suggests features with >10 suitable roosting trees with >10 cm DBH/ha be considered as potential high-quality SAR bat habitat.

Bat Acoustic Monitoring Surveys:

Bat acoustic monitoring surveys enable, with reasonable certainty, the identification of bat species using analysis of sonographic characteristics from recordings of ultrasonic calls used by bat echolocate. Survey methods were developed based on professional experience and using a combination of MNRF survey guidelines as outlined in "Bats and Bat Habitats: Guidelines for Wind Power Projects" (MNR 2011) and "MNRF Survey Protocols for Species at Risks Bats within Treed Habitats: Little Brown Myotis, Northern Myotis, and Tri-Coloured Bat" (MNRF 2017).

Surveys to detect bat species were carried out for candidate bat SWH polygons (primary stations) on and adjacent to the Subject Lands in June 2018, with the exception of one candidate SWH polygon that was surveyed in August 2018. The latter polygon was just at the threshold of meeting the SWH snag density requirement; surveys were completed as a conservative measure. Additional surveys were completed at secondary stations in July in wooded areas beyond the 120m adjacent lands to the site. Surveys to detect bat species in candidate SAR bat habitat polygons are discussed with MNRF through the Information Gathering Form process.

Acoustic monitoring surveys were completed using Wildlife Acoustics Song Meter SM3BAT/SM4BAT recording devices over a duration of ten consecutive evenings. Passive bat recording stations were located in areas inside and outside of the construction footprint to provide a complete understanding of the relative importance of the available habitats on the Subject Lands.

Survey stations were selected based on aerial interpretation, ELC vegetation community types, and ground-truthing for suitable bat micro-habitat such as clusters of ≥10 cm DBH trees with peeling bark, leaf clusters, and cavities. A total of 50 stations were identified on the Subject Lands. Stations were situated within and adjacent to the proposed development area as well as control stations in woodlands well beyond the Riverfront Residential Area, as requested by MNRF.

Passive acoustic recorders were programmed to begin recording at sunset and to end recording at sunrise. In addition, the SM3BAT/SM4BAT passive recorder microphones were elevated approximately 2 m above the ground to reduce background noise and echo.

All ultrasonic recordings were filtered to eliminate recordings with high levels of noise and that contained no bat calls, and then further analyzed using SonoBat's auto-classification tool. Any calls with a positive identification were manually vetted by a wildlife ecologist with training in bat species identification by sonogram.

All species of bats can make calls that range in frequencies and sonogram characteristics, depending on the behavior at the time of call recording (i.e., social calls, foraging calls, feeding buzzes). Calls recorded during a bat's search phase are the most reliable for an accurate species identification, and these calls were used preferentially to identify recorded species from the

Subject Lands. Calls can be classified as not identifiable by the program due to the high level of confidence needed when classifying recordings, quality of the calls, overlap of multiple bat calls, and/or too much environmental background noise). High frequency calls that were not identifiable to species were manually reviewed by a wildlife ecologist with training in bat species identification by sonogram to identify those calls with characteristics of Species at Risk bats (i.e., calls with frequencies greater than 40kHz). The four species of bats listed on the SARO list all show characteristics of high frequency calling within the search phase, and therefore are readily distinguished from most other species of bats.

The results of these surveys were used to identify confirmed bat maternity roosting SWH and SAR bat habitat polygons. The bat maternity roosting SWH analysis will be provided in the EIS and the SAR bat habitat polygons will be shared with MNRF (latter is sensitive data) through the Information Gathering Form process.

Analyses – Natural Heritage Features and Associated Functions

The following will be addressed in the Scoped Block Plan EIS:

- Species at Risk;
- Significant wetlands;
- Significant woodlands;
- Bat significant wildlife habitat (SWH); and
- Refinements to several SWH layers as required based on findings.

The Scoped EIS will also include:

- A summary from prior reporting regarding fish habitat and significant valleylands that are present on the Subject Lands;
- A significant wildlife habitat screening table that summarizes all SWH layers (per MNRF's SWH criteria for eco-region 7E) for the Subject Lands based on prior reporting and the latest SWH layer refinements; and
- Identification of and discussion regarding potential natural heritage corridors / ecological linkages.

Impacts Avoidance, Mitigation, Restoration/Enhancement

The impact assessment and identification of appropriate mitigation measures will identify/provide:

- Appropriate buffer widths for retained natural heritage features;
- Principles for suitable uses within buffers, if any (e.g., Low Impact Development measures, minor grading, access and/or trail construction, etc.);
- Preliminary water balance information for each wetland subcatchment with initial guidance regarding how to sustain each feature (details to be demonstrated through the Stormwater Management Plan at the site plan stage);
- Analyses and documentation to define predicted impacts associated with any removals (i.e., no negative impact test achievement);

- Details regarding proposed restoration planning and net ecological gain measures required (if any); and
- Information regarding proposed phasing and associated environmental considerations, if relevant.

As discussed at the pre-consultation meetings with the agency group, the Riverfront Residential Block Plan EIS will be followed by additional documentation in support of a future site plan submission, namely a Stormwater Management (SWM) Plan. From an ecological perspective, the SWM Plan will include site-specific grading and updated wetland water balance information associated with the site plan stage of development. The SWM Plan would be part of the site plan submission and/or could be added, once approved by the agencies, as an addendum to the Riverfront Residential Block Plan EIS. The latter choice is subject to dialogue with the agencies.

Conceptual Trail and Human Use Planning

The applicant has completed conceptual trail planning as part of a larger integrated assessment of opportunities to manage human use of natural areas and to generate significant opportunities for social benefits associated with nature. These will be addressed in the Scoped EIS (i.e., also related to impact assessment/enhancements).

Monitoring

Monitoring necessary to validate effects predictions will be included in the Scoped EIS. The proposed development has been the subject of detailed analyses and reporting, both in support of the approved OPA and in support of this stage of more detailed development planning. The Scoped EIS will specifically address outstanding technical matters defined in the City approvals from May 2018 and it will provide a detailed assessment of data collected in 2018.

We trust that this version of the Terms of Reference will be helpful to you. We look forward to delivering the Scoped EIS for your review and consideration.

Yours truly,

SAVANTA INC.

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Senior Ecologist
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Kyle Hunt
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Attachment (1)

Appendix F – Agency Correspondence

Table E1 EIS Compliance with City of Niagara Falls Official Plan Amendment 128 Policies

COMMENT ID	CITY OF NIAGARA FALLS OPA 128 – Environmental Policy	SAVANTA RESPONSE
001	**Natural Heritage System** 2.5.1. A Natural Heritage System (NHS) shall be applied to recognize the interdependence of natural heritage features and their associated functions, and to maintain those connections so that their existing ecologic and hydrologic functions are maintained or enhanced. Lands within the NHS are subject to the policies of Part 2, Section 11 Environmental Policies of the City of Niagara Falls Official Plan.	• The NHS is defined in the Riverfront Residential Block Plan EIS.
002	**Endangered Species Act** 2.5.5. Endangered and threatened species shall be addressed in accordance with the Endangered Species Act (ESA) and continues to apply to subsequent Planning Act applications.	• Savanta submitted an Information Gathering Form to initiate the ESA review process with MNRF on January 23, 2018. Savanta conducted additional species-specific surveys in spring/summer 2018 to support the IGF and will be submitting an updated IGF to MNRF in December 2018. Savanta will continue to work with the MNRF to fulfill any potential ESA permitting requirements for any threatened or endangered species that may be impacted by the project.
003	**Endangered Species Act** 2.5.6. Natural Heritage feature FOD 7-3 as identified in the Savanta Environmental Impact Study, September, 2017 and Addendum, March, 2018 and on Schedules A-1, A-6 and A-6 (a) has the potential for endangered species habitat. Further studies as required by the MNRF shall be satisfactorily completed as part of the submission of any further Planning Act application in the vicinity of this feature.	• This feature is not affected by the Riverfront Residential Block Plan.
004	**Endangered Species Act** 2.5.7. Significant species habitat relocation shall be undertaken pursuant to any permits or approvals required under the ESA obtained from the MNRF.	• See comment 002 regarding ESA approvals.
005	**Significant Wildlife Habitat** 2.5.8. Natural Heritage Feature FOD 7-3 in the Savanta Environmental Impact Study, September, 2017 and Addendum, March, 2018 as FOD 7-3 and identified on Schedules A-1, A-6 and A-6 (a) contains potential Significant Wildlife Habitat (SWH). Further studies as shall be completed to the satisfaction of the City and NPCA as part of the submission of any further Planning Act application.	• This feature is not affected by the Riverfront Residential Block Plan.
006	**Significant Wildlife Habitat** 2.5.9. Development and site alteration may only be permitted if no negative impact has been demonstrated to the satisfaction of the City, in consultation with Niagara Region and the NPCA.	• One of the objectives of the Riverfront Residential Block Plan EIS is to demonstrate no negative impact to significant wildlife habitat.
007	**Significant Wildlife Habitat** 2.5.10. The relocation of SWH may only be undertaken after the satisfactory demonstration of no negative impact.	• One of the objectives of the Riverfront Residential Block Plan EIS is to demonstrate no negative impact to significant wildlife habitat.
008	**Woodlands**	• One of the objectives of the Riverfront Residential Block Plan EIS is to demonstrate no negative impact to significant woodlands.

Table E1 EIS Compliance with City of Niagara Falls Official Plan Amendment 128 Policies

COMMENT ID	CITY OF NIAGARA FALLS OPA 128 – Environmental Policy	SAVANTA RESPONSE
	2.5.12. Woodlands that are shown on Schedule A-6(a) as "potential woodland removal area" will be subject to a holding provision in the implementing zoning by-law. A condition to be met prior to the lifting of the H-provision will be the submission of an updated EIS to the satisfaction of the City, in consultation with Niagara Region, as part of a complete Planning Act application which demonstrates no negative impact on significant natural features or their ecological function. Woodlands located outside the subject lands within Special Policy Area #56 as shown on Schedule A-6(a) shall be rehabilitated in accordance with the conditions of a Resource Management Agreement entered into by the developer and the City as a condition of draft plan approval, site plan approval or zoning by-law amendment.	
009	**Buffers** 2.5.14. A thirty (30) metre buffer shall be established to protect the ecologic and hydrologic functions of natural heritage features. The thirty (30) metre buffer may be increased or decreased, based on an approved Environmental Impact Study required through the subdivision and development application process.	• One of the objectives of the Riverfront Residential Block Plan EIS is to justify any proposed reductions to the 30 m buffer on natural heritage features.
010	**General** 2.5.16. Development within wetlands and other features regulated under Ontario Regulation 155/06 within the OPA boundary may be permitted based on the findings and subject to the conditions of any relevant EIS. These requirements may be further refined through new Environmental Impact Studies, prepared to the satisfaction of the City in consultation with Niagara Region and the NPCA, submitted in support of subdivision or condominium applications. An NPCA Work Permit shall be obtained as a condition of draft plan approval, site plan approval or zoning by-law amendment.	• Policy noted.
011	**General** 2.5.17. Linkages and natural corridors will be provided in accordance with the findings of any relevant EIS at locations intended to facilitate species movement and maintain biodiversity. The linkages may include both anthropogenic corridors provided by parks and open space areas as well as natural corridors. The width of the linkages should be a minimum of 50 metres wide but the specific location, width, function and implementation details of all linkages and natural corridors will be addressed through an approved Environmental Impact Study at the subdivision or condominium approval stage.	• One of the objectives of the Riverfront Residential Block Plan EIS is to identify the location of linkages and natural corridors.
012	**General** 2.5.21. Tree saving plans shall be required as part of subdivision and site plan applications to identify existing mature trees located outside of the Environmental Protection Areas and associated buffers to preserve and integrate them into the built environment where possible.	• Tree saving plans will be developed as part of the site plan approval process which will occur subsequent to the Riverfront Residential Block Plan EIS.

Table E2 Responses to MNRF Comments Received August 19, 2016; December 11, 2017; January 15, 2018; and April 30, 2018

COMMENT ID	EIS PAGE/ REFERENCE	MNRF COMMENT	SAVANTA RESPONSE
August 19, 2016 – MNRF Comments on the June 2016 Dougan and Associates Thundering Waters Secondary Plan – Characterization and Environmental Impact Study			
001	n/a	• We note that SAR bat species were considered by the project team as part of the EIS. SAR bats, including Little Brown Myotis, Northern Myotis and Tri-coloured Bat are listed as Endangered under the Endangered Species Act (ESA). These species receive individual and general habitat protection under the Act. • As noted in MNRF Guelph District's Bat and Bat Habitat Surveys of Treed Habitats (updated May 2016), mapping of Ecological Land Classification (ELC) communities is the first step to determine the presence/absence of candidate maternity roost habitat for SAR bats. If a suitable ELC community is identified, it is recommended that the ecosite is treated as confirmed SAR bat habitat and to move forward to the next step if impacts to the community cannot be avoided. The following step is to map snags and conduct acoustic surveys. The purpose of mapping snags is to determine the number and location of monitoring stations appropriate for the size and quality of the habitat. • The EIS identified both deciduous forest and deciduous swamp communities on site, which are suitable ELC communities for candidate maternity roost habitat for SAR bats. However, the EIS reported that no acoustic monitoring was undertaken to confirm presence/absence of SAR bats. MNRF staff recommend that the project team follow the steps outlined in the MNRF Guelph District's Bat and Bat Habitat Surveys of Treed Habitats (updated May 2016), which includes acoustic monitoring suitable habitats to confirm presence/absence of SAR bats. This will be important to understand the potential implications of the ESA (e.g. Overall Benefit Permit). We note that the EIS recommends undertaking acoustic monitoring and we concur with this recommendation. • MNRF staff note that Tri-colored Bat has been uplisted to Endangered under the ESA as of June 15, 2016. We recommend that the project team update their species lists to ensure any modifications made to species protected under the ESA are reflected in the reporting.	• Savanta completed a leaf-off habitat assessment for bats utilizing feedback from MNRF regarding survey methods in January and February 2018. Acoustic monitoring was completed primarily in June with some surveys extending into July and August 2018 to confirm the presence or absence of SAR bats. • The Bat Acoustic Monitoring Plan for Riverfront was provided to MNRF on May 16, 2018. No comments on the plan have been received to date and the plan was implemented as described in summer 2018. • The results of the bat acoustic monitoring program will be submitted to MNRF as part of the IGF process.
002	n/a	• Barn Swallow is listed as Threatened under the ESA and receives both individual and general habitat protection. Since no Barn Swallow nesting areas were identified on site, we agree that the nesting habitat may be restricted to drains and culverts in the area. We also agree that the project team should undertake surveys to document these locations in order to identify any foraging habitat that may be impacted by development. This will help to inform any potential implications of the ESA.	• The project team has identified the locations of drains and culverts in the area and is working with MNRF to determine review requirements under the ESA. Barn Swallow will be addressed with MNRF through the IGF process.
003	n/a	• Acadian Flycatcher is listed as Endangered under the ESA, and receives both individual and general habitat protection. Acadian Flycatcher has been documented in the EIS as using the site. Since the ESA indicates that habitat includes any area on which a species depends, directly or indirectly, to carry on its life processes – including life processes such as reproduction, rearing, hibernation, migration or feeding – then habitat for this species appears to be present. We recommend that any impact of the development on Acadian Flycatcher and/or its habitat be considered in the EIS in the context of the ESA.	• Savanta submitted an Information Gathering Form to initiate the ESA review process with MNRF on January 23, 2018. Savanta has conducted additional species-specific surveys in 2018 to support the IGF and will be submitting an updated IGF to MNRF in December 2018. Savanta will continue to work with the MNRF to address Species at Risk, including Acadian Flycatcher, through the IGF process.

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004		• Chimney Swift is listed as Threatened under the ESA, and receives both individual and general habitat protection. We agree that the potential for Chimney Swift habitat on site is low, although the species is known to use natural nest sites such as hollow trees. We recommend that the project team make a note in the EIS that there is potential for Chimney Swift to use natural sites as habitat.	• Chimney Swift were not detected during breeding bird surveys conducted by Dougan in 2015. No incidental observations of Chimney Swift were documented during other surveys completed in 2015, 2016, 2017 or 2018. Chimney Swift is considered absent from the Subject Lands.
005	n/a	• We note that in Table 11, the Species at Risk section states the following under the mitigate/rehabilitate column: "Where servicing and transportation impacts are unavoidable, steps should be taken to rehabilitate impacted features." We recommend that this statement also make reference to ESA requirements, where applicable.	• ESA requirements are being addressed through the IGF process with MNRF.
006	n/a	• The EIS identifies that the proposed development will result in the removal of approximately 1.3 ha, or 2% of the Niagara Falls Slough Forest Wetland Complex Provincially Significant Wetland (PSW) on the subject property. This statement appears to contradict Table 13 in the EIS which notes that "All areas that have been identified as Provincially Significant Wetland EPA have been protected." We recommend that the Region seek clarification on the proponent's intention to remove or protect the Niagara Falls Slough Forest Wetland Complex PSW.	• No PSW removal is proposed as part of this application.
007	n/a	• We note that PSWs are protected by provincial policy as wetlands are an important component of Ontario's landscapes and watersheds that provide a variety of economic, social and ecological benefits. Policy 2.1.4 of the 2014 Provincial Policy Statement (PPS) provides direction that there shall be no development or site alteration within PSWs in southern Ontario. Based on the review of the EIS, it appears that there is development proposed in the PSW.	• No PSW removal is proposed as part of this application.
008	n/a	• We note that the EIS has identified a number of other wetland areas that have not been evaluated and are contiguous with the existing PSW. We question why the EIS does not make the recommendation to have these wetland areas evaluated, or why the consultant did not undertake an evaluation as part of the EIS, to determine whether they should be included within the existing PSW. We recommend that a revaluation of the Niagara Falls Slough Forest Wetland Complex PSW be undertaken according to the Ontario Wetland Evaluation System, and that all wetlands within the subject area be considered.	• A re-evaluation of the Niagara Falls Slough Forest Wetland Complex PSW was undertaken by MNRF in 2016. Mapping of the feature was updated in 2017. No PSW removal is proposed as part of this application.
009	n/a	• Mapping provided in the EIS does not appear to include the Welland River East Wetland Complex PSW just outside, but adjacent to, the southern boundary of the study area. We recommend that the project team identify this PSW and include a discussion in the EIS to address the issue of adjacent lands noted below.	• PSWs located on adjacent lands (within 120m of the proposed development area) are shown on figures (Appendix A) in the Riverfront Residential Block Plan EIS, including the PSW south of Chippawa Parkway.
010	n/a	• Given the significance of some of the characteristics of the woodland areas and their proximity to the swamp wetlands, it's unclear why the EIS does not attempt to make a determination of the significance of the woodlands on the subject property. The 2014 PPS states that woodlands are identified using criteria established by the MNRF. These criteria are found in the ministry's Natural Heritage Reference Manual, however the EIS does not reference this document or compare the values of the wooded areas to criteria that are comparable to those in the manual.	• Significant woodlands were mapped and assessed in the March 2018 Savanta EIS Addendum. Significant Woodlands are further assessed in the Riverfront Residential Block Plan EIS to address requirements under the PPS.

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		• The wooded areas on the property are contiguous with the swamp wetlands and together create a large wooded area on the landscape that provides forest interior habitat and connectivity with neighbouring wooded areas. The EIS identifies old growth/ mature forest within some of these wooded areas, as well as habitat for Wood Thrush and Eastern Wood-Pewee, both species of Special Concern in Ontario which prefer intermediate to mature forests. We recommend that the Region ensure that the appropriate criteria for determining significance of the woodlands have been applied to the study area.	
011	n/a	• We note that a number of the natural areas identified on the subject lands have the strong potential to be identified as Significant Wildlife Habitat (SWH). MNRF's Significant Wildlife Habitat Technical Guide (SWHTG), and the supporting SWH Criteria Schedule for Ecoregion 7E, provide technical recommendations to help planning approval authorities evaluate and identify SWH. This includes Special Concern and Provincially Rare (S1S3, SH) plant and animal species.	• Significant wildlife habitat was mapped and assessed in the March 2018 Savanta EIS Addendum. Significant wildlife habitat is further assessed in the Riverfront Residential Block Plan EIS to address requirements under the PPS.
012	n/a	• Although the EIS documents a number of significant values that would be relevant to the determination of SWH, it does not take the step of making this assessment and recommendation.	• Significant wildlife habitat was delineated and assessed in the March 2018 Savanta EIS Addendum. Significant wildlife habitat is further assessed in the Riverfront Residential Block Plan EIS to address requirements under the PPS.
013	n/a	• Planning authorities are responsible for identifying SWH, or approving the work of others using municipal criteria or provincial guidance, to ensure consistency with the 2014 PPS. We recommend that the Region ensure that the appropriate criteria for determining SWH have been applied to the study area.	• Comment directed to Niagara Region.
014	n/a	• The EIS does not specifically identify adjacent lands to provincially significant natural heritage features but does identify several potential impacts of development on lands adjacent to the PSW. We suggest that some of the impacts identified in the EIS, including edge effects such as loss of habitat, noise, light and chemical pollution, reduction of forest interior habitat, introduction of non-native species, and human intrusions, could similarly apply to other areas on the subject property that may be identified as provincially significant.	• Adjacent lands (120m) are clearly identified on figures (Appendix A) within the Riverfront Block Plan EIS. Direct, indirect and net effects are described in detail in the EIS.
015	n/a	• The PPS does not permit development on adjacent lands to significant natural heritage features unless it satisfies the policy test that there will be no negative impacts on the natural features or their ecological functions.	• One of the objectives of the Riverfront Residential Block Plan EIS is to demonstrate no negative impact on natural heritage features as per PPS Section 2.1.
016	n/a	• The EIS documents several features and values on the subject lands that suggest the presence of provincially significant natural heritage features in addition to the existing provincially significant wetland. It also documents a relatively high degree of biodiversity and recognizes the linkages between and among the features on the subject land and with those on the broader landscape. The City of Niagara Falls recognizes in its Official Plan that the natural areas on the subject property serve as a major junction within a potential Natural Heritage Corridor.	• Comment noted. Provincially significant natural heritage features and linkages have been addressed in the September 2017 Savanta EIS, the March 2018 Savanta EIS Addendum and in the Riverfront Residential Block Plan EIS.
017	n/a	• S. 2.1.2 of the PPS (2014) states: "The diversity and connectivity of natural features in an area, and the long-term ecological function and biodiversity of natural heritage systems, should be maintained, restored	• A Natural Heritage System (NHS) approach to development is proposed in the September 2017 Savanta EIS, the March 2018 Savanta EIS Addendum and the Riverfront Residential Block Plan EIS. The Riverfront Residential Block Plan EIS includes a Conceptual Ecological Restoration Plan (CERP) for lands adjacent to the proposed

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		or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features".	development. The purpose of the CERP is to maintain, restore and improve the ecological function and biodiversity of the NHS, including linkages.
018	n/a	• The EIS acknowledges, and shows graphically on Map 3, that many of the areas having significant ecological features and values will be permanently removed by the proposed development. It also documents negative impacts that will result, and others that may potentially result, to the remaining PSW areas as a result of the development. It also discusses, and documents graphically in Map 4, a significant reduction in the size and functionality of natural connections between features on the subject lands and with those on neighbouring lands. • Although the EIS outlines a number of possible mitigation measures, such as enhancements to degraded areas, it states that the fundamental principle guiding its environmental management of the negative impacts is 'No Net Loss' and 'consolidating' key areas. In response to several of the identified potential negative impacts, the EIS recommends the development of a compensation plan to be submitted with the plans of subdivision. • We note that policy direction set out in the PPS and supporting documentation does not support consideration of compensation strategies to address the policy test of no negative impacts to features and functions of provincially significant natural heritage features and areas. • We recommend that the discussion supporting the removal of these features in the report be reviewed for consistency with the PPS.	• Savanta has outlined a no negative impact strategy that is consistent with the PPS in the Riverfront Residential Block Plan EIS.
December 11, 2017 – MNRF Comments on the September 2017 Savanta EIS			
019	Page 35	• The EIS states that "Suitable breeding habitat was observed for this species within the areas surveyed in the Study Area." Given that there is suitable habitat present, and there is a record of a calling male from 2015, MNRF staff can confirm that Acadian Flycatcher habitat is on site • Dougan and Associates identified a male Acadian Flycatcher calling 3 to 4 times and was listed as a possible breeder in 2015. The area that was surveyed in 2017 did not include the original location where the male Acadian Flycatcher was identified in 2015. In addition, this species is known to have site fidelity but may not utilize it on an annual basis. As such, MNRF staff is of the opinion that the additional studies carried out have not sufficiently demonstrated absence of this species on site • As a result, MNRF staff will map potential habitat for Acadian Flycatcher on site and provide it to the proponent with our final comments on the EIS in January • At this stage if the proponent would like to carry out further studies, it is recommended that they submit their survey methodology to MNRF	• Savanta submitted an Information Gathering Form to initiate the ESA review process with MNRF on January 23, 2018. Savanta has conducted additional species-specific surveys in spring/summer 2018 to support the IGF and will be submitting an updated IGF to MNRF in December 2018. Savanta will continue to work with the MNRF through the IGF to address Acadian Flycatcher and another and any other threatened or endangered species that may be impacted by the project.
020	Page 36	• "Dense Blazing Star has not been addressed in this section as the MNRF report that this species is not native to Niagara." This approach to species at risk (SAR) is not consistent with the ESA. In addition, we could not find any reports of the work done by Dougan or Savanta identifying this species. MNRF staff	• Dense Blazing Star occurrences within the Subject Lands have been mapped and submitted to MNRF along with the IGF for review with respect to the ESA. • The Riverfront Residential block plan does not overlap with the occurrences of this species.

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		recommends that the habitat for Dense Blazing Star is mapped and submitted to MNRF, along with an IGF, in order to inform the potential implications of the ESA	
021	Page 29	• There is an old barn mentioned on Page 29 of the EIS. MNRF staff would appreciate clarification on whether or not this barn and other anthropogenic features have been surveyed for bats. If these buildings have not been surveyed, it is recommended that they be surveyed for SAR bats, as well as other possible SAR species (such as Barn Swallow, Chimney swift). This information will help to inform the ESA, as well as the City's review of the OPA application • MNRF recommends being consulted on the methodology for bat surveys for the 2018 field season	• Savanta has completed a leaf-off habitat assessment for bats utilizing feedback from MNRF regarding survey methods. Acoustic monitoring was completed primarily in June with some surveys extending into July and August 2018 to confirm the presence or absence of SAR bats. • Barn Swallow and Chimney Swift were detected foraging within the Subject Lands by Dougan and Associates (see Thundering Waters EIS, Dougan and Associates, June 2016). Dougan and Associates concluded that neither species is breeding on site due to an absence of suitable breeding habitat. • The Bat Acoustic Monitoring Plan for Riverfront was provided to MNRF on May 16, 2018. No comments on the plan have been received to date and the plan was implemented as described in summer 2018.
022		• The Kentucky Coffee-tree is listed as threatened under the ESA and has general habitat protection. This species was observed on site (in polygon #1) and has been included in Table 6 of the 2015 EIS by Dougan and Associates. • MNRF advises that this tree should be identified on a map and an IGF should be submitted for review. The proponent can include all relevant SAR in the same IGF for MNRF review. This information will help to inform the ESA, as well as the City's review of the application.	• Kentucky Coffee-tree was originally included in the plant list of the 2016 EIS (Dougan and Associates). Savanta conducted two targeted area searches on September 17 and October 19, 2018, in the area where this species was reported by Dougan, however this species was not detected. Based on these results, the updated IGF that will be submitted in December 2018 recommends that Kentucky Coffee-tree be removed from the ESA review process.
023	Page 14 and Page 2	• The composition of the plant community has long been used as the primary criterion to determine if wetland habitat is present. The plant species composition in a given area represents the integrated response of that area to complex and interacting environmental factors – also known as the "biological response variable". Once a certain threshold of "soil moisture saturation" is surpassed, the plant composition shifts to those species that have adapted and are able to thrive in wet environments. Knowing which plant species are characteristic of wetland areas is necessary for delineating wetland boundaries. • Within OWES, a vegetation community may be defined as an assemblage of plant populations living in a prescribed area. Each vegetation community may contain one or several combinations of vegetation forms. Narrow-leaved Emergents "ne" Erect, rooted, graminoid monocots, including horsetails, which may be temporarily or permanently flooded at the base but are exposed at the upper portion and typically are less than 1.5 metres in height, examples of which include sedges and grasses similar to grass savannahs.	Comment noted.
024	Page 14 and Page 4	• The mortality of Green Ash does not indicate that the site is no longer wetland. Because of the value of dead trees (dc, dh) to wildlife, these forms should be included in the community description if they cover 10% or more of the community. Changes in composition to the community as a result of Emerald Ash Borer (EAB) only affect the dominant form, which would change from "h" to "dh". • The nature of European Buckthorn is opportunistic and tends to rapidly populate altered sites. As such, it important for wetland evaluators to realize that the physical and biological characteristics of some plants	• Comment noted.

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		can vary with latitude, longitude, and altitude. This can result in some species, in particular European Buckthorn, being found in very different ecotypes. • In addition, the vegetation changes alone do not necessarily change the characteristics of the wetland. Changes, if any, in surficial hydrology of the site need to be considered as well.	
025	Page 15 and Page 2	• Based on an MNRF staff observation in 2008, Black Gum is present on site.	• Black Gum does not occur within 120 m of the Riverfront Residential area so known occurrences of the species will not be affected by development activities.
026	Page 15 and Page 5	• The updated evaluation record (January 2017) is available from MNRF and should be used in this EIS. The quoted text in the EIS does not come from the current wetland evaluation. While some of the maps show part of the current extent of the complex, the text includes the wrong area figures. Overall, the EIS should be updated to reflect the current evaluation.	• The current mapping that is being used to inform the City of Niagara Falls review of the application is based on the January 2018 revision to the MNRF wetland mapping layer (available through the MNRF LIO database). Any subsequent revisions to the EIS will be updated to include the most recent wetland evaluation records, where applicable. Historic evaluations provide important input and information related to MNRF rationale for wetland mapping and evaluation updates as well as trends in wetland values.
027	Page 21, Page 22, and Page 1	• The text regarding the timelines of the Niagara Falls Slough Forest Wetland Complex PSW needs to be corrected. The original wetland evaluation was in 1986 with a score of 616 points. • The wetland complex has been reviewed a few times since. • Evaluations remain as open files, which are subject to change as more information becomes available or as a consequence of changes to the wetland itself. It is important to review only the most recent evaluation, in this case the January 2017 update.	• As noted in the comment, wetland evaluations are open files and the Niagara Falls Slough Forest Wetland Complex PSW was most recently updated in January 2018 (available through the MNRF LIO database). Any subsequent revisions to the EIS will be updated to include the most recent wetland evaluation records, where applicable.
028	Page 22 and Page 1	• The OWES does not use percentages to determine PSW status. Wetlands are determined to be provincially significant based on scoring. OWES scoring is not converted to a percentage; it is a relative ranking. • For both northern and southern Ontario, a PSW is any wetland that: 1. Achieves a total score of 600 or more points, or 2. Achieves a score of 200 or more points in either the Biological component or the Special Features component. • This section of the EIS should be corrected and updated to reflect OWES evaluation scoring methods, not a percentage.	• Savanta knows that percentages are not used in OWES. The use of the percentages in this instance is for illustrative purposes and is an interpretation, not an error.
029	Page 22 and Page 2	• The Dougan & Associates EIS provided Ecological Land Classification (ELC)-based mapping and did not delineate wetlands as per OWES. This should be clarified in the text.	• Comment noted.

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030	Page 22 and Page 4	• Wetlands must not be complexed across watersheds except in rare circumstances. For example, it can be difficult to determine to which watershed wetlands belong in major headwater areas, such as the Oak Ridges Moraine. • Watershed definition: an area drained by a river, brook or creek. In this case, the watershed is the Niagara River, the sub-watershed is the Welland River, and wetlands can cross sub-watershed boundaries. A careful examination of the drainage area for this wetland would indicate that the entire wetland drains into the Welland River Watershed.	• The determination of which units are included within wetland complexes is one of the primary sources of difficulties encountered in efforts to effectively and consistently implement OWES. The complexing rules applied are different across MNRF Districts. • It is important to note that not all wetlands that occur in close proximity should automatically be considered as a complex. Whether a group of wetlands should be considered as a complex depends on the particular combination of functional circumstances, location in the landscape and other characteristics of the wetlands. • The reliance upon a simple proximity measurement (i.e., <750 m apart) to guide many decisions regarding complexing, or the response that units are complexed because they can be, does not reflect a fulsome consideration of the role of wetland units within watersheds, terrain units or within complexes themselves. • It is also important to acknowledge that wetland units less than 2 ha in size may be included as part of the complex, if such small wetlands may provide important ecological benefit. There is no definition of important ecological benefit.
031	Page 23 and Page 3	• The term wetland is a general one and includes specific land types commonly called marshes, bogs, swamps and fens. Other terms sometimes used to describe wetlands include: mires, sloughs and peatlands. Wetlands may be relatively simple or highly complex and diverse biologically and ecologically. • Within a single wetland area (i.e., contiguous wetland) one may find very different ecological circumstances. Examples include an open water marsh, a spring fed swamp forest, a floating lakeside fen, an open channel of river, and the open water edge of a lake. Despite these profound ecological differences, the entire area is considered as a single wetland. It is to be identified and evaluated as a single unit. All wetland types are included, even if it is not slough.	• Comment noted, although the OWES guidance provided in, "Additional Guidelines for Mapping Transitional Areas" does not completely align with this MNRF comment. • The large forested blocks are treated as wetland types (i.e., reflected in ELC mapping provided in reporting).
032	Page 23 and Page 5	• OWES wetlands are categorized into 4 different types of ecosystems: marsh, swamp, bog and fens. The marsh type is treated as two categories "marsh" and (shallow) "open water marsh." Wetland types are determined by the field evaluator on the basis of the major plant associations and physical, substrate and hydrological information obtained in the wetland and immediate surroundings. OWES does not recognize a fourth category based on recent successional features that display signs of significant and/or recent disturbance (e.g. highly disturbed).	• Agreed; this is another problem with OWES. • The Wetland Conservation Strategy for Ontario identifies marshes as the most recognized yet least common type of wetland in Ontario. Unfortunately, this does not recognize or attempt to differentiate between marshes that perform significant functions and those that have recently occurred on landscapes in the GTA, principally as a result of agricultural abandonment and/or post-industrial uses. • The rather simple interpretation presented in OWES leads to equating significance to entirely different functional wetland units: e.g., an isolated marsh resulting from recently abandoned agricultural land, dominated by invasive Common Reed (*Phragmities australis* ssp. *australis*), is treated similarly to that of an isolated, native sedge marsh derived from natural processes within the landscape. • The OWES when applied in these types of settings typically includes more fulsome consideration of the degree of functions present before mapping any and all wetlands and/or features with some wetland characteristics, within a complex boundary. This interpretation is made more difficult by variable approaches being implemented in different MNRF Districts.

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			• The discussion in this section of the EIS is provided to add important context to the origin of some wetland features on the Subject Lands. This discussion highlights a challenge associated with the OWES, which can in some circumstances, exaggerate the significance of low functioning units.
033	Page 23 and Page 6	• The wetland units/areas identified are part of the Niagara Falls Slough Forest Wetland Complex PSW, 2017. As such, the categorization of individual wetland areas into separate wetlands is incorrect and does not represent the OWES approach required to delineate PSWs. Any references in the EIS to wetlands and PSWs should only reflect the OWES (e.g. in the EIS text, maps and tables).	• See previous comment.
034	Page 24 and Page 2	• The OWES evaluation system is concerned with the definition, identification and measurement of wetland functions. The wetland is then evaluated based upon the perceived values of characteristics, activities, or expressions of the wetland or its parts that function to maintain ecosystem processes, or that have some utility or amenity value to a segment of society.	• Disagree; the OWES is designed to identify and measure recognized values of wetlands. The evaluation is not a complete biophysical inventory and certain information, particularly about the presence of rare species and about hydrological functions, may be lacking even after the evaluation is completed. • Functions are neither measured nor well understood by the OWES. The MNRF is currently undertaking a review of wetland functional assessment processes across various jurisdictions, in an effort to better understand the definition and measurement of wetland functions, as input to the successful implementation of Ontario's Wetland Conservation Strategy.
035	Page 24 and Page 3	• Wetlands that are vulnerable to impacts (e.g. from development) should be addressed in the EIS (including avoidance, mitigation, buffers, etc.). Wetlands are not to be removed based on the rationale that they will be destroyed by the proposed development. This analysis should include relevant sections of the PPS, including policies related to the protection of PSWs (policy 2.1.4), and a discussion on adjacent lands in the context of PSWs on site (policy 2.1.8). • The OWES does not evaluate the vulnerability of wetlands in the context of development and related pressures. The evaluation system is a tool that allows consideration of the relative value of different wetlands through the examination and ranking of wetland functions.	• All wetlands within and 120m adjacent to the proposed concept plan have been addressed in the EIS.
036	Page 25 and Page 3	• MNRF determined that wetland units within the Niagara Falls Slough Forest Wetland Complex would not be complexed with the Welland River East Complex. For more details, refer to the Statement of Complexing Rationale of the January 2017 OWES evaluation. • Wetland complexes are commonly related in a functional way, that is, as a group they tend to have similar or complementary biological, social and/or hydrological functions. Much of the wildlife in the area of the complex is variously dependent upon the presence of the entire complex of wetlands, with each wetland unit contributing to the whole. When a wetland complex is recognized, the evaluator must score the entire complex as one wetland.	• See response to comment 012, above.
037	Page 38 and Page 8	• All areas identified by MNRF as PSW (Niagara Falls Slough Forest Wetland Complex PSW and Welland River East Wetland Complex PSW) should be addressed in the EIS. This EIS only refers to a portion of	• The EIS is focused on features that will potentially be impacted by the proposed development. No impacts to the Welland River East Wetland Complex PSW are anticipated. Savanta is engaged in ongoing discussions with the

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		the PSW and is incomplete. Furthermore, PSW wetland units cannot be "removed" as described in this EIS. All proposed wetland boundary changes need to follow the OWES process through MNRF. • Any use of the term 'significant' should align with the definitions of provincial policy. The definition of Significant: "means a) in regard to wetlands, coastal wetlands and areas of natural and scientific interest, an area identified as provincially significant by the Ontario Ministry of Natural Resources using evaluation procedures established by the Province, as amended from time to time;" (PPS, 2014)	MNRF regarding additional/new technical information that relates to the more precise refinement of individual wetland boundaries.
038	Page 40 and Page 2	• All wetland units within the Niagara Falls Slough Forest Wetland Complex PSW on the subject lands are subject to the same OWES process and same level of protection under the PPS, 2014. The OWES process does not allow for the inclusion of stormwater management features within an evaluation.	• Comment noted; this needs further discussion. It is important to understand and address the threats posed by climate change and to carefully consider methods (including innovative approaches) to ensure some wetland features and associated functions are maintained as viable systems within urbanizing landscapes. • Conserving wetlands without considering this aspect as part of an impact assessment process could lead to unintended negative effects, even without any form of development. The simplistic response that precludes considering this important aspect will not optimize conservation outcomes.
039	Page 52 and Page 2	• These wetlands have been evaluated as part of the Niagara Slough Forest Wetland Complex PSW and as such are considered significant. These areas are to be assessed as part of the whole wetland complex and not as individual components.	• Savanta has reviewed functions of individual disturbance-origin wetland units that have been complexed into the Niagara Slough Forest Wetland Complex PSW to inform future discussions related to their ability to withstand impacts associated with adjacent settlement areas.
040	Page 1 of 6, Table 2	• There is no language in the PPS or in OWES to support a discussion on "net effects" or "no net loss" approaches. This section should be updated to reflect existing provincial policy and related documents (e.g. OWES). In addition, the removal of PSW is not supported through an EIS process. Any updates to PSW boundaries need to be consistent with the OWES through MNRF.	• This statement does not reflect ongoing best practices being implemented elsewhere in the GTA. • Ignoring the 2017 Wetland Conservation Strategy released by the Minister, is not in keeping with applying the best thinking to conservation methods and outcomes. We understand that the MNRF may currently feel obligated to fall back on existing rules in the absence of clearer senior direction regarding the implementation of the Wetland Conservation Strategy.
041	Appendix B, Table 3	• This table has no basis for wetland functional rationale as it does not conform to the OWES process. Functional interconnectivity is explained in the wetland evaluation record for the Niagara Falls Slough Forest Wetland Complex PSW, 2017.	• We disagree with this comment and consider it inappropriate. • The functional interconnectivity explanation provided by the MNRF is incomplete, and it demonstrates a limited understanding of wetland functional assessment literature and best practices. • Recognizing that the MNRF has not developed this understanding, the MNRF has recently initiated a review of wetland functional assessment processes. The latter will seek to better understand wetland functional assessment methods and to determine how they can be used in the Ontario context to successfully implement the 2017 Wetland Conservation Strategy. • The functional assessment rationale presented in the Savanta 2017 EIS is based upon extensive literature review and analyses. It presents a sound and thorough tool to understand wetland functions in the context of an impact assessment.
042	Appendix D, Pg. 2, p. 2	• The Wetland Conservation Strategy for Ontario speaks to "Incorporating recent advances in our knowledge about science and technology" (pg. 45). There is no discussion of "correcting" the OWES within the strategy document.	• The Draft Wetland Conservation Strategy (2016) noted that the end product of the review of OWES may be a new edition of the Ontario Wetland Evaluation System, or it may be a new approach to mapping and evaluating the

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			significance of wetlands in Ontario. That language appears to have been deleted from the final Strategy, leaving it unclear whether and when the OWES will be revised to address existing weaknesses and gaps. • Having said that, the need to incorporate "recent advances in our knowledge about science and technology" indicates that the Government of Ontario recognizes that OWES is outdated and does not reflect current wetland science. Our ongoing discussions with senior levels of the MNRF confirm an interest in modernizing OWES. • It is incorrect to suggest that some of the key elements of the OWES do not need serious review and/or replacement (e.g., lack of consultation, community feedback, unclear weighting, and a misrepresentation of Aboriginal and Cultural Values)
043	Appendix D, Pg. 2, Pg. 3	• This position is not shared by MNRF. The OWES was created to meet the need for a standardized approach to map wetlands, assess their functions, and determine their level of significance for purposes of municipal land use planning. Design of the system was overseen by a committee with representation from the provincial and federal government, with input from conservation authorities, academia, consultants and others. • Development of the system began with a review of scientific literature and evaluation methods being used in other jurisdictions at the time, and involved extensive field-testing, consultation with experts, and statistical analysis. The manuals have been updated over time, most recently in 2014 to include administrative updates and technical clarifications. • The Wetland Conservation Strategy for Ontario does not identify problems with OWES. The document does, however, validate the OWES method and commits improving and strengthening it: "Much has been learned over the past 30 years of evaluating Ontario's wetlands. Information collected during past evaluations will be useful for investigating how evaluation guidance can be improved. Conservation of wetlands will be improved by making wetland evaluation results available to support informed decisions about land use and resource development."	• Savanta agrees that OWES needs to be improved as evidenced by the evaluations that result in the complexing of small, disturbance-origin areas with wetland characteristics that occur widely on recently abandoned agricultural lands and in post-industrial disturbance landscapes. • The Wetland Conservation Strategy for Ontario when fully implemented will contribute to more effective wetland conservation and enhancement outcomes. • Additional comments presented above (023)
044	Appendix D, Pg. 2, p. 5	• There is no language in the PPS or in OWES to support a discussion on "net effects" or "no net loss" approaches. This section should be updated to reflect existing provincial policy and related documents (e.g. OWES). In addition, the removal of PSW is not supported through an EIS process. Any updates to PSW boundaries need to be consistent with the OWES through MNRF. • All of the wetlands have been identified as part of the Niagara Falls Slough Forest Wetland Complex PSW. As such, the categorization of individual areas into separate wetlands (i.e. Areas 1 -4) in the EIS does not meet the standardized process under OWES.	• This project is being planned within an evolving policy context. GR(Can) intends to continue refining the project boundaries within that policy context. • The 2017 MNRF Wetland Conservation Strategy provides important information and a pathway to achieve better wetland conservation outcomes.
045	Appendix D, Pg. 3, p. 2	• The OWES and any updates or addendums issued are the only means of evaluating wetlands in Ontario to determine whether they are provincially significant. In the OWES, the term "significant wetland" refers to PSWs, as determined by the criteria outlined in the manual.	• Savanta understands the current policy context. The 2017 MNRF Wetland Conservation Strategy provides important information and a pathway to achieve better wetland conservation outcomes.

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		Although other information sources, maps or inventory approaches (e.g., the Ecological Land Classification System) may be used to aid evaluators in undertaking a wetland evaluation, it is the OWES that determines whether a wetland is a PSW and, likewise, determines the boundaries of the PSW wetland.	
046	Appendix D, Pg. 3, p. 3	• These 10 wetland units/areas have been identified as part of the Niagara Falls Slough Forest Wetland Complex PSW. The categorization of individual areas into separate wetlands in the EIS does not conform to OWES and is not supported by MNRF.	• See comment 012.
047	Appendix A, Figure 8	• The PSW should be mapped as per the approved wetland boundaries available in Land Information Ontario (LIO).	• The current mapping that is being used to inform the City of Niagara Falls review of the application is based on the January 2018 revision to the MNRF wetland mapping layer (available through the MNRF LIO database) where MNRF removed one of the units previously identified as provincially significant. • GR(Can) plans to review additional individual wetland pockets with MNRF in the future to determine if similar revisions are appropriate. Subsequent revisions to the EIS will be updated to include the most recent wetland evaluation records, where applicable. All PSWs, as mapped by MNRF in the January 2018 revision (LIO), are retained within the Riverfront Residential Block Plan EIS.
048	n/a	• We note that PSWs are protected by provincial policy as wetlands are an important component of Ontario's landscapes and watersheds that provide a variety of economic, social and ecological benefits. Policy 2.1.4 of the 2014 PPS provides direction that there shall be no development or site alteration within PSWs in southern Ontario. Based on the review of the EIS, it appears that PSWs are proposed to be removed to support development, and that there will be development impacts proposed in some PSWs (e.g. stormwater management).	• All PSWs, as mapped by MNRF in the January 2018 revision (LIO), are retained within the Riverfront Residential Block Plan EIS. The final site plan will conform to current policy at the time of site plan finalization. Ongoing technical work and monitoring may contribute additional or new technical data that could inform any potential future revisions to the open wetland files.
049	n/a	• We also note that in order to revise the boundaries of a PSW, all wetland evaluations must be reviewed and approved by MNRF staff before they are considered complete and 'official' (i.e. the wetland status may be used to make land use planning decisions). It is recommended that the proponent consult OWES and contact MNRF staff in order to move forward with any recommended changes to the Niagara Falls Slough Forest Wetland Complex PSW boundaries.	• Savanta will continue to work with MNRF where any revisions to PSW boundaries are proposed.
050	n/a	• We recommend that the City reviews the EIS for consistency with PPS policy regarding PSWs.	• Not a comment for Savanta Inc.
051	Page 29	• The EIS refers to Stratum I and II deer wintering habitat. This reference comes from an MNRF document titled 2.1.c Identification and Delineation of White-Tailed Deer Winter Habitat. This methodology is not suitable for Southern Ontario. In order to identify deer wintering areas for SWH, the stratum approach is not utilized. The deer wintering areas have already been delineated by MNRF. As outlined in the	• Savanta provided MNRF with proposed revisions to the Deer Wintering Areas based on the MNRF's "Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E". MNRF confirmed their support for the refined mapping in their letter to Mr. John Barnsley (City of Niagara Falls) dated April 30, 2018.

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		"Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E, January 2015." Deer wintering areas in ecoregion 7E is an MNRF responsibility and are mapped by MNRF. • The most up-to-date wintering areas mapping is available online through LIO. It is recommended that City staff review Deer Wintering Areas in the context of the map available online from MNRF.	
052	n/a	• We recommend that MNRF staff is consulted on the acoustic monitoring planned for 2018 to confirm whether or not maternity roosting habitat for Big Brown and Silver Haired bats is present.	• The Bat Acoustic Monitoring Plan for Riverfront was provided to MNRF on May 16, 2018. No comments on the plan have been received to date and the plan was implemented as described in summer 2018.
053	n/a	• MNRF staff recommends that the project team maps the following SWHs (separately) using SWH Criteria Schedules for Ecoregion 7E, January 2015: - Turtle wintering areas - Reptile hibernacula - Woodland amphibian breeding habitat - Wetland amphibian breeding habitat - Woodland area-sensitive breeding bird habitat - Turtle nesting areas	• The City/Region are the responsible authorities for the determination of significant wildlife habitat. • The Riverfront Residential Block Plan EIS includes an SWH screening table that addresses all SWH types in the MNRF's "Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E". Several SWH mapping layers were revised as part of the Block Plan EIS. All SWH mapping are provided in Appendix A of the Block Plan EIS.
054	Page 30	• We note that there are areas of suitable habitat on site (including loam/sand substrate in disturbed areas); however, the EIS has noted that no nesting habitat was observed. To confirm SWH, there has to be one or more Northern Map Turtle or Snapping Turtle nesting. Given the presence of these species on site (observed overwintering and basking) MNRF staff is of the opinion that this EIS has not satisfactorily demonstrated the absence of turtle nesting areas on site. City staff may still want to consider this as candidate SWH for Turtle Nesting Areas. Further surveys could be undertaken to confirm presence/absence of SWH for Turtle Nesting Areas.	• Comment is addressed to the City; the City/Region are the responsible authorities for the determination of significant wildlife habitat. Savanta technical comments follow: • Areas of suitable habitat were tested by soil auger during nesting surveys completed by Savanta and Dougan & Associated ecologists. Soils were compacted by the historic disturbances on these lands and by recreational vehicle use; the soil auger was not able to penetrate surficial layers. Attempts were made along the transect routes anywhere suitable soils were observed. No samples were taken despite survey effort. • Potentially suitable turtle nesting habitat is present on City lands located off-site, south of Chippawa Parkway. The accessible portion of this area was surveyed on August 27 and September 14, 2018, during the autumn turtle hatchling emergence period. The area shown as candidate turtle nesting SWH in the March 2018 EIS Addendum and in the Riverfront Residential Block Plan EIS was found to provide moderately suitable turtle nesting habitat. Soils were clay loam underlain with clay, based on soil auger samples. Some areas with gravel were present, likely from construction of the pedestrian pathway in this area. There were areas that could not be explored as they were fenced. Turtle movement was recorded between this candidate turtle nesting SWH polygon (on the City lands) and the Subject Lands based on spring and fall 2017 wildlife road crossing surveys (March 2018 EIS Addendum). A wildlife road crossing survey was conducted along Chippawa Parkway and Dorchester Road on September 14, 2018, in case hatchling turtles were evident on the roadways. No turtles were recorded during the fall 2018 wildlife road crossing survey. The candidate turtle nesting SWH polygon remains the same in the Riverfront Residential Block Plan EIS as was shown in the March 2018 EIS Addendum.

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055	Page 30	• Some of the rare vegetation communities appear to have been missed in this section. FOD communities are present on site but have not been included. • Only SWD1-3 is listed, however, other SWD communities (e.g. Oak Mineral Deciduous Swamp (SWD1)) have not been included. In addition, Dougan and Associate listed polygons 3, 4, 5, 6, 27 and 32 as provincially rare vegetation communities. The most recent EIS completed by Savanta only includes polygons 3 and 4 as provincially rare vegetation communities. • Dougan and Associates noted "Old growth forest elements associated with Blocks A06, A11, and B13" in table 13 (Thundering Waters Secondary Plan Characterization and EIS, June 2016). A06 is an SWD so given that it is also has "old growth" means it is likely confirmed SWH; however, it was not included in the current EIS. B13 also has a small polygon with SWD; if this is where the old growth is located, it should also be considered for SWH. A11 is SWD and FOD, and similarly they should be considered for SWH.	• The City/Region are the responsible authorities for the determination of significant wildlife habitat. • Rare vegetation communities are shown on updated SWH mapping provided in Appendix A of the Riverfront Residential Block Plan EIS.
056	n/a	• As a more general comment, it appears that the 2017 EIS provides new ELC mapping. MNRF staff would appreciate clarification on how this was carried out and if there are data sheets to showing how it has been remapped. It appears that a combination of OWES mapping and ELC have been used to make a new map. • City staff may wish to request clarification on the changes to the ELC mapping in the most recent EIS.	• Additional refinements were made in response to reclassification of a wetland unit (as per MNRF January 2018). Some other areas were reclassified due to ground conditions not reflective of previous classifications prepared through aerial interpretation. • ELC refinements were ground-verified in 2018 to confirm the results of the desktop analysis. ELC data sheets were completed and provided to MNRF on September 28, 2018.
057	n/a	• It is recommended that each SWH category is mapped separately for ease of review.	• All SWH mapping has been updated as requested. A separate map is provided for each SWH layer and an amalgamated SWH layer is also provided in Appendix A of the Riverfront Residential Block Plan EIS.
058	n/a	• Planning authorities are responsible for identifying SWH or approving the work of others using municipal criteria or provincial guidance, to ensure consistency with the 2014 PPS. We recommend that the City ensure that the appropriate criteria for determining SWH have been applied to the study area.	• All SWH mapping has been updated as requested and follows the MNRF's "Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E".
059	n/a	• We suggest applying caution to the interpretation of significant woodlands as outlined in the EIS. The EIS seems to suggest that woodland areas within Area 4 should not be considered significant because of further expected canopy decline due to EAB, and because of an apparent lesser degree of functional importance than Areas 1 – 3. The potential future decline in ash canopy may change the dominant canopy species but not necessarily the functional value of the woodland. The woodlands are contiguous with existing forested wetlands and upland forested areas which contribute to the overall species and structural diversity, size of the larger wooded areas, and the functional linkages between the different features within the Study Area and beyond. • MNRF's Natural Heritage Reference Manual lists a number of woodland benefits which these woodlands would presumably continue to provide, and also lists several criteria for significance that the woodlands in Area 4 may continue to meet, including size, interior area, linkages, and proximity to other natural heritage features. MNRF staff therefore recommends that the City review the Significant Woodland interpretation in the context of appropriate criteria (e.g. PPS 2014; MNRF Natural Heritage Reference Manual; Region of Niagara Official Plan).	• Woodland comments are provided for the City's consideration; the City/Region are the responsible authorities for the determination of significant woodlands. • Savanta has refined the woodland boundaries based on the dominance of shrub species in some areas. • ELC refinements were ground-verified in 2018 to confirm the results of the desktop analysis. ELC data sheets were completed and provided to MNRF on September 28, 2018. • Separate letters from Niagara Region and NPCA, both dated April 5, 2018, support the approach to woodland significance presented in the Savanta 2017 EIS.

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060	n/a	• The EIS does not specifically identify and evaluate adjacent lands to provincially significant natural heritage features, however section six does identify several potential direct and indirect negative impacts of development on lands adjacent to natural features. Several mitigation measures are proposed but there is little discussion of their effectiveness and ability to confidently avoid negative impacts.	• The Savanta 2017 EIS was completed at the Secondary Plan scale, where some of the suggested level of detail would not typically be requested. • The Riverfront Residential Block Plan EIS addresses lands within 120m of the proposed development area and addresses compliance with provincial policy.
061	Section 6.2 and Section 6.6	• We recommend interpreting section 6.2 and 6.6 with caution for the reasons identified above in our discussion of significant woodlands. We are also unclear about the suggestion on p. 46 that the existing mosaic of eco-sites “already mimic a pre-stressed outcome”. We suggest that it is difficult to compare the functional and structural nature of naturally occurring adjacent successional communities with the hard artificial edges that result with development structures and areas.	• Comment noted.
062	n/a	• The PPS does not permit development on adjacent lands to significant natural heritage features unless it satisfies the policy test that there will be no negative impacts on the natural features or their ecological functions.	• The Riverfront Residential Block Plan EIS addresses lands within 120m of the proposed development area and addresses compliance with provincial policy.
063	n/a	• The EIS documents several features and values in the Study Area that recognize the presence of provincially significant natural heritage features in addition to the existing provincially significant wetland. The two EISs prepared in support of the application, document a relatively high degree of biodiversity and the Dougan EIS recognized the linkages between and among the features on the subject land and with those on the broader landscape. The Natural Heritage System identified in the current EIS does not appear to draw a connection to all of the significant features being considered on the subject lands and with those on the broader landscape. It is recommended that once all of the previous sections above are comprehensively addressed, that the NHS is updated to reflect connectivity on site. • We note that both the City of Niagara Falls and Niagara Region recognize in their Official Plans that the natural areas on the subject property serve as a major junction within a potential Natural Heritage Corridors running both east-west and north-south. This was not evident in the EIS’s discussion of natural linkages or graphically portrayed.	• Savanta is not aware of any detailed technical studies completed in support of the relevant Official Plans, that would define connections on the landscape at a refined scale. If available, Savanta expects that such MNRF technical resources would have been provided to the City during the OP review. • The Riverfront Residential Block Plan EIS considers animal movement corridors (i.e., the amphibian movement corridor SWH type) and potential natural heritage corridors and linkages, as per the Regional Official Plan and the City’s OPA 128. The Riverfront Residential NHS has been designed to enhance existing corridors and linkages within the Subject Lands. The detailed work developed by the applicant provides a more accurate and thorough information base upon which to define linkage functions.
064	Figure 10	• Map appears to be missing features and does not reflect a fulsome summary of natural heritage features. For example, it does not include the entire PSW areas, significant woodlands, and several significant wildlife habitats (noted above). This map also does not appear to align with Figure 9 for SWH. City staff may want to consider requesting clarification or additional maps to review the full extent of the natural heritage features on site and ELC communities.	• All SWH mapping has been updated as requested. A separate map is provided for each SWH layer and an amalgamated SWH layer is also provided in Appendix A of the Riverfront Residential Block Plan EIS. • Natural heritage features are fully mapped in the Riverfront Residential Block Plan EIS and 120m adjacent lands.
065	Figure 10 and Figure 11	• Although there is a reference to Dougan and Associates on these maps, they do not match the ELC mapping done by Dougan in the 2016 EIS (Thundering Waters Secondary Plan Characterization and EIS, June 2016). City staff may want to consider requesting clarification or additional maps to review the full extent of the natural heritage features on site and ELC communities.	• Comment to City. • All SWH mapping has been updated as requested • ELC refinements were ground-verified in 2018 to confirm the results of the desktop analysis. ELC data sheets were completed and provided to MNRF on September 28, 2018

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066	n/a	• It is recommended that the project team update references to maps/figures throughout the EIS to ensure they are correct. For example, on page 23 of the EIS, there are references in paragraphs 5 and 6 to Figure 4, which seems to correspond with Figure 7.	• Comment noted.
January 15, 2018 – MNRF Comments on the December 2017 Savanta EIS Technical Update			
067		• Acadian Flycatcher: Page 35 of the EIS states that "Suitable breeding habitat was observed for this species within the areas surveyed in the Study Area." Given that there is suitable habitat present, and there is a record of a calling male from 2015, MNRF staff can confirm that Acadian Flycatcher habitat is on site. • As a result, MNRF staff noted in our December 11, 2017 letter that we would map the potential habitat for Acadian Flycatcher on site. As per our discussion at the technical meeting on December 12, 2017, the proponent will map the potential habitat for Acadian Flycatcher and provide to MNRF for review.	• Savanta submitted an Information Gathering Form to initiate the ESA review process with MNRF on January 23, 2018. Suitable habitat mapping for Acadian Flycatcher was included in the initial IGF submission. An updated IGF will be submitted in December 2018.
068		• Reptile Emergence, Hibernacula and Turtle Nesting Surveys: It is noted that the surveys for Significant Wildlife Habitat (SWH) seem to be focused in the areas of proposed development. In order to determine how a species is using the habitat, the ecological function of the entire feature and adjacent lands should be evaluated. MNRF staff recommends that SWH be mapped beyond the boundaries proposed for development (ideally for the whole site), which may require additional surveys.	• Surveys for significant wildlife habitat were conducted within and adjacent to the OPA boundary as per Figures 3, 4, 5 and 6 in the September 2017 EIS. • The March 2018 EIS Addendum mapped significant wildlife habitat layers for the entire site (GR(Can) land holidings) • The Riverfront Residential Block Plan updated several SWH layers and maps SWH for the proposed development area and 120m adjacent lands.
069		• It is understood that Turtle Basking Surveys were carried out on June 13, and June 15, 2017, with additional surveys completed on October 2, October 5 and October 10, 2017. However, MNRF staff recommends that the appropriate methodology for turtle basking surveys includes five surveys in April and May in order to see turtle basking behavior effectively. In order to identify overwintering sites through basking this may be even earlier, just after the ice recedes.	• Five rounds of reptile emergence – turtle basking surveys were conducted in the spring of 2017 (April 28, May 10, May 15, May 19 and May 23) according to MNRF survey protocols. Turtle nesting surveys were completed on June 13 and June 15, 2017. • An additional turtle nesting habitat suitability survey was conducted on August 27, 2018, on City lands (located off-site) as part of the preparation of the Riverfront Residential Block Plan EIS. Two surveys (August 27 and September 14, 2018) were completed during the turtle hatchling emergency period on the City lands located south of the site.
070		• Reptile Nesting Surveys: Page 3 of the Addendum notes "It is suspected that the Snapping Turtle hatchlings observed at RT-1 originate from nesting areas located adjacent the Welland River and OPG Power Canal." MNRF Staff would appreciate more information on these observations to inform our review, in particular, exact location, number of individuals, observation details and photos, if available.	• Two Snapping Turtle hatchlings were observed dead on Dorchester Road, west of the FOD7-3 ELC community. • The results of wildlife road crossing surveys are provided for the Riverfront Residential Block Plan EIS and 120m adjacent lands. This application does not include the FOD7-3 or adjacent lands to that feature. • Potentially suitable turtle nesting habitat is present on City lands located off-site, south of Chippawa Parkway. The accessible portion of this area was surveyed on August 27 and September 14, 2018, during the turtle hatchling emergence period. The area shown as candidate turtle nesting SWH in the March 2018 EIS Addendum

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			was found to provide moderately suitable turtle nesting habitat. Soils were clay loam underlain with clay, based on soil auger samples. Some areas with gravel were present, likely from construction of the pathway in this area. There were areas that could not be explored as they were fenced. Turtle movement was recorded between this candidate turtle nesting SWH polygon (on the City lands) and the Subject Lands based on spring and fall 2017 wildlife road crossing surveys (March 2018 EIS Addendum). A road mortality survey was conducted along Chippawa Parkway and Dorchester Road on September 14, 2018, in case hatchling turtles were evident on the roadways. No turtles were recorded during the fall 2018 wildlife road crossing survey. The candidate turtle nesting SWH polygon remains the same in the Riverfront Residential EIS as was shown in the March 2018 EIS Addendum.
071		• Bat Habitat Assessment: MNRF has concerns that SWH and potential SAR bat habitat are being mapped simultaneously and leading to inaccurate mapping of both. MNRF recommends that candidate SWH for bat maternity colonies be mapped out separately from potential SAR bat habitat. - Candidate SWH for bat maternity colonies should be mapped according to the criteria in "Significant Wildlife Habitat Criteria Schedules for Ecoregion 7E". - Mapping potential SAR bat habitat should be done by considering any wooded ELC polygon containing snag trees. • After mapping of potential SAR bat habitat, MNRF recommends the following steps for the project team (these recommendations align with previous email correspondence sent to the project team): - In addition to Dougan's snag density survey carried out in December 2015, we also request snag density surveys to be completed for the remainder of the site (proposed for development or not). This data is necessary for MNRF to assess the level of impact to SAR bat habitat. - Submit findings to MNRF with the proposed areas of impact included. To inform a thorough review, MNRF would appreciate receiving a map from the project team showing the snag trees that were identified as potential maternity roosts. - MNRF may request more detailed mapping for some areas – we can advise based on what is submitted. - After reviewing the results above, MNRF can give advice on the acoustic monitoring necessary for the site.	• Savanta has prepared separate mapping for SWH bat habitat and SAR bat habitat based on criteria identified. Candidate SWH bat maternity colonies was shown on Figure 9a of the March 2018 EIS Addendum. SAR bat habitat polygons and SAR bat call recording locations will be submitted to MNRF as part of the updated IGF in December 2018. • The Bat Acoustic Monitoring Plan for Riverfront was provided to MNRF on May 16, 2018. No comments on the plan have been received to date and the plan was implemented as described in summer 2018. All results will be provided to MNRF in an updated IGF.
072		• After mapping of potential SAR bat habitat, MNRF recommends the following steps for the project team (these recommendations align with previous email correspondence sent to the project team): - In addition to Dougan's snag density survey carried out in December 2015, we also request snag density surveys to be completed for the remainder of the site (proposed for development or not). This data is necessary for MNRF to assess the level of impact to SAR bat habitat.	• Savanta has been in consultation with the MNRF. The Bat Acoustic Monitoring Plan for Riverfront was provided to MNRF on May 16, 2018. No comments on the plan have been received to date and the plan was implemented as described in summer 2018. All results will be provided to MNRF in an updated IGF in December 2018.

Table E2 Responses to MNRF Comments Received August 19, 2016; December 11, 2017; January 15, 2018; and April 30, 2018

COMMENT ID	EIS PAGE/ REFERENCE	MNRF COMMENT	SAVANTA RESPONSE
		- Submit findings to MNRF with the proposed areas of impact included. To inform a thorough review, MNRF would appreciate receiving a map from the project team showing the snag trees that were identified as potential maternity roosts. - MNRF may request more detailed mapping for some areas – we can advise based on what is submitted. - After reviewing the results above, MNRF can give advice on the acoustic monitoring necessary for the site.	
April 30, 2018 – MNRF Comments on the March 2018 Savanta EIS Addendum			
073	Figure 9d	• Some portions of ELC polygons that Dougan and Associates previously classified as SWD (polygon 6, 26, and 29) are now identified as CUW, CUT, or SWT. MNRF has not received the ELC data sheets that support this change. As previously classified by Dougan and Associates, this area would be considered significant by applying the ecoregion criteria. It is also unclear to MNRF staff why there have been such significant changes to the ELC maps since Dougan and Associates original work, and thorough justification should be provided.	• ELC data sheets were completed and provided to MNRF on September 28, 2018.
074	EIS Addendum, Page 11	• Page 11 of the EIS Addendum states: "The biology of tree-roosting bats is such that maternity roost sites are frequently changed from tree to tree over the duration of the maternity season, sometimes as frequently as every night." • Please provide the source for this information, as other published literature seems to suggest a high level of site fidelity to maternity roosts in Myotis, and stress related to exclusion or removal of preferred maternity roosts in Big Brown Bat and Little Brown Myotis. For example, Brittingham and Williams (2000, Wildlife Society Bulletin) report that when bats are excluded from attics and provided with bat boxes, that, "exclusion causes stress among displaced bats and there is some evidence of mortality and reduced reproductive success associated with this procedure."	• As noted by MNRF, Brittingham and Williams (2000, Wildlife Society Bulletin) examines bat behavior when excluded from attics. This is a much different context than the potential removal of several suitable roosting trees within a forest where available roosting habitat is not a limiting factor, such as Riverfront. The following studies support the notion that tree-roosting bats change their roost sites throughout the maternity season: o Vonhof, M. J. and R. M. R. Barclay 1996. Roost-site selection and roosting ecology of forest-dwelling bats of British Columbia. Canadian Journal of Zoology: 74: 1797-1805. o Barclay, R. M. R. and A. Kurta 2007. Pp. 17–59 in Bats in forests: conservation and management (Lacki, M. J., J. P. Hayes and A. Kurta, eds.). Johns Hopkins University Press, Baltimore, Maryland.
075	EIS Addendum, Table 4, line 033	• Table 4, line 033 states that "Savanta will consult with MNRF on the acoustic monitoring methods planned for 2018." MNRF staff requests that the proposed methodology be provided to us well in advance of the anticipated field season to allow sufficient time to review the proposal.	• The Bat Acoustic Monitoring Plan for Riverfront was provided to MNRF on May 16, 2018. No comments on the plan have been received to date and the plan was implemented as described in summer 2018. All results will be provided to MNRF in an updated IGF in December 2018.
076	EIS Addendum, Schedule G	• Based on the proposed Schedule G, it appears that mixed use, low/medium density and high density residential uses are proposed within PSWs.	• As per Figure 10 in the Riverfront Residential Block Plan EIS, no development or site alteration is proposed in PSWs. Any future changes to PSW designations will be reviewed in consultation with MNRF and will require MNRF approval.
077	EIS Addendum, Page 8	• Page 8 of the EIS addendum states that Google Earth 3D imagery was used to visualize canopy characteristics. MNRF staff has concerns with this approach, as no metadata have been provided to indicate the accuracy of the Z value in the dataset used to generate the	• ELC refinements were ground-verified in 2018 to confirm the results of the desktop analysis. ELC data sheets were completed and provided to MNRF on September 28, 2018.

Table E2 Responses to MNRF Comments Received August 19, 2016; December 11, 2017; January 15, 2018; and April 30, 2018

COMMENT ID	EIS PAGE/ REFERENCE	MNRF COMMENT	SAVANTA RESPONSE
		imagery. Ground truthing to confirm boundary changes are recommended to validate these analyses.	
078		• MNRF staff requested that data be provided on the locations where soil testing was conducted in order to conclude that soils were not suitable for nesting. To date MNRF has not received this information.	• Comment is addressed to the City; the City/Region are the responsible authorities for the determination of significant wildlife habitat Savanta technical comments follow: • Areas of suitable habitat were tested by soil auger during nesting surveys completed by Savanta and Dougan & Associated ecologists. Soils were compacted by the historic disturbances on these lands and by recreational vehicle use; the soil auger was not able to penetrate surficial layers. Attempts were made along the transect routes anywhere suitable soils were observed. No samples were taken despite survey effort. • Potentially suitable turtle nesting habitat is present on City lands located off-site, south of Chippawa Parkway. The accessible portion of this area was surveyed on August 27 and September 14, 2018, during the autumn turtle hatchling emergence period. The area shown as candidate turtle nesting SWH in the March 2018 EIS Addendum and in the Riverfront Residential Block Plan EIS was found to provide moderately suitable turtle nesting habitat. Soils were clay loam underlain with clay, based on soil auger samples. Some areas with gravel were present, likely from construction of the pedestrian pathway in this area. There were areas that could not be explored as they were fenced. Turtle movement was recorded between this candidate turtle nesting SWH polygon (on the City lands) and the Subject Lands based on spring and fall 2017 wildlife road crossing surveys (March 2018 EIS Addendum). A wildlife road crossing survey was conducted along Chippawa Parkway and Dorchester Road on September 14, 2018, in case hatchling turtles were evident on the roadways. No turtles were recorded during the fall 2018 wildlife road crossing survey. The candidate turtle nesting SWH polygon remains the same in the Riverfront Residential Block Plan EIS as was shown in the March 2018 EIS Addendum. • Savanta requests any record of “Northern Map Turtle or Snapping Turtle” that exists with the MNRF. The applicant’s consulting team has no record of Northern Map Turtle from the study area.

Table E3 Responses to NPCA and Niagara Region Comments (April 5, 2018) Regarding the September 2017 EIS, November 2017 EIS Technical Update and March 2018 EIS Addendum

COMMENT ID	EIS PAGE/ REFERENCE	NPCA/NIAGARA REGION COMMENT	SAVANTA RESPONSE
001	N/A	• The proposed OPA lands, while within the Urban Area, are situated next to a core natural heritage system that has been examined as part of a larger study area, including lands outside of the OPA boundary. The OPA area itself contains natural heritage features mapped in the Regional Official Plan and regulated by Provincial and Regional policies. The assessment of the proposed OPA relative to Provincial and Regional planning policies was an important component of the OPA review. In this regard, an Environmental Impact Study, prepared by Savanta (September 2017) (the EIS), was submitted with the application. Following questions raised by circulated agencies, an EIS Addendum, also prepared by Savanta (dated March 2018) was submitted by email. • In accordance with the protocol between the Region and the NPCA relative to the transfer of natural heritage review back to the Region, the NPCA has reviewed and provided comments related to impacts on the natural environment on this application. Regional staff has reviewed the comments from the NPCA and concurs with the Provincial/Regional natural heritage policy interpretation. Please refer to comments provided by the NPCA for any issues with the application from an environmental perspective, to address compliance with the PPS and the Region's environmental policies.	• Comment noted. See responses to NPCA comments below.
002	N/A	• Sections 3.24 and 4.4 of the NPCA's policies pertains to development in wetlands and prohibits development within wetlands. This policy also prohibits development within 30 m of a PSW unless it has been demonstrated that there will be no negative impacts to the wetland and its ecological and hydrological function.	• As per Figure 10 (Appendix A) in the Riverfront Residential Block Plan EIS, no development or site alteration is proposed in PSWs. This EIS provides justification for reduced buffer widths such that there will be no negative impacts to wetlands and their ecological and hydrological function.
003	N/A	• It should be noted if any PSWs are re-evaluated, they may still be subject to NPCA policies.	• Comment noted.
004	N/A	• There is one area of candidate SWH (bat maternity colony/woodland amphibian breeding habitat) located in a small wooded area (FOD7-3) of Figure 9a of the Addendum in the northwest corner of the OPA boundaries. Sufficient information is available for the NPCA to conclude there will be no negative impact to bat maternity habitat.	• Comment noted. The FOD7-3 is not part of the Riverfront Residential Block Plan application.
005	N/A	• Further fieldwork is planned (spring 2018) to confirm the absence or presence of SWH in (FOD7-3) for woodland amphibian breeding habitat. This fieldwork will help determine how to achieve no negative impact to SWH.	• Comment noted. The FOD7-3 is not part of the Riverfront Residential Block Plan application.
006	N/A	• Revised mapping in the March 2018 EIS Addendum confirms there are no Deer Wintering Congregation Areas within the OPA boundaries. NPCA staff are satisfied with this conclusion.	• Comment noted.
007	N/A	• The March 2018 EIS Addendum provides a detailed assessment of the significant woodlands within the OPA boundary, indicating that none of these will meet the criteria for significance within three years due to the composition of these woodlands and the expected mortality of ash trees from the effects of Emerald Ash Borer. NPCA staff consider this rationale to be reasonable for the planning horizon of the OPA and, therefore, considers it to be consistent with Section 2.1.5 of the PPS and Policy 7.B.1.11 of the ROP.	• Comment noted.
008	N/A	• The March 2018 EIS Addendum proposed buffers less than 30 metres in specific locations. NPCA staff advise that there is insufficient information in the EIS to support any buffer reduction below 30 metres, at this time. The OPA provides sufficient policy direction to allow reductions in the 30 metre buffers where supported through an approved EIS.	• The Riverfront Residential Block Plan EIS provides justification for reduced buffer widths such that there will be no negative impacts to wetlands and their ecological and hydrological function.

Appendix G – Water Budget Assessment and Conceptual Grading Plan (Wood.)

Memo

To: Heather Whitehouse, Savanta

From: Emma Haug-Kindellan, Aaron Farrell

Date: November 29, 2018

File: TPB184078

cc: John Henricks, Niagara Planning Group Inc.

Re: **Riverfront Community Draft Plan, City of Niagara Falls – Water Budget Assessment and Conceptual Grading Plan**

1.0 Introduction

The proposed Riverfront Community is proposed to be located in the City of Niagara Falls, and is generally bounded by Oldfield Road to the north, Dorchester Road to the west and south, and by the existing industrial developments to the east. The proposed development areas (ref. Phase A and B) measure some 36 ha (+/-) in total and is proposed to be developed to provide a mix of residential, park lands, and other employment uses.

As part of the Environmental Impact Study being conducted by Savanta, Wood has undertaken a water budget assessment to inform the impact assessment to key terrestrial features on the landscape, as well as to establish a conceptual grading and plan to manage surface water contributions to the features. As part of this assessment, the stormwater management plan for the area, as outlined in the Functional Servicing Study (Amec Foster Wheeler, June 2016) has been refined to reflect the updated extent of proposed development and the associated conceptual grading plan. This Technical Memorandum has been prepared to summarize the results of this assessment.

2.0 Existing Conditions

The subject Riverfront Community lands drain in their current state to seven (7) Provincially Significant wetland features, and two (2) notable watercourses, the Welland River and the Eastern Watercourse (EWC). Existing conditions subcatchments for each of the wetland features have been delineated from available contour data as shown on Figure 1.

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Hydrologic analyses have been undertaken to establish the existing water budget for each of the subject ecological features. These analyses have applied the Rational Method, consistent with the approach applied in the June 2016 Functional Servicing Study, recognizing that the features on the landscape are sustained by surface water from storm runoff. Under existing conditions, it has been assumed that the catchments draining to the features are undeveloped (ie. impervious coverage of 0%, C value of 0.25).

It should be noted that several features are hydrologically connected, such that runoff to upstream features contribute to downstream features due to the existing grades on the site. As shown in Figure 1, W2 contributes to W1, which then flows into W3 followed by W4 prior to discharge into the Welland River. By contrast, features W5 and W6 are hydrologically isolated, and receive runoff from local catchments only due to the existing grades on the property. The Eastern Watercourse (EWC) includes five (5) contributing catchments and a local wetland feature within the floodplain near the Chippawa Parkway (noted as EWC LF). The hydrologic analyses have thus applied a cumulative water balance approach where required, to account for the hydrologic connectivity of the features.

The results of the water budget assessment for existing conditions are presented in Table 2.1.

Table 2.1 Water Balance Assessment – Existing Land Use Conditions

Wetland ID	Drainage Area (ha)	Cumulative Drainage Area (ha)	A x C	Annual Runoff Volume (m^3)*
W1	15.79	20.96	5.24	49,638
W2	5.17	5.17	1.29	12,246
W3	15.92	36.88	9.22	87,348
W4	15.86	52.73	13.18	124,908
W5	12.58	12.58	3.15	29,799
W6	6.17	6.17	1.54	14,625
EWC 1	12.47	109.88	27.47	206,286
EWC LF	5.42	5.42	1.36	12,843

Note: * Precipitation and runoff volumes have been determined using the average annual precipitation data (i.e 947.5 mm) from Environment Canada collected at the "Niagara Falls NPCSH" climate station between the years 1981 and 2010.

The ecological assessment of the existing wetland features within the development area, completed by Savanta, has determined the types of wetlands, the vegetation species present, and their associated sensitivity and tolerance to water inundation or flooding (ref. attached e-mail correspondence Beam-Farrell, August 8, 2018 and November 29, 2018). Five (5) types of wetlands have been identified by Savanta within the Riverfront Community development area. The wetland types and water inundation requirements have been summarized in Table 2.2, and the feature locations are attached to this correspondence for reference.

Table 2.2 Area Wetlands and Associated Hydrologic Sensitivities			
Wetland Type	Associated Wetland ID	Hydrologic Sensitivities Based upon Vegetation Communities	Suitable LID BMP Type
Oak Mineral Deciduous Swamp (SWD1)	W1, EWC	Requires periodic inundation during the dormant season (winter), and moist conditions during the growing season, intolerant of intermittent flooding, some specific vegetation thrives well under flooded conditions	Infiltration
Green Ash Mineral Deciduous Swamp (SWD2-2)	W1, W2, EWC, EWC LF	Common on land that is subject to flooding, can remain healthy when flooded for as long as 40% of the time during growing season	Infiltration
Willow Mineral Deciduous Swamp (SWD4-1)	W3, W4, W6	Requires intermittent flooding during the dormant season, common on land subject to flooding, moderately tolerant of flooding, floods of short duration in growing season, poor growth when wet throughout the year	Conveyance and Infiltration
Mineral Thicket Swamp (SWT2)	W5	Shallow inundation up to 5 cm of water at surface level during early April to late May, drawdown in summer and moist (no inundation) from September to November	Infiltration
Open Aquatic (OAO)	W1, W4	Permanent standing water	Conveyance and Infiltration

The ecological assessment completed by Savanta also noted the presence of two (2) turtle ponds (OAO), one located in W1 and the other located in W4. Information provided by Savanta indicates that the turtle ponds have been observed to be dry during recent years of monitoring (ref. attached e-mail correspondence Beam-Farrell, August 8, 2018 and November 29, 2018). Savanta has thus suggested that it would be ideal for these features to hold water permanently or at least for much of the year, (i.e. September to end of June), in order to provide suitable turtle habitat.

3.0 Proposed Conditions

3.1 Proposed Land Use and Grading Plan

The proposed development of the Riverfront Community lands consists primarily of low density residential land uses, with some medium density residential land uses and mixed land use. A conceptual grading plan has been developed for the proposed land use block plan, to determine the proposed water budget to the wetlands under the future land use condition, and thereby identify the type of stormwater management required for the respective development areas. The conceptual grades have been established in accordance with the current drainage standards and

requirements as per the City Standards for Site Planning (City of Niagara Falls, 1992); the following principles have been applied:

- Grades adjacent to proposed stormwater management facilities have been established at 2.4 m (+/-) above the 2-year water surface elevation within the receiving watercourse, in order to account for a 1.1 m (+/-) depth of extended detention storage and storm sewer outlet, and 1.3 m (+/-) cover to centreline of road.
- Road grades established at 0.5 % minimum as per City of Niagara Falls standards.
- Future grades long Chippawa Parkway surrounding the development may be altered if required to accommodate future grading within the development area.
- Roadway crossings required to match existing road grades within the surrounding area, where future roads are proposed to connect with existing roads.

The land use plan and preliminary conceptual grading plan for the proposed development area are presented in Figure 2 and Figure 3.

Water Budget

A water budget assessment has been completed for the proposed development, based upon the land use plan and conceptual grading plan for the Riverfront Community. Consistent with the methodology applied for the water budget assessment for existing conditions, the analyses have applied the Rational Method, to determine the supply of storm runoff which would be conveyed to the respective features under proposed land use conditions. The conceptual grading plan is noted to maintain the existing hydrologic connectivity between the features, hence the hydrologic connectivity has been incorporated into the water budget assessment for the proposed land use conditions. The proposed conditions subcatchment boundary plan is presented in Figure 4.

The imperviousness and corresponding runoff coefficients for each land use are provided in Table 3.1, and the contributing drainage area characteristics to each feature are summarized in Table 3.2. The results of the water budget assessment for proposed land use conditions are presented in Table 3.3, along with the change in water budget compared to existing conditions.

Table 3.1 Impervious Coverages and Runoff Coefficients for Future Land Uses

Land Use Classification	Impervious Coverage (%)	Runoff Coefficient
Residential	69 %	0.70
Roads	75 %	0.74
Mixed Use	80 %	0.77
Utility/Services	68 %	0.69
Open Space	0 %	0.25

Table 3.2 Drainage Areas to Wetland Features – Proposed Land Use Conditions					
Wetland Feature	Developed Area (ha)		Undeveloped Area (ha)	Total Drainage Area (ha)	Weighted (Net) Impervious %
	Phase A	Phase B			
W1	0.36	-	15.17	15.53	+ 2 %
W2	0.85	-	3.22	4.07	+ 14 %
W3	4.10	1.31	4.03	9.44	+ 39 %
W4	4.04	0.50	4.68	9.22	+ 33 %
W5	1.77	-	8.16	9.93	+ 12 %
W6	0.30	-	5.54	5.83	+ 3 %
EWC 1	-	0.49	11.71	12.20	+ 3 %
EWC LF	-	0.25	4.54	4.79	+ 4 %

Table 3.3 Water Budget Assessment – Existing and Proposed Land Use Conditions					
Wetland ID	A x C		Annual Runoff Volume (m^3)		Difference (%)
	Existing	Proposed	Existing	Proposed	
W1	5.24	5.44	49,638	51,501	+ 4 %
W2	1.29	1.39	12,246	13,201	+ 8 %
W3	9.22	10.19	87,348	96,513	+ 10 %
W4	13.18	14.50	124,908	137,348	+ 10 %
W5	3.15	3.29	29,799	31,163	+ 5 %
W6	1.54	1.59	14,625	15,050	+ 3 %
EWC 1	27.47	27.63	260,286	261,759	+ 1 %
EWC LF	1.36	1.33	12,843	12,565	- 2 %

The results in Table 3.3 indicate that the proposed development and conceptual grading plan would provide an annual supply of surface water to the features generally within 10 % of existing levels. As noted in Table 2.2, the wetland features differ in their seasonal requirements for surface water inundation (depth, duration and frequency) throughout the growing season. Therefore, at detailed design, a seasonal water balance assessment will be required to ensure seasonal water volumes to each wetland are maintained post-development.

3.2 Stormwater Management Plan

The stormwater management plan for the Riverfront Community development has been established, in accordance with the following criteria and functional plan from the June 2016 Functional Servicing Study:

- Two (2) wet ponds designed to provide stormwater quality control to a "Normal" standard of treatment as a minimum.
- LID BMPs designed to provide stormwater quality control to a "Normal" standard of treatment as a minimum, for the development areas contributing to the preserved wetlands, in order to enhance water quality and manage water budget to the features.
- No quantity controls for flooding or erosion are required.

The type and size of stormwater management facilities have been refined, based upon the land use and conceptual grading plan for the development area. The proposed stormwater quality management plan is presented in Figure 5 and further details are provided in the following sections.

Low Impact Development Best Management Practices (LID BMPs)

As indicated in the conceptual grading plan, the development areas adjacent to the existing wetland features are proposed to drain directly towards the wetlands in order to manage water budget to the features. Due to the size of the contributing drainage areas, as well as the natural features to which these lands drain, stormwater quality controls are recommended in the form of Low Impact Development Best Management Practices (LID BMPs) to provide the requisite stormwater quality control at the source and prior to discharging to the wetlands.

As discussed in Section 2.0, the ecological assessment completed by Savanta indicated five (5) wetland vegetation community types which vary seasonally in their tolerance to inundation (depth, duration and frequency). Recognizing the varying sensitivities to changes in surface water runoff to the features, the LID BMPs would correspondingly need to be selected to incorporate infiltration BMPs as appropriate, to manage water budget to features which would be intolerant of increases in surface runoff volume, in particular during the summer. Refer to Table 2.2 for the recommended LID BMP types for each wetland vegetation community.

Conveyance LID BMPs

Conveyance LID BMPs provide water quality treatment through physical surface filtration, while conveying the surface runoff to the wetlands directly. These features would provide limited infiltration of surface runoff, hence would be better suited for maintaining water budget to the flood tolerant wetlands, and potentially for areas draining directly to the turtle ponds. Examples of conveyance LID BMPs include the following:

- Vegetated buffer strips
- Enhanced grass swales
- Clean water collectors (for rooftop or rear-yard drainage)
- Bioswales without subdrain

As noted above, it is recommended that these systems/practices provide stormwater management for the development areas draining directly towards the two open aquatic (OAO) wetlands, and portions of the areas draining towards the Willow mineral deciduous treed swamp (SWD4-1) wetlands. The final selection and siting of the specific LID BMPs should be completed at the detailed design stage to ensure seasonal surface water volumes requirements are met post-development.

LID Infiltration BMPs

LID infiltration BMPs are proposed to be implemented for areas directly draining towards wetland features which are less tolerant to increases in surface runoff and which are not as capable of accommodating intermittent flooding. These BMPs type would manage the amount of direct surface runoff toward the features by incorporating an infiltration component below the subdrain discharging to the feature. Examples of LID infiltration BMPs include the following:

- Bioswales with subdrain
- Perforated pipes
- Raingardens
- Bio-retention cells
- Infiltration gallery

As noted above, it is recommended that these systems/practices provide stormwater management for the development areas draining directly toward the Oak mineral deciduous treed swamp (SWD1), the Green Ash mineral deciduous treed swamp (SWD2-2), and the mineral thicket swamp (SWT2). A combination of both infiltration and conveyance LID BMPs are required for the Willow mineral deciduous treed swamp (SWD4-1). The final selection and siting of the specific LID BMPs should be completed at the detailed design stage to ensure seasonal surface water volumes requirements are met post-development.

Wet Pond Facilities

Per the recommendations of the June 2016 Functional Servicing Study, two (2) wet pond facilities are recommended to provide stormwater quality treatment for the development areas not discharging directly to the area wetlands. In order to manage the water budget, the wet ponds are required to discharge directly to the Welland River rather than discharging toward the existing wetlands on the site. The facilities should therefore be sited proximate to Chippawa Parkway, and as near as possible to existing hydraulic structures to accommodate the facility outlet structures. The final facility siting and sizing of the wet pond facilities is to be completed through the detailed design process.

The end-of-pipe facilities have been sized in accordance with the criteria provided in the Stormwater Management Planning and Design Guidelines (Ministry of the Environment, 2003) for wet pond facilities designed to a "Normal" standard of treatment. Additional analyses have been completed to provide preliminary estimates of the facility footprints required, based upon the following criteria:

- 7:1 side slopes required within 3 m of the permanent pool.
- 5:1 side slopes required above and below the 7:1 shelf.
- Extended detention storage to be provided at a maximum depth of 1.5 m.
- Permanent pool volume to be provided at an average depth of 2 m.
- Requirements for maintenance access and decanting zones represent 20% of the facility footprint.

The corresponding storage volumes and facility footprints are summarized in Table 3.4.

Table 3.4 Preliminary Sizing of Wet Pond Facilities

Facility ID	Contributing Drainage Area		Stormwater Quality Volumes (m^3)		Estimated Footprint (ha)
	Size (ha)	Impervious %	Permanent Pool	Extended Detention Storage	
SWM-S1 (Phase A)	14.5	72 %	1,400	600	0.85
SWM-S2 (Phase B)	16.1	70 %	1,500	700	0.90

It should be noted that the June 2016 Functional Servicing Study recommended that the wet pond facility at the east limit of the site (i.e. the Phase B facility) provide stormwater quality control for additional potential development north of the Phase B area. Consequently, the sizing for the Phase B facility, as provided in Table 3.4, has been established premised upon providing stormwater quality control for the additional development per the June 2016 Functional Servicing Study as well as the proposed development of the Riverfront Community. At the detailed design stage, the sizing of the facility for the Phase B area should be determined based upon the anticipated land use and grading for the lands north of the Phase B area.

4.0 Conclusion

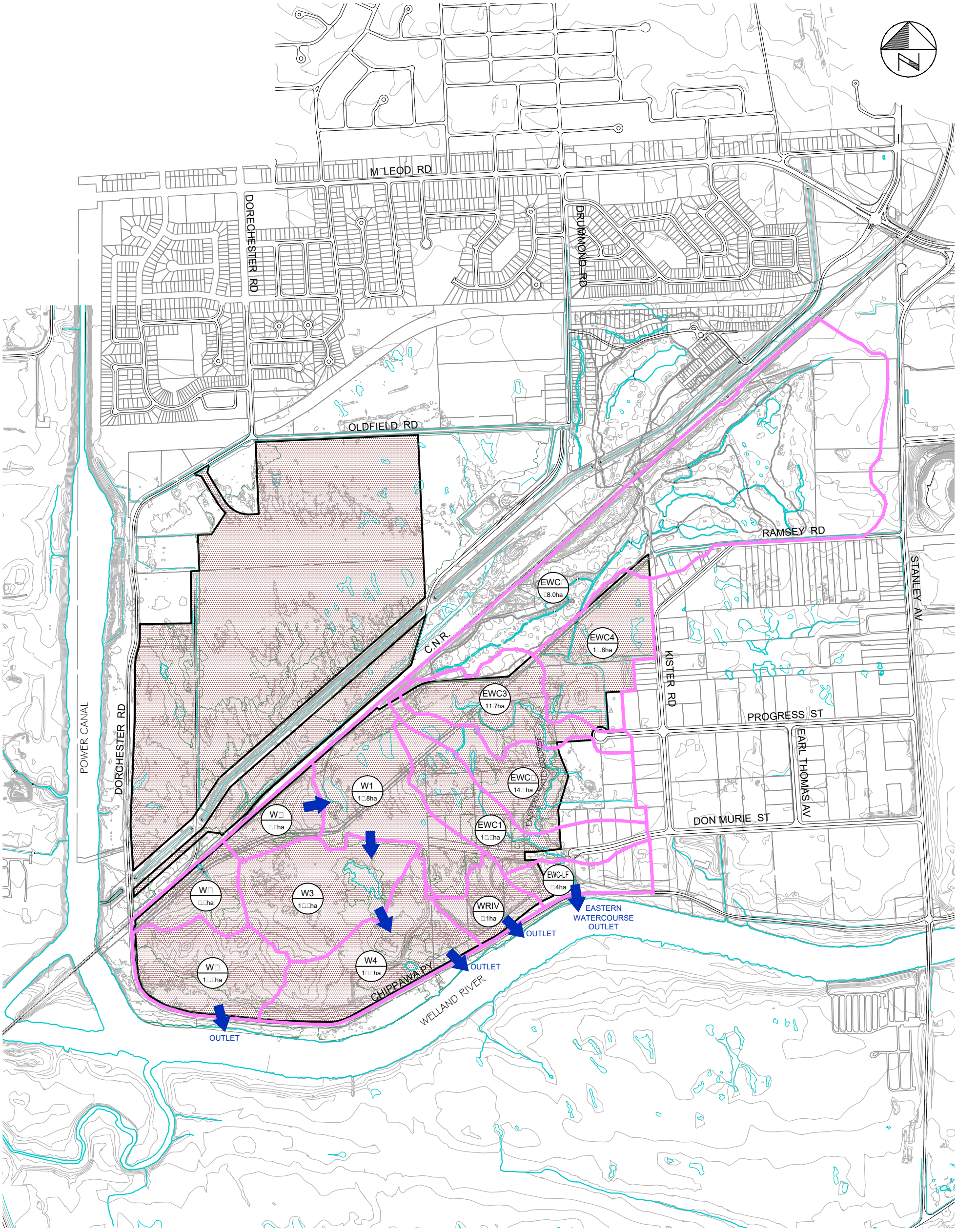
Wetland features and associated subcatchments have been identified within the Riverfront Community. The grading and stormwater management plan for the Riverfront Community can be established in accordance with the recommendations of the 2016 Functional Servicing Study, and refined to manage the water budget to the features. The block plan water budget assessment has determined that through site grading and stormwater quality management, the existing annual

surface water volume requirements may be met in post-development conditions. LID BMPs are recommended to provide stormwater quality management for areas of the development draining directly to the wetland features. Depending upon the wetland vegetation type and associated hydrologic sensitivity, either infiltration or conveyance LID BMPs have been recommended to achieve annual water budget requirements. In addition, the LID BMPs may be sited to provide a clean supply of surface water to the open aquatic wetlands to support turtle habitat.

At the detailed design stage, it is recommended that a seasonal water balance assessment be completed for each wetland vegetation community, to verify seasonal surface water volumes (depth, duration and frequency) are maintained post-development. During detailed design, the site grading and the type and placement of LID BMPs may be refined as part of this assessment, to establish drainage areas to the wetland features which would support surface water requirements for each wetland community.

Two (2) wet pond facilities are recommended to provide stormwater quality control for the portions of the Riverfront Community which are not proposed to discharge directly to the wetland features to maintain water budget. The wet pond facilities should discharge directly toward the Welland River as part of the water budget management plan for the future development, and should utilize existing crossings under the Chippawa Parkway, where feasible, to accommodate the stormwater management facility outlets.

EHK/AF/ehk/af/cc



LEGEND

- PROPERTY FABRIC
- WATERCOURSE
- CONTOUR (1m)
- LANDS OWNED BY GR(CAN) INVESTMENTS
- SUBCATCHMENT BOUNDARY
- W1 / □□0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA
- FLOW DIRECTION

SCALE VALID ONLY FOR 24"x36" VERSION

RIVER FRONT COMMUNITY CITY OF NIAGARA FALLS	SUBCATCHMENT BOUNDARY PLAN (EXISTING CONDITIONS)	wood.	Scale 1:6000 (0 75 150 300) Consultant File No. TPB184078 Drawing No. 1

Last Saved: 2018-11-28 Last Saved By: richard.bartolo Plotted: 2018-11-28 Plotted By: richard.bartolo Path: P:\2018\Projects\TPB184078 - Riverfront Community Civil Design For Site Plan Approval\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PROJ\2018-10 (TechMemo)\Dwg1 SubCatchmentEX.dwg

DORECHESTER RD
HYDRO CORRIDOR
DRUMMOND RD
OLDFIELD RD
Thundering Water Golf Course
Thundering Water Golf Course
POWER CANAL
DORCHESTER RD
CONRAIL DRAIN
C.N.R.
KISTER RD
EASTERN WATERCOURSE
DON MURIE ST
CHIPPAWA PY
WELLAND RIVER

LEGEND

- PROPERTY FABRIC
- WATERCOURSE
- WETLAND BOUNDARY
- CONTOUR (1m)
- LANDS OWNED BY GR(CAN) INVESTMENTS

LAND USE

- ARTERIAL ROAD
- RESIDENTIAL – PHASE 1A
- RESIDENTIAL – PHASE 1B
- COMMERCIAL
- OPEN SPACE
- WETLAND
- EPA
- SWM FACILITY
- UTILITY BLOCK

SCALE VALID ONLY FOR 24"x36" VERSION

RIVER FRONT COMMUNITY

CITY OF NIAGARA FALLS

PROPOSED LAND USE PLAN

wood.

Scale 1:4000
0 50 100 200

Consultant File No.
TPB184078

Drawing No.
2

Path: P:\2018\Projects\TPB184078 – Riverfront Community Civil Design For Site Plan Approval\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PROJ\2018-10 (TechMemo)\Dwg2 LandUseFT.dwg
Last Saved: 2018-11-28 Last Saved By: richard.bartolo Plotted: 2018-11-28 Plotted By: richard.bartolo

DORECHESTER RD
HYDRO CORRIDOR
DRUMMOND RD
OLDFIELD RD
Thundering Water Golf Course
Thundering Water Golf Course
POWER CANAL
DORCHESTER RD
CONRAIL DRAIN
C.N.R.
KISTER RD
EASTERN WATERCOURSE
DON MURIE ST
CHIPPAWA PY
WELLAND RIVER

LEGEND

- PROPERTY FABRIC
- WATERCOURSE
- WETLAND BOUNDARY
- CONTOUR (1m)
- LANDS OWNED BY GR(CAN) INVESTMENTS
- ×178.00 PRELIMINARY GRADE
- ×178.00 EXISTING GRADE

LAND USE

- ARTERIAL ROAD
- RESIDENTIAL – PHASE 1A
- RESIDENTIAL – PHASE 1B
- COMMERCIAL
- OPEN SPACE
- EPA
- SWM FACILITY
- UTILITY BLOCK

SCALE VALID ONLY FOR 24"x36" VERSION

RIVER FRONT COMMUNITY

CITY OF NIAGARA FALLS

CONCEPTUAL GRADING PLAN

wood.

Scale 1:4000
0 50 100 200

Consultant File No.
TPB184078

Drawing No.
3

Last Saved: 2018-11-28 Last Saved By: kyle.guglielmo Plotted: 2018-11-29 Plotted By: kyle.guglielmo Path: P:\2018\Projects\TPB184078 – Riverfront Community Civil Design For Site Plan Approval\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PROJ\2018-10 (TechMemo)\Dwg3 FutureGrading.dwg

DORCHESTER RD
HYDRO CORRIDOR
DRUMMOND RD
OLDFIELD RD
Thundering Water Golf Course
Thundering Water Golf Course
EWC5 □8.0ha
EWC4 1□8ha
KISTER RD
C.N.R.
CONRAIL DRAIN
EWC3 11.7ha
POWER CANAL
DORCHESTER RD
W1 1□□ha
W2 4.1ha
EWC2 14.□ha
EASTERN WATERCOURSE
EWC1 1□□ha
DON MURIE ST
W3 □4ha
EWC-LF 4.8ha
EASTERN WATERCOURSE OUTLET
W6 □8ha
SWM-S2 8.4ha
CHIPPAWA PY
SWM-S1 14.□ha
W5 □□ha
W4 □□ha
OUTLET
WELLAND RIVER
OUTLET

LEGEND

- PROPERTY FABRIC
- WATERCOURSE
- WETLAND BOUNDARY
- CONTOUR (1m)
- LANDS OWNED BY GR(CAN) INVESTMENTS
- FUTURE DEVELOPMENT AREA
- EXISTING SUBCATCHMENT BOUNDARY
- FUTURE SUBCATCHMENT BOUNDARY
- W1 / □□.0ha — SUBCATCHMENT ID# / SUBCATCHMENT AREA
- AREAS DRAINING TO WETLANDS FOR WATER BUDGET
- AREAS NOT DRAINING TO WETLANDS
- FLOW DIRECTION

SCALE VALID ONLY FOR 24"x36" VERSION

RIVER FRONT COMMUNITY
CITY OF NIAGARA FALLS

SUBCATCHMENT BOUNDARY PLAN
(PROPOSED LAND USE CONDITIONS)

wood.

Scale 1:4000 (0 50 100 200)
Consultant File No. TPB184078
Drawing No. 4

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DORCHESTER RD
HYDRO CORRIDOR
DRUMMOND RD
OLDFIELD RD
Thundering Water Golf Course
Thundering Water Golf Course
POWER CANAL
DORCHESTER RD
CONRAIL DRAIN
C.N.R.
KISTER RD
EASTERN WATERCOURSE
DON MURIE ST
EASTERN WATERCOURSE OUTLET
CHIPPAWA PY
OUTLET
WELLAND RIVER
OUTLET

LEGEND

- PROPERTY FABRIC
- WATERCOURSE
- WETLAND BOUNDARY
- CONTOUR (1m)
- LANDS OWNED BY GR(CAN) INVESTMENTS
- FUTURE DEVELOPMENT AREA
- TREATMENT VIA LID BMP
- TREATMENT VIA WETPOND
- FLOW DIRECTION

SCALE VALID ONLY FOR 24"x36" VERSION

RIVER FRONT COMMUNITY

CITY OF NIAGARA FALLS

STORMWATER QUALITY MANAGEMENT PLAN

wood.

Scale 1:4000
0 50 100 200

Consultant File No.
TPB184078

Drawing No.
5

Path: P:\2018\Projects\TPB184078 - Riverfront Community Civil Design For Site Plan Approval\06_DES-ENG\01_CAD\02_DWGS\05_WR\01_PROJ\2018-10 (TechMemo)\Dwg5 FutSQMP.dwg
Last Saved: 2018-11-28 Last Saved By: richard.bartolo Plotted: 2018-11-28 Plotted By: richard.bartolo

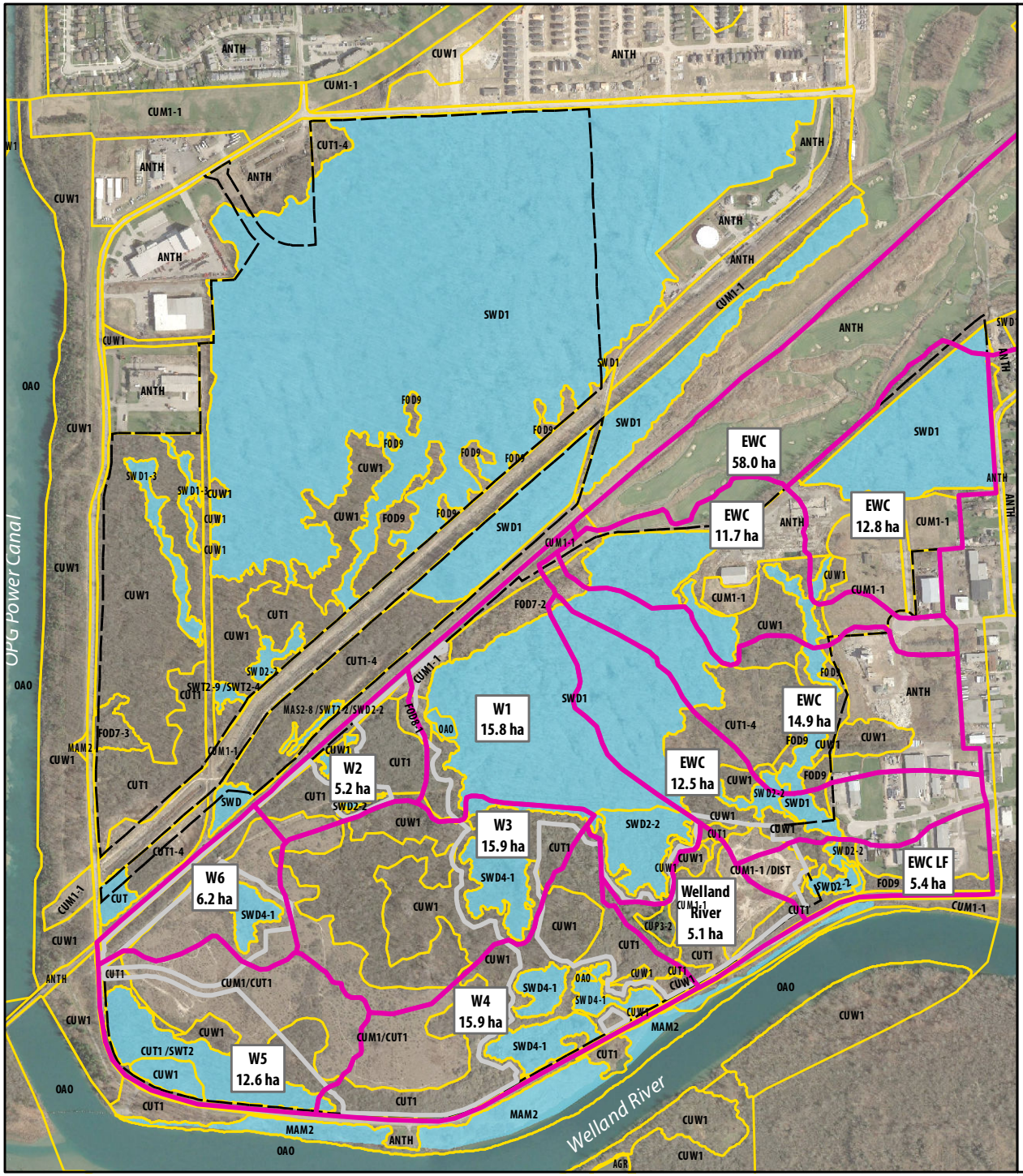
Wetland Water Tolerance and Requirements Guidance – Received from Savanta (August 8, 2018)

Notes from Savanta Received on August 8, 2018 - for final vegetation community map see Figure received on November 29, 2018

Column1	Tree Species	Water Inundation Requirements
SWD1 unit (most sensitive wetland community in Phase 1A) - note: this community contains low "ridges" that are upland forest just they are too narrow to impact the overall classification as a SWD wetland. The upland species on these ridges generally have poor tolerance to inundation.	Quercus palustris	Requires interimittent flooding during the dormant season (winter), much less tolerant of growing-season flooding and trees may be injured or killed by intermittent flooding over several successive years during the growing season. The trees can usually survive one growing season of continuous flooding but will be killed by continuous flooding over 2 or 3 consecutive years.
	Quercus macrocarpa	Relatively intolerant of flooding, young seedlings suffer high mortality if flooded for 2 weeks or longer during the growing season though some can tolerate flooding up to 30 consecutive days they will be damaged, species is not resistant to flooding and will die within 3 years of consecutive flooding
	Quercus bicolor	Requires periodic inundation but cannot tolarate permanent flooding
	Acer x freemanii	Grows in average to wet conditions and will tolerate some standing water; seedlings can survive longer periods of innundation but are often stunted if satured with water, recovers when soil moisture drops
	Salix nigra	Requires abundant and continuous supply of moisture during the growing season, flourishes at or slightly below, water level and is not appreciably damaged by flooding and silting
	Cephalanthus occidentalis	Thrives well under flooded conditions
	Cornus amomum	Tolerates temporary flooding
	Cornus racemosa	Prefers moist to wet soils but generally not water above ground level for very long (i.e. 2 weeks)
SWD4-1 units	Salix alba	Mature trees tolerant to inundation, can easily survive to temporary waterlogging, does not withstand permanent flooding

SWD4-1 units cont.	Populus deltoides	Often grows in areas with frequent flooding, floods during the dormant season or floods of short duration during the growing season may benefit this species, floods that overtop newly sprouting cuttings or established trees for prolonged periods during the growing season or that result in stagnant water pools are harmful
	Juglans nigra	Moderately tolerant of flooding, mature trees generally killed after 90 days of continuous inundation during the growing season, although some individuals may survive for 150 days or more
	Ulmus americana	Poor growth when topsoil is wet throughout the year, seedlings that develop in saturated soils are stunted, can withstand flooding in the dormant season but dies if the flooding is prolonged into the growing season
	Fraxinus pensylvanica	It is common on land subject to flooding and can remain healthy when flooded for as much as 40% of the growing season
	Quercus palustris	Requires interimittent flooding during the dormant season (winter), much less tolerant of growing-season flooding and trees may be injured or killed by intermittent flooding over several successive years during the growing season. The trees can usually survive one growing season of continuous flooding but will be killed by continuous flooding over 2 or 3 consecutive years.
	Salix x rubens	S. fragilis is well adapted to a montane-submediterranean climate, colonizing riparian habitats. It is found along river valleys and mountain creeks, lakes, and wet soils between cultivated fields. S. fragilis is a temperate species preferring moist habitats. It is found where annual rainfall is 500-2000 mm, but with no more than a 2-month dry season. S. fragilis is found almost exclusively on riversides, stream banks, pond sides, boggy ground and dry river beds with a permanent water table not far from the soil surface. https://www.cabi.org/isc/datasheet/48577
SWD2-2 units	Fraxinus pensylvanica	It is common on land subject to flooding and can remain healthy when flooded for as long as 40 percent of the time during a growing season.

"Note from Markup Map received August 8th"	*The little "OAO" pond to the right of this post-it note is a turtle pond that has been going dry during parts of the year for the last 2 years of monitoring. To provide / continue to provide suitable turtle overwintering conditions it would be ideal for this feature to hold water permanently or at least for much of the year (especially between September to end of June). If you need somewhere to direct excess water this is a potential candidate location.*



Study Area

Riverfront Residential

Ecological Land Classification (updated area within/ adjacent to OPA Development Area, Savanta 2018)

Provincially Significant Wetland (MNRF)

Drainage Catchment Boundary

Vegetation Community (ELC Code)

AGR, Agricultural
ANTH, Anthropogenic
CUM1-1, Dry - Moist Old Field Meadow
CUM1/CUT1, Mineral Cultural Thicket
CUP3-2, White Pine Coniferous Plantation
CUT, Cultural Thicket
CUT1, Mineral Cultural Thicket
CUT1-4, Gray Dogwood Deciduous Cultural Thicket
CUW1, Mineral Cultural Woodland
FOD7-2, Fresh – Moist Green Ash Lowland Deciduous Forest
FOD7-3, Fresh – Moist Willow Lowland Deciduous Forest
FOD8-1, Fresh – Moist Poplar Deciduous Forest
FOD9, Fresh – Moist Oak – Maple – Hickory Deciduous Forest
MAM2, Mineral Meadow Marsh
MAS2-8, Rice Cut-grass Mineral Shallow Marsh
OAO, Open Aquatic
SWD, Mineral Deciduous Swamp
SWD1, Oak Mineral Deciduous Swamp
SWD1-3, Pin Oak Mineral Deciduous Swamp
SWD2-2, Green Ash Mineral Deciduous Swamp
SWD4-1, Willow Mineral Deciduous Swamp
SWT2, Mineral Thicket Swamp
SWT2-2, Willow Mineral Deciduous Thicket Swamp
SWT2-4, Buttonbush Mineral Deciduous Thicket Swamp
SWT2-9, Grey Dogwood Mineral Deciduous Thicket Swamp

Riverfront Phase 1A Block Plan Environmental Impact Statement

Pre-Development Wetland Subcatchment Map

0 100 Meters

N

SAVANTA

Path: S:\9024 - SAV 7602 Riverfront Community\gis\mxd\2018 11 29 wetland water balance\Phase 1A Pre-Development Wetland Subcatchment Map.mxd REVISED: November 29, 2018