BEACON ENVIRONMENTAL

GUIDING SOLUTIONS IN THE NATURAL ENVIRONMENT

Natural Environment Report/ Environmental Impact Study

in support of a Master Environmental Servicing Plan

4134 16th Avenue

Prepared For:

Sixteenth Land Holdings Inc.

Prepared By:

Beacon Environmental Limited

Date: *Project:*

October 2017 **215200**

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1. Introduction

This Environmental Study Report by Beacon Environmental Limited (Beacon) has been prepared for the property located at 4134 16th Avenue. This study is part of the overall Master Environmental and Servicing Plan (MESP) in support of an Official Plan Amendment ("OPA") application to permit the development of a residential community on the subject property.

The property is a total of 168.64 hectares (416.72 acres), and it is located on the north side of 16th Avenue, on the west side of Kennedy Road. It has a small amount of frontage onto the east side of Warden Avenue in the City of Markham, Regional Municipality of York (**Figure 1**). Existing residential development surrounds the property on all sides.

The following Environmental Study follows the Terms of Reference (TOR) for the MESP that were prepared by the landowner consulting team and was approved by the City of Markham in July 2016. The TOR are provided in **Appendix A**. It demonstrates conformity with all policies from the Greenbelt Plan, the York Region Official Plan, the existing City of Markham Official Plan (1987) and all regulations and policies from the Toronto Region Conservation Authority (TRCA).

Bruce Creek traverses the property in a roughly north / south direction, bisecting the property into west and east tableland areas. Berczy Creek crosses the southwest corner of the property.

The current golf course use has been ongoing since York Downs Golf & Country Club opened on site in the early 1970's. The current Official Plan designation of 'Private Open Space' for the areas outside of the valleylands reflects this historic golf course use.

Sixteenth Land Holdings Inc. proposes to develop the property for a residential community and is submitting an OPA to re-designate the developable portion of the property from 'Private Open Space' to appropriate urban residential designations to permit the development of residential uses.

This report has been prepared in conjunction with the OPA application in support of the re-designation as proposed in the draft OPA and in the Planning Report (Gatzios Planning, October 2017). Please refer to the draft OPA and to the Planning Report for a description of the proposed Official Plan land use designations for the property.
The OPA application was first submitted in September 2016. Comments on this Plan and supporting documents were received from the agencies in the spring of 2017. These included comments from the City of Markham (March 13 and May 10, 2017), TRCA (May 10, 2017), Region of York (March 1 and May 10, 2017) and York Region District School Board (February 16, 2017). This Environmental Study has been updated to reflect the revised draft plans and address agencies' comments.

The proposed residential development is detailed in the two draft plan of subdivision applications that accompany this MESP. There is one draft plan of subdivision for the east portion of the property and one for the west portion of the property. The west draft plan of subdivision also contains the valleylands associated with both Berczy Creek and Bruce Creek. References in this report to the two draft plans or to specific lots / blocks will include 'East' or 'West' to denote the appropriate area.

2. Policy Context

2.1 Provincial Policy Statement

Policy 2.1 of the Provincial Policy Statement (PPS) (MMAH 2014) provides direction to regional and local municipalities regarding planning policies for the protection and management of natural heritage features and resources. The PPS defines seven natural heritage features and provides planning policies for each. The *Natural Heritage Reference Manual* (OMNR 2010), which is currently under review, is a technical document used to help assess the natural heritage features listed below:

a) significant wetlands;
b) coastal wetlands;
c) significant habitat of endangered and threatened species;
d) fish habitat;
e) significant woodlands;
f) significant valleylands;
g) significant Areas of Natural and Scientific Interest (ANSIs); and
h) significant wildlife habitat.

Each of these features is afforded varying levels of protection subject to guidelines, and in some cases, regulations. Of these features, significant wetlands and ANSIs are designated by the Ministry of Natural Resources and Forestry (MNRF). MNRF also provides criteria for the determination of Significant Woodlands, which may also be identified by the municipality. Significant habitat of Endangered or Threatened species is addressed through the *Endangered Species Act* (see **Section 7.1.2**). Fish habitat is governed by Fisheries and Oceans Canada (DFO). The identification and regulation of the remaining features is the responsibility of the municipality or other planning authority.

2.2 Greenbelt Plan

The subject property is located outside of the Greenbelt Plan Area. Bruce Creek and Berczy Creek are identified as River Valley Connections (outside the Greenbelt).

Section 3.2.5 of the Plan speaks to External Connections of the Greenbelt Plan Area. The Natural Heritage System is connected to local, regional and provincial scale natural heritage, water resource and agricultural systems beyond the boundaries of the Greenbelt Plan Area. The river valleys that run through existing or approved urban areas and connect the Greenbelt Plan Area to inland *lakes* and the Great Lakes are a key component of the long-term health of the Natural System. Municipalities should consider planning, design and construction practices that maintain or where possible enhance the size, diversity and *connectivity* of *key natural heritage features* and *key hydrologic features* and functions. These external connections are generally depicted in the Greenbelt Plan, but are not within the regulated boundary of the Greenbelt Plan.

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0 75 150 300 450 600

Subject Property

Draft Plan Boundary

MASTER ENVIRONMENTAL SERVICING PLAN FOR
4134 16TH AVE

FIGURE 1 Site Location

First Base Solutions Web Mapping Service 2015
UTM Zone 17 N, NAD 83

Date: October 2017

2.3 Rouge North Management Plan

The subject property is located within the Rouge North Management Plan Area, a guideline document that seeks to protect the Rouge River and its tributaries from the Oak Ridges Moraine to Lake Ontario was created in 2001. OPA 140 in the City's Official Plan (1987) incorporates the Rouge North Management Plan.

The Rouge River Tributaries within the Subject Property are located in the Urban Policy Area. OPA 140 states that the Urban Policy Area is intended "*to identify the lands within the Rouge watershed where a significant portion of lands adjacent to the Rouge River tributaries have already been acquired into public ownership. It is the intent of the Town to protect and enhance the aquatic resources of the tributaries of the Rouge River in a manner which supports the Park objectives and policies of this Plan."* Further, it is intended that lands adjacent to the tributaries in the areas which come into public ownership as a result of the development approvals process will form part of the Rouge Park North, should they be specifically identified by Council for these purposes.

2.4 Region of York Official Plan

The Region of York Official Plan was adopted in 2009 and approved by the Ministry of Municipal Affairs and Housing in September 2010 incorporating several modifications. The OP identifies a Regional Greenlands System. The policies detailed in the plan are intended to identify, protect and restore the Greenlands System as a permanent resource for the Region. Lands designated Greenlands in the Region of York Official Plan are subject to development constraints.

The boundaries and extent of the Greenlands System identified on Map 2 of the Official Plan are approximate. Specific delineation or clarification of Greenland boundaries may be undertaken when applications for development are received. Refinements to the boundaries may occur through environmental evaluation, and do not require an amendment to the plan.

Development applications within or on lands close to the Greenlands System must be accompanied by an environmental evaluation of impacts the development will have or is expected to have on the environmental functions, attributes, or linkages of the Greenlands System. The evaluation must also provide the details of any mitigation measures that will ensure that the Greenlands features will not be adversely impacted.

Wetlands are identified on Map 4 in the York OP; no wetlands are depicted on the subject property on Map 4. Nonetheless, Section 2.2.39 states that "*applications for development and site alteration within 120 metres of wetlands not shown on Map 4 of this Plan shall be accompanied by an environmental impact study that determines their importance, functions and means of protection and/or maintenance of function, as appropriate, to the satisfaction of the approval authority*". Furthermore, development is prohibited within wetlands evaluated as "provincially significant", and a vegetation protection zone, the width of which is determined through an environmental impact study, shall be applied. The vegetation zone shall be no less than 30 m for all wetlands evaluated as "significant".

Permanent and intermittent streams and Significant Woodlands are identified on Map 5 in the York OP. The policies in the plan that address these features are intended to protect woodlands and their biodiversity and encourage reforestation to provide environmental, social and economic benefits for the

residents of York Region. Section 2.2.45 of the OP states that woodlands are significant if they meet one of the following criteria:

a. *is 0.5 hectares or larger and:*
   i. *directly supports globally or provincially rare plants, animals or communities as assigned by the Natural Heritage Information Centre; or,*
   ii. *directly supports threatened or endangered species, with the exception of specimens deemed not requiring protection by the Province (e.g. as is sometimes the case with Butternut); or,*
   iii. *is within 30 metres of a provincially significant wetland or wetland as identified on Map 4, waterbody, permanent stream or intermittent stream;*
b. *is 2 hectares or larger and:*
   i. *is located outside of the Urban Area and is within 100 metres of a Life Science Area of Natural and Scientific Interest, a provincially significant wetland or wetland as identified on Map 4, significant valleyland, Environmentally Significant Area, or fish habitat; or,*
   ii. *occurs within the Regional Greenlands System;*
c. *is south of the Oak Ridges Moraine and is 4 hectares or larger in size;*
d. *is north of the Oak Ridges Moraine and is 10 hectares or larger in size;*
e. *on the Oak Ridges Moraine the woodland will be evaluated for significance based on the requirements of the Oak Ridges Moraine Conservation Plan and associated technical papers; or,*
f. *on lands in the Greenbelt Natural Heritage System, the woodland will be evaluated for significance based on the requirements of the Greenbelt Plan and associated technical papers; or,*
g. *on lands in the Lake Simcoe watershed, outside of the Greenbelt, the Oak Ridges Moraine Conservation Plan, and existing settlement areas, the woodland will be evaluated for significance based on the requirements of the Lake Simcoe Protection Plan and associated technical papers.*

Section 2.2.48 states that woodlands are NOT considered significant notwithstanding Section 2.2.45 if they are within the Urban Area if all of the following criteria are met:

a. *the woodland is located outside of the Regional Greenlands System as shown on Map 2 of this Plan;*
b. *the woodland is located in an area strategic to the achievement of the community objectives of Section 5.2 and 5.6 of this Plan or is identified within an intensification area detailed in a local municipal intensification strategy, and is evaluated through an official plan amendment process, or other appropriate study;*
c. *the woodland does not meet the criteria in policy 2.2.45.a of this Plan; and,*
d. *the woodland is a cultural and regenerating woodland to the satisfaction of York Region, in consultation with the conservation authority and local municipality.*

Significant Valleylands in the York Region OP are defined as valleylands "which are ecologically important in terms of features, functions, representation or amount, and contribute to the quality and diversity of an identifiable geographic area or natural heritage system."

2.5 Town of Markham Official Plan

Markham's new Official Plan was adopted by Council on December 10, 2013, and approved by York Region on June 12, 2014. The new Official Plan has been appealed to the Ontario Municipal Board and is not yet in force. Until an Ontario Municipal Board decision to approve all or part of the new Official Plan has been made, the current Official Plan (Revised 1987), as amended, continues to remain in force and has been reviewed and applied to the subject property. Nevertheless, natural heritage policies of the 2014 Official have also been reviewed and considered as part of this study. Section 5, below addresses specific amendments to the OP, regarding natural heritage features within the subject property.

2.5.1 Markham OP (1987)

Schedule A (Land Use) identifies the subject property as Open Space, Hazard Land and the north east corner as Future Urban Area. Schedule I (Environmental Protection Areas) of the Markham Official Plan identifies Valleylands on the subject property which includes the Hazard Lands depicted on Schedule A. As outlined in the Markham OP:

> *Environmental Protection Area identifies lands and water bodies containing natural features and/or ecological functions of such significance to the Town or sensitivity to disturbance as to warrant long term protection. Corresponding objectives for their preservation will be implemented through detailed policies which address specific subcategories as follows:*
>
> - *Locally Significant Area Complexes;*
> - *Valleylands including HAZARD LANDS designated on Schedule 'A' - LAND USE; and*
> - *Woodlots and other Significant Vegetation Communities.*

Section 2.2.2.9 c) and f) of the Official Plan speaks to Environmental Buffers, which calls for the minimum width of an environmental buffer to be 10 m from the stable top of bank or predicted stable top of bank or the Regulatory Flood Line, drip line of the trees at the edge of the woodlot, or as defined by an Environmental Impact Study.

Greenway System

Appendix Map 1 of the Town of Markham OP identifies Bruce Creek, Berczy Creek, the eastern woodlot and a Bruce Creek tributary as part of the Greenway System.

The purpose of the Greenway System is to:

- support ecological functions;
- provide access to natural areas; and
- provide continuous trails linking the Town's Greenway System with the Rouge Park, the Oak Ridges Moraine and the Don River Valley south of Steeles Avenue.

The Greenway System as shown on Map 4 in the City of Markham OP (2014) incorporates the same areas/features as the 1987 Greenway System for the subject property, with one exception. The 2014 Greenway System does not include Feature A which is described in Section 3.2.3.3.

2.5.2 *Markham OP (2014)*

In the updated OP, the City of Markham identifies key natural heritage features and key hydrologic features as the following:

a) *wetlands*
b) *significant portions of the habitat of:*
    i. *endangered species and threatened species;*
    ii. *special concern species in the Oak Ridges Moraine Conservation Plan Area and Greenbelt Plan Area; and*
    iii. *Provincially rare species in the Oak Ridges Moraine Conservation Plan Area*
c) *fish habitat*
d) *Life Science Areas of Natural and Scientific Interest*
e) *significant valleylands;*
f) *significant woodlands;*
g) *significant wildlife habitat;*
h) *sand barrens, savannahs and tallgrass prairies;*
i) *permanent and intermittent streams; and*
j) *seepage areas and springs.*

Generally, development, redevelopment and site alteration are prohibited within key natural heritage features and key hydrologic features and their vegetation protection zones. The extent of features and their protection zones are to be determined through an environmental impact study. Prescribed vegetation zones and definitions of "significant" features (e.g., woodlands and valleylands) are provided in Chapter 3 of the OP, which is currently under appeal at the OMB.

2.6 Toronto and Region Conservation Authority

The Toronto and Region Conservation Authority (TRCA) regulates land use activities in and adjacent to wetlands, watercourses and valleylands under Ontario Regulation 166/06 (*Regulation for Development, Interference with Wetlands and Alterations to Shorelines and Watercourses*) made under the *Conservation Authorities Act.*

The TRCA may grant permission to development within regulated areas "if, in its opinion, the control of flooding, erosion...or pollution of the conservation of land will not be affected by the development". As part of its permitting process, the TRCA typically requires the proponent to prepare an Environmental Impact Statement (EIS), which must demonstrate that the development can proceed without resulting in any alteration to a watercourse or interference to the hydrologic function of a wetland.

With respect to wetlands (which were a key change in the May 2006 revision to the Conservation Authority regulations) the regulated area extends to within 30 m of an unevaluated wetland and within 120 m of a Provincially Significant Wetland. The regulation requires the issuance of a permit from the

Conservation Authority to allow "interference" with a wetland or for infringement within the flood and fill areas associated with a watercourse as was the case prior to the new regulation.

Generally, development within the flood limit of a watercourse is not allowed. However, subject to conformity with the Official Plan and completion of appropriate studies and Conservation Authority permits, some development *may* be permitted within the constraint area. The TRCA will generally require that all watercourses stay in their natural state with respect to development proposals.

The TRCA's Living City Policy was approved in November 2014 and replaces the Valley and Stream Corridor Management Program (1994). The Living City Policy document, among other matters, implements current federal, provincial and municipal legislation, policies and agreements affecting conservation authorities; and implements the policies for TRCA's updated section 28 of Ontario Regulation 166/06. According to the Living City Policy, the boundaries of a stream corridor generally require a minimum 10 m setback from the greater of:

- Physical top of the valley feature;
- Stable top of bank, where geotechnical concerns exist (which must be confirmed through an appropriate geotechnical analysis);
- Limits of flooding on the property in a Regional Storm Event; and
- Limits of significant vegetation which is contiguous with the valley corridor.

Section 7.3.1.4 of the Living City Policy outlines buffers adjacent to natural features. The boundaries of a wetland that is not identified as a Provincially Significant Wetland is 10 m.

2.7 Endangered Species Act

Ontario's *Endangered Species Act, 2007* (ESA) came into effect on June 30, 2008, with over 200 species in Ontario identified as extirpated, endangered, threatened, or of special concern. The MNRF provides oversight of the *Endangered Species Act (ESA)* for the regulation of Species at Risk (SAR) in Ontario. Under the *ESA,* native species that are in danger of becoming extinct or extirpated from the province are identified as being extirpated, endangered, threatened and special concern. These designations are defined as follows:

- Extirpated – a species that no longer exists in the wild in Ontario but still occurs elsewhere;
- Endangered – a species facing imminent extinction or extirpation in Ontario which is a candidate for regulation under Ontario's *Endangered Species Act;*
- Threatened - a species that is at risk of becoming endangered in Ontario if limiting factors are not reversed; and
- Special Concern – a species with characteristics that make it sensitive to human activities or natural events.

Under the *ESA*, protection is provided to threatened or endangered species and their habitat, as well as providing stewardship and recovery strategies for species. Permitting is required to conduct works within habitat regulated for threatened or endangered species.

A Species at Risk Screening (SAR) request was submitted to MNRF in August 2016. A response from M. Eplett a Management Biologist with MNRF was provided on August 23, 2016 and is provided in

Appendix B. The SAR screening identifies the following species recorded in the vicinity of the subject property:

- Redside Dace (*Clinostomus elongatus*) – Endangered
- Butternut (*Juglans cinerea*) – Endangered
- Barn Swallow (*Hirundo rustica*) – Threatened
- Eastern Wood-peewee (*Contopus virens*)– Special Concern

Both Bruce Creek and Berczy Creek provide direct habitat for the Endangered Redside Dace and in this regard are regulated as occupied Redside Dace streams. MNRF also indicates that the property contains features that may be considered contributing habitat for Redside Dace. Contributing habitat includes streams, permanent or intermittent headwater drainage features, groundwater discharge areas or wetlands that augment or maintain the baseflow, coarse sediment supply or surface water quality of areas currently known to be occupied by Redside Dace or areas which provide an opportunity for Redside Dace recovery / recolonization.

MNRF also identifies Bobolink (*Dolichonyx oryzivorus*) and Eastern Meadowlark (*Sturnella magna*) both listed as Threatened under the *ESA.*

2.8 Federal *Fisheries Act*

Fish habitat is protected under the Federal *Fisheries Act* (1985). In Ontario, the federal department of Fisheries and Oceans Canada (DFO) manages fish habitat and the Ontario Ministry of Natural Resources and Forestry (MNRF, formerly known as OMNR or MNR) manages fisheries.

Section 35 (1) of the Federal *Fisheries Act* precludes "any work, undertaking or activity that results in serious harm to fish" that are part of a commercial, recreational or aboriginal fishery, or to fish that support such a fishery. S. 35(2) provides that s. 35(1) does not apply where the work, undertaking or activity has been authorized by the Minister and is carried on in accordance with conditions established by the Minister.

The *Fisheries Act* defines "serious harm" to fish as "the death of fish or any permanent alteration to, or destruction of, fish habitat". The Fisheries Protection Policy Statement (2013) was prepared by Fisheries and Oceans Canada (formerly Department of Fisheries and Oceans [DFO]) to provide guidance on compliance with the *Fisheries Act*.

2.9 Federal *Species at Risk Act*

The federal *Species at Risk Act* - SARA (2002) is intended to prevent federally endangered or threatened wildlife (including plants) from becoming extinct in the wild, and to help in the recovery of these species. The Act is also intended to help prevent species listed as Special Concern from becoming endangered or threatened. To ensure the protection of Species at Risk (SAR), SARA contains prohibitions that make it an offence to kill, harm, harass, capture, take, possess, collect, buy, sell or trade an individual of a species listed in Schedule 1 of SARA as endangered, threatened or extirpated.

The federal SARA applies primarily to lands under federal jurisdiction, and relies on Provincial laws to protect federal SAR habitat. On private land, SARA prohibitions apply only to aquatic species and migratory birds that are also listed in the *Migratory Birds Convention Act* (1994). The intent of SARA is to protect critical habitat as much as possible through voluntary actions and stewardship measures.

Redside Dace was uplisted in May 2017 to Schedule 1 of SARA meaning its status is confirmed as federally Endangered. Regulations of SARA (2002) also apply to the subject property in relation to the *Migratory Birds Convention Act* (1994).

2.10 Transport Canada

The subject property is located within the Secondary Bird Hazard Zone. A report prepared for Transport Canada (LGL, 2002) identifies the Secondary Bird Hazard Zone is a "bird behaviour buffer zone" of 4 km placed around the Primary Bird Hazard Zone. This buffer accounts for variations in bird movements around specific land-uses.

Paragraph 6 of the Pickering Airport Site Zoning Regulations states:

> *6. No owner or lessee of any land which is situated within the Bird Hazard Zone, which is more particularly described in Part VII of the schedule, shall use the land or allow the land to be used for activities or uses that attract birds that create a hazard to aircraft safety and, therefore, are incompatible with the safe operation of the airport or aircraft.*

Appendix C of the document indicates that Stormwater Management Ponds are permitted in the Secondary Bird Hazard Zone but are classified as "Potentially Risky".

3. Existing Conditions

3.1 Field Investigations

Beacon conducted field investigations from 2015 through 2017. Previous field investigations, including characterization of Bruce and Berczy Creeks, vegetation assessments and natural features staking were completed in 2010 by Beacon Environmental as part of an Environmental Analysis Study completed for the York Downs Golf and Country Club. The results of all of these studies have been compiled in this MESP report. **Table 1** provides a list of the field investigations conducted by Beacon.

Table 1. Summary of Field Investigations

Field Investigation	Dates
ELC and Floral Inventory	June 18 and 21, 2010; June 21, June 30 and August 15, 2016
Butternut Health Assessment	August 2, 2016
Tree Inventory	April to August 2016
Aquatic Assessment	June 19, 2010 and August 3, 2016

Field Investigation	Dates
Surface Drainage Feature Assessment	May 10 and November 10, 2011; July 19, August 3 and August 17, 2016; April 13, July 28 and September 21, 2017
Amphibian Surveys	April 19, May 30 and June 29, 2016
Breeding Bird Surveys	June 2, June 11 and June 19, 2015
Vegetation/Top of Bank Staking/Wetland Staking	July 28, September 10 and September 23, 2010; March 4, 2016; September 28 , 2017

Also completed as part of MESP were hydrogeological, geotechnical, hydrologic and fluvial geomorphology investigations. The results of these investigations are presented in the MESP (2017) and a summary of each in respect to natural environment is provided below.

3.2 Terrestrial Resources

3.2.1 ELC Communities

A total of 31 vegetation community types were identified on the subject property. The communities can be broadly categorized as forest, wetland, and semi-natural/cultural. Semi-natural/cultural communities include old field meadows, plantations, successional thickets and woodlands, and managed areas (e.g. golf course greens, agriculture). Large areas of the subject property fall into the semi-natural/cultural category. Natural forests and wetlands on the property tend to be rather small and are generally associated with the valleylands of Berczy Creek and Bruce Creek. The vegetation communities on the subject property are illustrated on **Figure 2** and described in detail below.

3.2.1.1 Semi-Natural and Cultural Communities

Cultural Plantation/Cultural Woodland (CUP/CUW1)

Unit1 (multiple units): This community occurs throughout the golf course between fairways and manicured areas. It is characterized by a mix of predominantly mid-aged planted deciduous and coniferous trees, including Silver Maple (*Acer saccharinum*), Norway Maple (*Acer platanoides*), Little Leaf Linden (*Tilia cordata*), Weeping Willow (*Salix x sepulcralis*), White Pine (*Pinus strobes*), Scots Pine (*Pinus sylvestris*), Austrian Pine (*Pinus nigra*), Red Pine (*Pinus resinosa*), White Spruce (*Picea glauca*), Norway Spruce (*Picea abies*), and Colorado Blue Spruce (*Picea pungens*). In addition to the planted trees, there are occasional remnant natural trees including Sugar Maple (*Acer saccharum*), Bur Oak (*Quercus macrocarpa*), basswood (*Tilia americana*), and white cedar (*Thuja occidentalis*). Canopy cover ranges from 25% to 60%. The understory is sparse, with occasional regenerating shrubs such as Buckthorn (*Rhamnus cathartica*) and Raspberry (*Rubus spp*.). The ground layer is comprised of old field meadow species such as Smooth Brome Grass (*Bromus inermis*), Bluegrass (*Poa spp*.), Reed Canary Grass (*Phalaris arundinacea*), Tall Goldenrod (*Solidago altissima*), Cow Vetch (*Vicia cracca*), Creeping Thistle (*Cirsium arvensis*), Panicled Aster (*Aster lanceolatus*), Bird's Foot Trefoil (*Lotus corniculata*), and Common Milkweed (*Asclepias incarnate*). Narrow bands of wet meadow vegetation occur along the edges of streams and ponds.

Semi-natural and Cultural Communities		
1	CUP/CUW1	Cultural Plantation/Cultural Woodland
2a-2e	CUM1-1	Dry-Moist Old FieldMeadow
15	CUP3-3	Scotch Pine Plantation
20	CUP1-3	Black Walnut Plantation
24	CUW1	Cultural Woodland
26, 29	CUT1	Cultural Thicket
32, 36	CUW1	Cultural Woodland
34	CUT1	Cultural Thicket/Shrub Hedgerow
39	CUS1	Cultural Savannah
40	CUP3	Coniferous Plantation
44	CUW1	Cultural Woodland
47		Agriculture
48		Manicured
Forest Communities		
3	FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest
6	FOD6-5	Fresh-Moist Sugar Maple-Hardwood Deciduous Forest
8, 9, 12	FOC4-1	Fresh-Moist White Cedar Coniferous Forest
13	FOD5-1	Dry-Fresh Sugar Maple Deciduous Forest
14, 16a, 16b	FOM7-2	Fresh-Moist White Cedar-Hardwood Mixed Forest
17a, 17b	FOD5-6	Dry-Fresh Sugar Maple-Basswood Deciduous Forest
21	FOC2-2	Dry-Fresh White Cedar Coniferous Forest
22	FOD6-5	Fresh-Moist Sugar Maple-Hardwood Deciduous Forest
27	FOD7-3	Fresh-Moist Willow Lowland Deciduous Forest
31	FOD2-4	Dry-Fresh Oak-Hardwood Deciduous Forest
35	FOM7-2	Fresh-Moist White Cedar-Hardwood Mixed Forest
37	FOM7-1	Fresh-Moist White Cedar-Sugar Maple Mixed Forest
41	FOD7-4	Fresh-Moist Black Walnut Lowland Deciduous Forest
42	FOD6-1	Fresh-Moist Sugar Maple-Ash Deciduous Forest
43	FOD8-1	Fresh-Moist Poplar Deciduous Forest
45	FOC4-1	Fresh-Moist White Cedar Coniferous Forest
Wetland Communities		
4	SWD4-1	Willow Mineral Deciduous Swamp
5	MAM2-5	Narrow-Leaved Sedge Mineral Meadow Marsh
7	MAM2	Common Reed Mineral Meadow Marsh
18, 23a, 23b, 23c	MAM2-2	Reed Canary Grass Mineral Meadow Marsh
25	MAM2-10	Forb Mineral Meadow Marsh
30	MAM2-10	Forb Mineral Meadow Marsh
33	SWD7-1	Paper Birch-Poplar Organic Deciduous Swamp

Pond B
Pond C
Pond D
Pond E
Pond F
Pond G
Pond H
Pond I
Pond A
Bruce Creek
Berczy Creek
Warden Avenue
Kennedy Road
16th Avenue

Woodland/Wetland Feature 1

Woodland Feature 2

N

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Legend

- Subject Property
- ELC Communities
- Butternut
- Watercourse

ELC Community Type

- Forest Communities
- Wetland Communities

JD Barnes: Aerial Photograph, 2015.
MBTW: Subject Property, 2015.
Beacon Environmental, 2017. All other data.

MASTER ENVIRONMENTAL SERVICING PLAN FOR
4134 16TH AVE

FIGURE 2: Existing Conditions Terrestrial

UTM Zone 17 N, NAD 83

Project 215200
October 2017

Dry-Moist Old Field Meadow (CUM1-1)

Unit 2 (multiple units): Old field meadow communities are present throughout the property. These communities have a ground layer comprised of varying mixtures of common grasses and forbs, including Smooth Brome Grass, Bluegrasses, Reed Canary Grass, Tall Goldenrod, Cow Vetch, Creeping Thistle, Panicled Aster, Bird's Foot Trefoil and Common Milkweed. Woody regeneration in these communities is generally sporadic (<25% woody cover) and includes Buckthorn, Hawthorn (*Crataegus spp.*), Poplar (*Populus spp.),* Raspberry, Manitoba Maple (*Acer negundo*), and Red Osier Dogwood (*Cornus sericea*). Occasional planted trees include young maples, pines, spruce and cedar. Narrow bands of wet meadow vegetation occur along the edges of streams and ponds.

Scotch Pine Coniferous Plantation (CUP3-3)

Unit 15: This unit, located at the southwest corner of the site, consists of planted Scots Pine with a dense understory of Buckthorn

Black Walnut Deciduous Plantation (CUP1-3)

Unit 20: This is a small mid-aged Black Walnut plantation mixed in with several Scots Pines.

Mineral Cultural Thickets (CUT1)

Unit 26: This disturbed thicket community occurs on a stretch of valley slope associated with Bruce Creek at the southeast corner of the property. It is a tall shrub dominated community of predominantly Common Buckthorn, Hawthorn and Lilac (*Syringa vulgaris*). Riverbank Grape (*Vitis riparia*) and Chokecherry (*Prunus virginiana*) occur occasionally in the understory. The ground layer is sparse and consists of little more than Riverbank Grape, Virginia Creeper (*Parthenocissus inserta*), Enchanter's Nightshade (*Circaea lutetiana*), and Buckthorn seedlings. The community has a sparse canopy of Black Walnut, Ash and Silver Maple (*Acer saccharinum*).

Unit 29: This unit is a small patch of buckthorn and hawthorn.

Cultural Woodlands (CUW1)

Unit 24: This woodland has an open canopy of Black Walnut with some willow, Trembling Aspen, and Bur Oak. The understory is sparse, consisting of Black Walnut and Common Buckthorn. The ground layer is dominated by grasses, Garlic Mustard, and Tall Goldenrod.

Unit 32: This unit is one of the larger wooded areas on the property. The structure and species composition of this woodland suggest past disturbances, such as clearing or grazing. It is a dense, scrubby site with a generally open canopy of young to mid-aged White Elm, Bur Oak, Basswood, Green Ash, Manitoba Maple, and Trembling Aspen. Tall shrubs including Buckthorn, apples, and hawthorns are abundant. The ground layer consists of species common to moist soils including Virginia Creeper, Poison Ivy, Enchanter's Nightshade, Garlic Mustard, Herb Robert, Red Baneberry, and Sensitive Fern.

Unit 36: This semi-natural/successional community occurs toward the southwest corner of the property. The canopy consists of planted Red Pine and Scots Pine and regenerating Manitoba Maple, Norway Maple and Poplar. The understory is dense and comprised of Buckthorn, Riverbank Grape, Manitoba Maple and Raspberry. Virginia Creeper, Enchanter's Nightshade, Garlic Mustard (*Alliaria petilota*), Urban Avens (*Geum urbanum*) and Dame's Rocket (*Hesperis matronalis*) are common in the ground layer.

Unit 44: This woodland community is located along the northwest edge of Unit 35. The area appears to have been logged/cleared as the canopy is very open and consists mainly of Black Cherry (*Prunus serotina*) and White Cedar (*Thuja occidentalis*). The understory is sparse and composed of White Ash (*Fraxinus americana*), Buckthorn and Raspberry. Tall Goldenrod is abundant in the ground layer.

Cultural Thicket/Shrub Hedgerow (CUT1)

Unit 34: This hedgerow community has an open canopy comprised of predominantly Hawthorns (*Crateaegus punctata*) and a remnant Bur Oak. The sparse understory is made up of Buckthorn and Raspberry. Old field meadow species such as Creeping Thistle and cool season grasses make up the ground layer.

Cultural Savannah (CUS1)

Unit 39: This community is located along the northern edge of the property. It has a sparse canopy of Black Walnut, Green Ash (*Fraxinus pennsylvanica*), Manitoba Maple and White Cedar. The understory consists of Riverbank Grape, Elderberry and a dense patch of Red Raspberry. Dominant ground covers include Jewelweed (*Impatiens capensis*), Tall Goldenrod, Dame's Rocket, and Virginia Creeper.

Coniferous Plantation (CUP3)

Unit 40: This community is located at the far western edge of the property. It consists of planted Red Pine, White Pine and Scots Pine, along with occasional naturally occurring Black Walnut, Sugar Maple, and White Ash. White Ash, Alternate-Leaved Dogwood (*Cornus alternifolia*), Buckthorn and Chokecherry make up the understory. Ground covers include Virginia Creeper, Enchanter's Nightshade, Jack-In-The-Pulpit (*Arisaema triphyllum*) and Red Baneberry (*Actaea rubra*).

Agriculture

Unit 47: These areas are managed agriculture fields planted with corn.

Manicured

Unit 48: Much of the property is characterized by manicured lawns with planted deciduous and coniferous trees, including Silver Maple, Norway Maple, Green Ash, pines, and spruce

3.2.1.2 Forest Communities

Fresh-Moist Willow Lowland Deciduous Forest (FOD7-3)

Unit 3: This mid-aged forest patch occurs toward the southwest end of the property within the Berczy creek floodplain. The canopy consists of Crack Willow, along with Black Walnut, Manitoba Maple, Poplar and Butternut. The understory consists of Buckthorn and Manitoba Maple. Garlic Mustard, Enchanter's Nightshade, Field Horsetail (*Equisetum arvensis*), and Jewelweed are common in the ground layer.

Unit 27: This lowland willow forest occurs in the floodplain of Bruce Creek toward the southeast end of the property. The canopy consists of Crack Willow (*Salix fragilis*), Black Walnut, and Manitoba Maple. The shrub layer is sparse, consisting of a few Elderberry (*Sambucus canadensis*) and Riverbank Grape. The ground layer is dense and comprised mainly of Jewelweed, Dame's Rocket and Ostrich Fern (*Matteuccia struthiopteris*).

Fresh-Moist Sugar Maple – Hardwood Deciduous Forest (FOD6-5)

Unit 6: This forest community occurs along the western boundary of the property. The canopy consists of Sugar Maple, Black Walnut, White Ash, and Basswood, with a subcanopy of ash, Basswood (*Tilia americana*), Black Cherry, Manitoba Maple and Butternut. Manitoba Maple, Ash, and Alternate-Leaved Dogwood occur in the understory. The ground layer consists of Virginia Creeper, White Avens (*Geum canadensis*), Spinulose Wood Fern (Dryopertis carthusiana), Riverbank Grape, and Red Baneberry.

Unit 41: This mid-aged forest community is located at the far western edge of the property on gentle valley slope adjacent to Berczy Creek. The canopy is dominated by Black Walnut in association with White Ash and Sugar Maple. Alternate-Leaved Dogwood, White Ash, Buckthorn and Chokecherry make up the understory. The ground layer consists of Jack-In-The-Pulpit, Virginia Creeper and Enchanter's Nightshade.

Fresh White Cedar Coniferous Forest Type (FOC2-2)

Unit 21: This unit is a small patch of young White Cedar located in the northeast area of the property.

Fresh-Moist White Cedar Coniferous Forest (FOC4-1)

Unit 8: This mid-aged coniferous forest community is located at the northern edge of the property along Bruce Creek. The canopy is predominantly White Cedar along with several Manitoba Maple and Black Walnut. The subcanopy/understory consists of Hawthorn, Buckthorn, Ash, Basswood aAnd Chokecherry. Ground flora includes ferns (*Matteuccia struthiopteris*, *Onoclea sensibilis*, *Athyrium felix-femina*), Enchanter's Nightshade, and Virginia Creeper. A small meadow marsh community occurs along the creek with Canada Anemone (*Anemone canadensis*), Reed Canary Grass, Joe-Pye Weed (Eupatorium macultatum) and Dame's Rocket.

Unit 9: This forest community has a dense canopy of large White Cedar trees. The shrub and ground layers are sparse due to heavy shade. Occasional shrubs include Buckthorn, Elderberry, White Ash

and Alternate-Leaved Dogwood. The ground layer is predominantly Herb Robert (*Geranium robertianum*), Enchanter's Nightshade, Garlic Mustard and Celandine (*Cheledonim majus*).

Unit 12: This moist coniferous forest community is dominated by White Cedar, with several Yellow Birch (*Betula alleghaniensis*), Basswood and Sugar Maple. The understory is generally sparse and comprised of Hawthorn, Buckthorn and Green Ash. Jewelweed and Ostrich Fern dominate the ground layer.

Unit 45: This forest community is part of the large woodland situated on the tableland and upper valley slope of Bruce Creek. It has a dense canopy of mid-aged to mature White Cedar, with occasional White Ash. The understory is generally open and consists of Buckthorn and White Ash. Enchanter's Night Shade, Virginia Creeper, Ostrich Fern, Lady Fern and Celandine make up the ground layer.

Dry-Fresh Sugar Maple Deciduous Forest (FOD5-1)

Unit 13: This community has a canopy comprised primarily of Sugar Maple with Basswood associates. The sub-canopy consists mainly of Sugar Maple, along with Buckthorn, White Cedar and Elm. The understory is fairly sparse and composed of Buckthorn, Chokecherry and Ash. Virginia Creeper, Enchanter's Nightshade and Garlic Mustard are common ground species.

Fresh- Moist White Cedar-Hardwood Mixed Forest (FOM7-2)

Unit 14: This moist mixed forest is associated with a small intermittent drainage feature draining toward Bruce Creek. The canopy is comprised of primarily White Cedar and Black Maple (*Acer nigrum*), with Basswood, Black Walnut and Hawthorn associates. Buckthorn, Chokecherry, Young Black Maple and Basswood make up the understory. Jewelweed, Virginia Creeper, Tall Goldenrod, and Field Horsetail are dominant in the ground layer.

Unit 16: These two small forest patches occur on a slope bordering a reed canary grass meadow marsh and stream. The canopy is composed of White Cedar in association with Basswood, Sugar Maple, Elm and Ash. The subcanopy consists of Ash, Buckthorn and Hawthorn. The understory is fairly open, and consists of primarily Buckthorn, Ash and Chokecherry. The ground layer is generally sparse and consists of Virginia Creeper, Jewelweed and Wild Strawberry (*Fragaria virginiana*).

Unit 35: This unit is one of the larger wooded areas on the property, much of which is situated within the floodplain of Bruce Creek. The area is generally characterized by a mix of mid-aged to mature White Cedar and hardwoods, including Yellow Birch, Black Ash (*Fraxinus nigra*), Green Ash and Basswood. Ostrich Fern, Jewelweed and Enchanter's Nightshade are abundant in the ground layer. Several small drainages run through the woodlot toward Bruce Creek. Bruce Creek runs along the south end of the unit. The creek is bordered by meadow marsh vegetation (Reed Canary Grass, Joe-Pye Weed), Manitoba Maple, Black Walnut, Willow and Cedar.

Unit 46: Two mid-aged mixed forest communities occur within Unit 32. The canopy consists of White Cedar in association with Trembling Aspen, Yellow Birch, Green Ash and White Elm. Ground covers include Enchanter's Nightshade, Wood Ferns, Virginia Creeper, Field Horsetail, Jack-In-The-Pulpit and Wild Sarsaparilla (*Aralia nudicaulis*).

Dry-Fresh Sugar Maple-Basswood Deciduous Forest (FOD5-6)

Unit 17: This community occurs on a slope adjacent to a reed canary grass meadow marsh and stream. It is characterized by a canopy of predominantly Sugar Maple and Basswood, with a subcanopy of Sugar Maple and Crab Apple (*Malus pumila*). Shrubs include Buckthorn, Chokecherry and Young White Ash. Enchanter's Night Shade, Wild Strawberry and Buckthorn Seedlings, and Jewelweed make up the ground layer.

Dry-Fresh Oak-Hardwood Deciduous Forest (FOD2-4)

Unit 31: This mid-aged forest community has a canopy of Bur Oak, Black Maple, and White Ash. Ironwood, Black Cherry, Bur Oak, and Basswood occur in the subcanopy. The understory is fairly sparse, consisting of Buckthorn and Chokecherry. The ground layer is composed of primarily Zigzag Goldenrod, Virginia Creeper, May-Apple (*Podophyllum peltatum*), and Virginia Waterleaf (*Hydrophyllum virginiana*).

Fresh-Moist White Cedar-Sugar Maple Mixed Forest (FOM7-1)

Unit 37: This forest community occurs along the western edge of the property along the slope to Berczy Creek. It is a small piece of a larger forest corridor that extends off the property to the west. The canopy is a mix of White Cedar, Sugar Maple, Black Walnut, and Norway Maple. The subcanopy and understory is comprised of Manitoba Maple, Buckthorn, White Ash, Chokecherry, Alternate-Leaved Dogwood, and Elderberry. Zig-Zag Goldenrod, Enchanter's Nightshade, and Virginia Creeper are common in the ground layer.

Fresh-Moist Sugar Maple-Ash Lowland Forest (FOD6-1)

Unit 42: This small forest community is situated along Berczy Creek, adjacent to Warden Ave. The canopy is comprised of Sugar Maple, Ash, Basswood, and Willow. The understory consists of ash, alternate leaved dogwood, and chokecherry. Zig-zag Goldenrod and Virginia creeper are abundant in the ground layer.

Fresh-Moist Poplar Deciduous Forest (FOD8-1)

Unit 43: Young trembling aspen dominate the canopy of this small forest community. The understory is generally sparse and consists of red-osier dogwood and buckthorn. The ground layer is dense and consists mainly of jewelweed, as well as tall goldenrod and Virginia creeper.

Fresh-Moist Sugar Maple-Hardwood Deciduous Forest (FOD6-5)

Unit 22: This mid-aged forest community occurs along a stretch of valley slope associated with Bruce Creek. The canopy is composed of sugar maple along with black walnut, bur oak, and basswood. Buckthorn, chokecherry, and young ash are dominant in the understory. The ground layer includes

Virginia creeper, goldenrod, Canada anemone, and avens. A small inclusion of White Cedar (FOC4-1) occurs at the south end of the unit.

3.2.1.3 Wetland Communities

Willow Mineral Deciduous Swamp Type (SWD4-1)

Unit 4: This small mid-aged swamp community occurs at the south end of the property along 16th Avenue. The canopy is comprised of crack willow. Ground vegetation includes cattails (*Typha spp*.), Panicled Aster, Marsh Bedstraw (*Galium palustre*), Reed Canary Grass, Field Horsetail, and bulrush (*Scirpus spp*).

Narrow-leaved Sedge Graminoid Mineral Meadow Marsh (MAM2-5)

Unit 5: This small meadow marsh community occurs at the southwest corner of the property within a cultural meadow in the Berczy Creek floodplain. It is comprised of a mix of wetland forbs and graminoides including sedges (*Carex pellita, Carex vulpinoidea*), rushes (*Junus sp*.), Panicled Aster, Marsh Bedstraw, bulrush (*Scirpus atrovirens*), and Spotted Water Hemlock (*Cicuta maculate*).

Mineral Meadow Marsh (MAM2)

Unit 7: This community occurs in a low-lying area in an old field on the west side of the property. It is dominated by Common Reed (*Phragmites australis*), an exotic invasive species. Additional species include Reed Canary Grass, cattails, Panicled Bulrush, sedges, Tall Goldenrod, and Spikerush (*Eleocharis sp*.).

Reed-canary Grass Mineral Meadow Marsh (MAM2-2)

Unit 18: This meadow marsh community is located along a surface drainage feature (SDF-B) that eventually drains toward Bruce Creek. It is dominated by Reed Canary Grass, with Jewelweed and Red-osier Dogwood associates. Individual Green Ash, White Cedar, Willow, and Basswood make up a very sparse canopy (<10%).

Unit 23: This community was identified in several areas of the property. It is comprised of predominantly Reed Canary Grass, with occasional occurrences of common meadow marsh species such as Joe-pye Weed and Panicled Aster.

Forb Mineral Meadow Marsh (MAM2-10)

Unit 25: This wet meadow community is located in the floodplain of Bruce Creek at the southeast corner of the property. It is a diverse community of forbs and graminoids typical of moist soils and marshes, including Field Horsetail, Marsh Bedstraw, Panicled Aster, Reed Canary Grass, sedges (*Carex granularis, Carex bebbii*), Canada anemone, Tall Goldenrod, Bulrush (*Scirpus spp.*), rushes (*Juncus sp*.), Joe-pye Weed, cattail, Red-osier Dogwood, and Michigan lily (*Lilium michiganense*).

Unit 30: This small meadow marsh community of predominantly Panicled Aster is located within a large old field meadow community.

Birch-Poplar Organic Deciduous Swamp (SWD7-3)

Unit 33. This poplar swamp community has an open canopy of Trembling aspen and Balsam poplar, and a shrub layer comprised of Red-osier Dogwood, Common Buckthorn, and Red Raspberry. The ground layer consists of Jewelweed, Field Horsetail, grasses, sedges, and Fringed Loosestrife (*Lysimachia ciliata*).

3.2.2 Flora

A total of 163 plant species were identified on the subject property. A checklist of plant species is presented in **Appendix C**. Approximately 71% of the plant species recorded on the subject property are native to the region. Forty-eight species (29%) are non-native to the region and reflect higher levels of disturbance and a lower floristic quality. The relatively high proportion of native species for natural areas within an urbanized context is one indicator that, overall, the remaining natural areas on the subject property are of good quality.

A number of regionally and locally rare species were observed on the subject property. These species are listed in **Table 2.**

Table 2. Regionally Rare and Uncommon Plants

Scientific Name	Common Name	S-RANK[1]	YORK[2]	L-Rank[3]
Acer nigrum	Black Maple	S4?	R4	L4
Bromus ciliatus	Fringed Brome	S5	U	L3
Calystegia sepium	Hedge Bindweed	S5	U	L5
Elodea canadensis	Broad Waterweed	S5	U	L4
Galium asprellum	Rough Bedstraw	S5	U	L4
Heracleum maximum	Cow-parsnip	S5	R9	L5
Juglans nigra	Black Walnut	S4	R	L5
Lilium michiganense	Michigan Lily	S5	U	L4
Oenothera biennis	Common Evening-primrose	S5	U	L5
Potamogeton zosteriformis	Flatstem Pondweed	S5	U	L3
Salix exigua	Sandbar Willow	S5	U	L5
Sanicula marilandica	Black Snakeroot	S5	U	L4
Scirpus microcarpus	Small-fruit Bulrush	S5	U	L4
Solidago patula	Rough-leaved Goldenrod	S5	R5	L3
Spirodela polyrhiza	Common Water-flaxseed	S5	U	L4

Key to Table
[1]**Provincial S-Rank: S4** = Apparently Secure; **S5** = Secure**; S4?** = inexact or uncertain rank
[2]**York** (regional statuses from Varga et al., 2005): **R** = rare (no. of records indicated when <20), **U** = uncommon.

[3]**TRCA Ranks: L5** = Able to withstand high levels of disturbance; generally secure throughout the jurisdiction, including the urban matrix. May be of very localized concern in highly degraded areas; **L4** = Able to withstand some disturbance; generally secure in rural matrix; of concern in urban matrix; **L3** = Able to withstand minor disturbance; generally secure in natural matrix; considered to be of regional concern; **L2** = Unable to withstand disturbance; some criteria are very limiting factors; generally occur in high-quality natural areas, in natural matrix; probably rare in the TRCA jurisdiction; of concern regionally

In addition to the regionally rare and uncommon species, two vascular plant Species at Risk were identified on to the subject property: Butternut (Endangered) and Kentucky Coffee-tree (*Gymnocladius dioicus*) (Threatened). Both species are protected under the Ontario *Endangered Species Act*.

Butternut

The Butternut tree is designated Endangered in Ontario due to a fungal disease known as Butternut Canker, which kills most trees once they are infected. Twenty-eight Butternut trees were identified on the subject property, with an additional two found just west of the property. Most of these trees occur in the southwestern portion of the property (**Figure 2**). A Butternut Health Assessment was conducted on 25 of the Butternuts which are close to the development.

Under the *ESA,* if proposed development or site alteration may affect a Butternut tree or its habitat, the tree must be assessed to determine its health and confirm its status under the EAS. Under the assessment process, there are three categories of Butternut trees:

- Category 1 (Non-retainable): the Butternut tree is affected by butternut canker to such an advanced degree that retaining the tree would not support the protection or recovery of butternut trees in the area in which the tree is located;

- Category 2 (Retainable): the Butternut tree is not affected by butternut canker or the butternut tree is affected by butternut canker but the degree to which it is affected is not too advanced and retaining the tree could support the protection or recovery of Butternut trees in the area in which the tree is located; and

- Category 3 (Archivable): the Butternut tree may be useful in determining sources of resistance to butternut canker. Archivable trees are Category 2 trees that are over 20 cm DBH and within 40 m of a badly cankered Butternut.

Retainable and Archivable trees (Categories 2 and 3) are protected under the ESA; however; non-retainable (Category 1) trees are not protected. The Butternut Health Assessment, and subsequent audit by MNRF, confirmed that fourteen trees are Category 1, eight trees are potentially Category 2, and three trees are potentially Category 3. Hybridity testing will confirm the status of the potential Category 2 and 3 trees. It is expected these tests will be carried out in the fall of 2017.

Kentucky Coffeetree

Several planted Kentucky Coffeetrees were identified on the golf course. The species is designated as Threatened in Ontario, but is not native to York Region. Extant populations of Kentucky Coffee-tree are limited to extreme southwestern Ontario (Counties of Lambton, Kent, and Essex) (Environment Canada 2014); however, Kentucky Coffee-tree is frequently planted as an ornamental tree (often from questionable genetic stock) and, as a result, it is located well beyond the species known native range

on Ontario (Environment Canada 2014). In this regard, the incidences of the Kentucky Coffeetree on the property are not subject to the ESA.

3.2.3 Tree Inventory

Trees were tagged with individually numbered aluminum forestry tags between April and September 2016 and located by topographical survey. A visual assessment of the trees was undertaken from April 2016 to September 2016 and all trees ≥40 cm in diameter at breast height (DBH, measured 1.4 m above grade) on the property were inventoried and assessed according to accepted arboricultural guidelines. Trees were measured at DBH and condition was assessed based on presence and severity of flaws, damage, evidence of pests or diseases, structural condition, dead or dying branches, or other decline indicators. Trees 20-39 cm DBH were inventoried in groups noting species present and the overall health of trees in the group.

The results of this assessment are provided in the accompanying Arborist Report (Beacon 2017).

3.3 Wildlife

3.3.1 Breeding Birds

Breeding bird surveys were undertaken at a time of year when most breeding birds are singing (i.e., between late May and early July on the dates noted above). Surveys were undertaken in the early morning, between dawn and 10:00 am, on days with typical temperatures, light or no wind, and no precipitation. All birds that were either heard or seen using the site were recorded by means of walking surveys that would record all singing birds in the surveyed area. All birds observed or heard singing in suitable habitat, were assumed to be breeding on-site, and were recorded by location on an orthophotograph. The maximum number of each species in any one survey day was tabulated.

A total of 47 bird species were observed on the site (**Appendix D**). This a moderate diversity that is reflective of the variety of habitats, albeit fragmented on the property. Of the species identified, three were foraging but not breeding on the property. These were: Great Blue Heron (*Ardea herodias*), Rock Dove (*Columba livia*) and Cliff Swallow (*Petrochelidon pyrrhonota*). Numerous species recorded on the property were common, disturbance-tolerant species found in rural and edge environments. The six most abundant species, in decreasing order of abundance were: American Robin (*Turdus migratorius*), Red-winged Blackbird (*Agelaius phoeniceus*), Song Sparrow (*Melospiza melodia*), Tree Swallow (*Tachycineta bicolor*), Baltimore Oriole (*Icterus galbula*), and Northern Cardinal (*Cardinalis cardinalis*). An estimated 11 pairs of Tree Swallows were nesting in nest boxes which had been supplied by the landowners.

Small numbers of species in low abundance were associated with both woodland and wetland habitat. Forest species included common species that breed in the small fragmented woodlands located throughout the property. Species in this group include: Black-capped Chickadee (*Poecile atricapillus*), Eastern Wood-Pewee (*Contopus virens*), Great-crested Flycatcher (*Myiarchus crinitus*) and Rose-breasted Grosbeak (*Pheucticus ludovicianus*). More breeding birds were identified on the eastern half of the property in Feature 2 woodlot than in Feature 1 woodlot/wetland.

Mainly single individuals of a few wetland species were observed. Most of these species, such as foraging Great Blue Heron, and breeding Mallard (*Anas platyrhynchos*), Spotted Sandpiper (*Actitis macularia*) and Common Yellowthroat (*Geothlyphis trichas*) were using the swm Pond H. The golf course ponds are too small and without sufficient wetland habitat to provide habitat for wetland birds. At most, the ponds may provide foraging habitat for swallows.

Red-breasted Nuthatch (*Sitta canadensis*) and Savannah Sparrow (*Passerculus sandwichensis*) were the only two area-sensitive species recorded. Area-sensitive species require either larger blocks of suitable habitat in which to breed, or higher productivity in larger habitat blocks. Red-breasted Nuthatch is frequently present in mixed and coniferous forests in southern Ontario. Savannah Sparrow is frequently present in agricultural fields and old fields in southern Ontario. Although it requires large areas of open land, it will breed in many types of large field habitats is a very common species in southern Ontario. That only two individual area-sensitive species were recorded indicates that the property provides negligible habitat for area-sensitive species.

Two species at risk were recorded on the subject lands by Beacon Environmental: Eastern Wood-Pewee and Barn Swallow (*Hirundo rustica*). Eastern Wood-Pewee is listed as Special Concern nationally by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and provincially by the Committee on the Status of Species at Risk in Ontario (COSSARO). Barn Swallow is listed as Threatened by both COSEWIC and COSSAR). Both species have been listed due to declines in populations, however both are still quite common and widespread throughout southern Ontario.

Eastern Wood-Pewee is present in a variety of deciduous and mixed woodlands. Three Eastern Wood-Pewee territories were recorded on the subject property in wooded patches across the golf course. The two central observations on **Figure 3** are assumed to be the same pair.

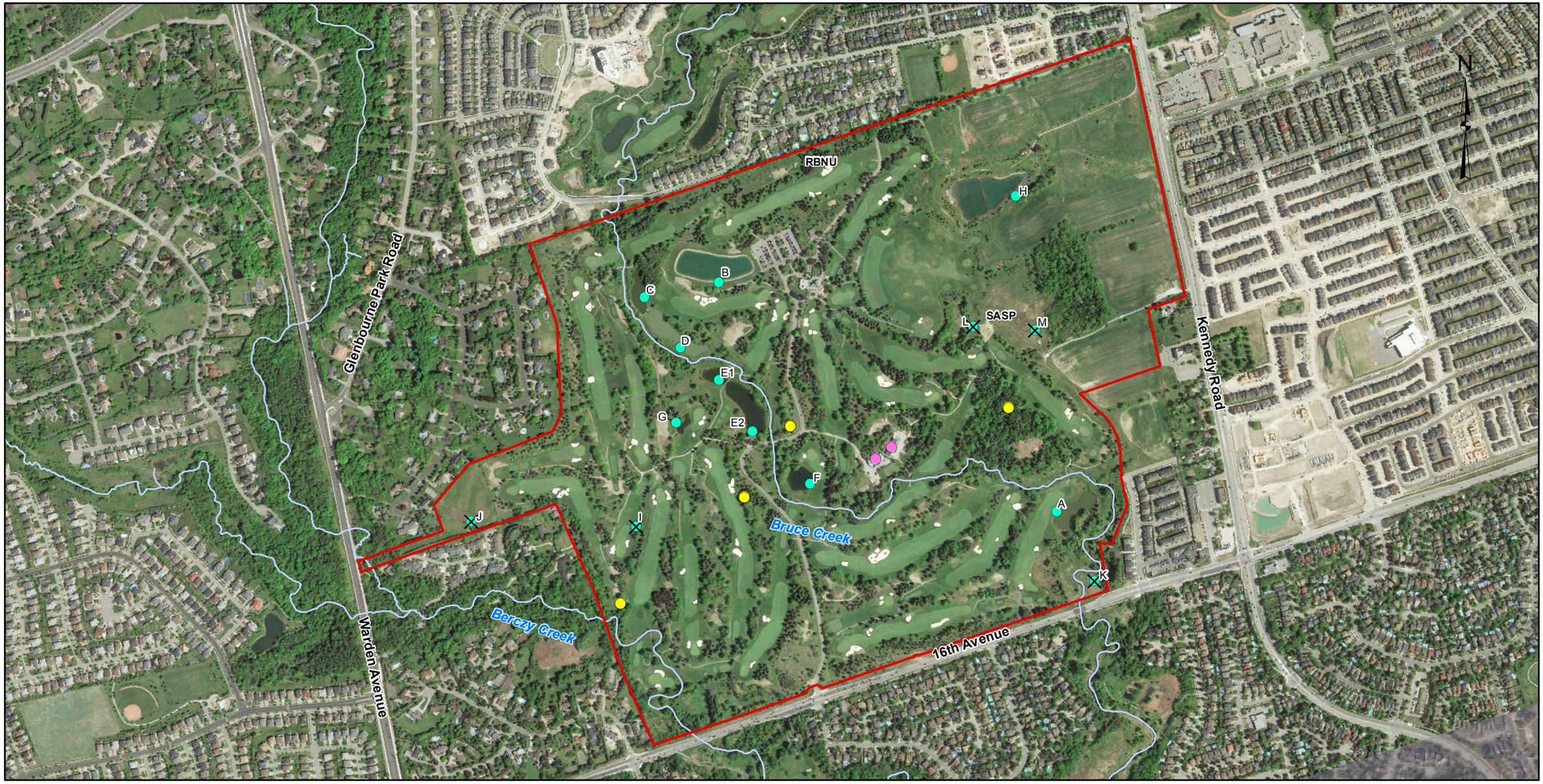
Barn Swallow usually nests in built structures and forages in surrounding fields, meadows and wetland areas. Single nests were observed in two of the maintenance buildings in the central part of the site (**Figure 3**).

Provincial 'S' Ranks

None of the species observed are 'provincially rare' (i.e. ranked S1 to S3 by MNR's Natural Heritage Information Centre). Most of the species have an S5 (secure) rank, while about one-third have been given an S4 ("apparently secure") rank.

TRCA 'L' Ranks

Three species are listed as TRCA Species of Concern (L1-L3, most to least concern). All are ranked L3: Great Blue Heron, Black–billed Cuckoo (*Coccyzus erythropthalmus*) and Mourning Warbler (*Geothlypis philadelphia*). The Great Blue Heron was foraging over the site and is not a breeding species on the property. Black-billed Cuckoo is uncommonly observed in southern Ontario. It is usually found in large shrubland habitats, but may also be observed in forests with gaps in vegetation. The golf course may provide a somewhat similar habitat structure. Mourning Warbler is usually present in dense vegetation in early successional forests, as well as densely vegetated gaps in forests. Single individuals



Stantec
BEACON ENVIRONMENTAL
BURNSIDE

1:9,000 0 50 100 200 300 400

Legend

- Subject Property
- Watercourse

Amphibian Survey Locations
- Calling Amphibians
- No Calls

Threatened
- Barn Swallow Nest Location

Special Concern
- Eastern Wood Pewee Observation

Area-Sensitive Species
RBNU –Red-breasted Nuthatch
SASP – Savannah Sparrow

JD Barnes: Aerial Photograph, 2015.
MBTW: Subject Property, 2015.
Beacon Environmental, 2017. All other data.

MASTER ENVIRONMENTAL SERVICING PLAN FOR
4134 16TH AVE

FIGURE 3: Existing Conditions Wildlife

UTM Zone 17 N, NAD 83

Project 215200
October 2017

of both species were recorded on the property and were probably breeding species. The Mourning Warbler was observed near the south end of Feature 1 woodlot.

MNRF identified Bobolink and Eastern Meadowlark both listed as Threatened under the *ESA.* Breeding bird surveys did not identify these species or their habitat on the subject property.

3.3.2 Breeding Amphibians

Breeding amphibian surveys were completed on April 19th, May 30th and June 29th 2016, after dusk and during suitable temperature conditions. Amphibian breeding surveys were conducted according to Environment Canada's Marsh Monitoring Program protocol (Gartshore *et al*. 2004). The survey dates are spaced so as to record amphibian species that call during different times in the spring. These surveys are conducted to record the presence or absence of breeding amphibians in potentially suitable habitat. Species, calling locations and approximate numbers of calling individuals were recorded and mapped. The survey method provides an indication of amphibian abundance during the breeding season using the following scale:

0 no calls;
1 individuals of one species can be counted, calls not simultaneous;
2 some calls of one species simultaneous, numbers can be reliably estimated; and
3 full chorus, calls continuous and overlapping (not countable).

All areas that contained potential breeding amphibian habitat (ponds, wetlands, etc.) were surveyed from a distance that would enable calling amphibians to be heard.

Survey Date	Weather
April 19, 2016	Temp.:9°C, Wind: 2, Precip.: None
May 30, 2016	Temp.:21°C, Wind: 0, Precip.: None
June 29, 2016	Temp.:21°C, Wind: 0, Precip.: None

A total of three species were identified through the surveys, all of which are widespread and common in Ontario (**Table 3** and **Figure 3** for survey locations). Green Frogs (*Rana clamitans*) are mostly aquatic, rely on permanent water and may be present in relatively poor quality water. American Toads (*Bufo americanus*) are habitat generalists and will use a variety of wetland or pond types for both breeding and summering. They require burrowable soil for hibernation. American Bullfrog (*Lithobates catesbeianus*) is the largest North American frog. They require larger bodies of water to breed but can be found in smaller ponds and along well-vegetated shorelines.

Table 3. Breeding Amphibian Survey Results

Location	Date		
	April 19, 2016	May 30, 2016	June 29, 2016
A	-	GRFR 1(3)	-
B	-	GRFR 1(1)	GRFR 1(1)
C	-	GRFR 2(4)	GRFR 2(7) BULL 1 (1)

Location	Date		
	April 19, 2016	May 30, 2016	June 29, 2016
D	-	GRFR 1(2)	GRFR 1(2)
E1	-	-	GRFR 1(2)
E2	-	GRFR 1(1)	-
F	-	AMTO 1(1) GRFR 2(6)	GRFR 1(3)
G	-	GRFR 2(9)	-
H	-	-	BUFR 1(1)
I	-	-	-
J	-	-	-
K	-	-	-
L	-	-	-
M	-	-	-

Notes: Species Call Code (#of individuals)
GRFR – Green Frog
BUFR – American Bullfrog
AMTO – American Toad

Several survey locations had no frog calls during all three survey dates. No SAR amphibian species were detected during the 2016 surveys.

3.3.3 Bats

Many bat species in Ontario have recently experienced marked population declines attributed to a rampant fungal disease, known as White-nose Syndrome. Several species are thus now listed as provincially Endangered. Bats affected by this syndrome experience mortality in part due to excessive thirst, which causes a disruption in their overwintering behaviour. Individuals emerge from their hibernation sites early and are killed by cold winter conditions. Apart from migratory species, bats hibernate from October or November to March or April, most often in caves or abandoned mines that are humid and remain above freezing. Certain species, such as the Little Brown Myotis (*Myotis lucifugus*), Northern Myotis (*Myotis septentrionalis*), Tricolored (*Perimyotis subflavus*) and Eastern Small-footed Myotis (*Myotis leibii*) are known to roost in trees (under loose bark or in cavities), under rocks or in attics during other times of the year.

Explicit bat surveys (i.e., snag surveys and acoustic monitoring) were undertaken for the subject property. Several wooded areas, including small woodlots and fairway trees, have been identified as potential bat maternity roost habitat. Consultation with the MNRF is ongoing and the conclusion of these discussions will be prepared as an addendum to this report, once direction from MRNF has been received.

3.3.4 Significant Wildlife Habitat

Section 2.1 of the PPS affords protection to certain natural heritage features, including Significant Wildlife Habitat (SWH). It is typically the responsibility of the municipality to identify Significant Wildlife Habitat for areas within its jurisdiction; however neither York Region nor the City of Markham have

undertaken this assessment. Therefore any areas that may be identified as SWH would be considered 'candidate' SWH.

To determine if the subject property supports candidate Significant Wildlife Habitat, the *Significant Wildlife Habitat Technical Guide* (SWHTG) (MNR 2000), and the MNRF Significant Wildlife Habitat (SWH) Ecoregion 7E Criterion Schedule (January 2015) were consulted. Both are guidance documents and provide guidance on possible criteria and thresholds that could be used by municipalities to identify candidate Significant Wildlife Habitats in their respective planning areas.

The list of criteria and thresholds is quite extensive, but all SWH falls under one of four categories:

- Seasonal Concentration Areas
- Rare Vegetation Communities or Specialized Habitats for Wildlife
- Habitats for Species of Conservation Concern
- Animal Movement Corridors

Seasonal concentration areas include areas such as heron colonies, waterfowl or shorebird stopover or staging areas and reptile hibernacula. There are none of these types of features on the subject property.

The presence of American Bullfrog can lead to a SWH recommendation, if the individuals are present in sufficient numbers within natural wetland communities. In our opinion, the presence of a single individual within a constructed golf course irrigation pond, does not constitute SWH.

Rare vegetation communities or specialized habitats for wildlife include areas such as: cliffs, alvars, other rare vegetation types as well as other habitats such as raptor nesting habitat, old growth habitat and habitat for area-sensitive species. None of these types of features are present on the subject property.

Regarding Habitat for Species of Conservation Concern, species have been considered conservation concern if they are: listed as Special Concern, or S1- S3 under the provincial Natural Heritage Information Centre rankings, Note however, that the presence of a Conservation Concern species per se does not necessarily lead to Candidate Significant Wildlife Habitat status, since according to the SWHTG (MNR 2000) "Habitats that support large populations of a species of concern should be considered significant", and therefore probably not habitats that support few or one individuals.

The Eastern Wood-Pewee is a provincial Special Concern species. Each of the three territories of Eastern Wood-Pewee that were observed were in different wooded areas across the property (**Figure 3**). Despite its status, the Eastern Wood-Pewee is very common across southern Ontario in various types of woodlands. The presence of a single pewee in a wooded area is not sufficient evidence to constitute SWH.

The SWH Ecoregion 6E Criterion Schedule notes that Animal Movement Corridors are difficult to identify and can be detrimental for some species. The guidance given is that animal movement corridors should be identified only when they have been recognized by the MNRF or a planning authority. These identified corridors are often for either amphibians or deer. Thus, no animal movement corridors are identified on the subject property.

3.4 Aquatic Resources

The subject property lies within the Berczy Creek and Bruce Creeks subwatersheds, which are part of the greater Rouge River watershed. Berczy Creek traverses the property at the south west corner of the property and Bruce Creek flows through the central portion (**Figure 4**).

Fish habitat assessments were completed to identify and assess water body characteristics that provide habitat for the critical life processes as outlined in the federal *Fisheries Act*. The habitat assessments detail the characteristics and major physical attributes of the water body. Eleven transects were completed at existing crossings along the main branch of Bruce Creek and three along Berczy Creek (**Figure 4**). Stream physical conditions were inspected and documented with photographs.

Since both the Berczy and Bruce Creek systems provide direct habitat for the Provincially Endangered Redside Dace, fish sampling was not completed. MNRF's preference is not to sample such a watercourse. Also, sufficient fisheries records for the system are available to characterize the fish community.

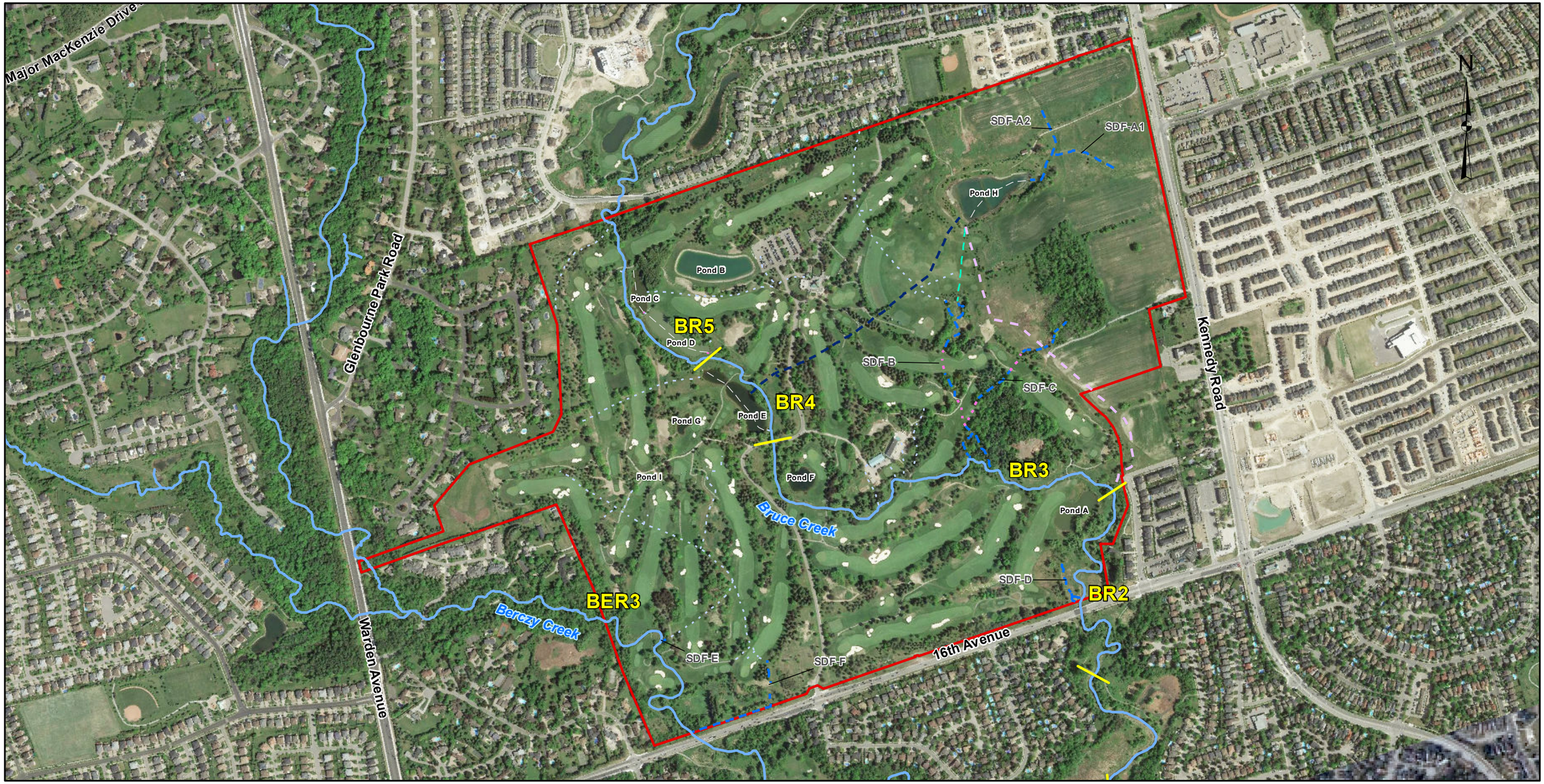
3.4.1 Berczy Creek

The Rouge River State of the Watershed Report, (TRCA 2007) classifies Berczy Creek as a riverine cool water system. This classification is based on the known groundwater discharge areas upstream of the property. Occurrences of migratory salmonids have been recently documented and much of Berczy Creek is also known habitat for Redside Dace. Records as recent have 2005 have been documented for reaches just downstream of the golf course lands and existing populations are known in other nearby reaches. Redside Dace is addressed in further detail in Section 3.2.5. The overall species profile for Berczy Creek is a diverse warmwater/coolwater complement with at least 19 species identified in recent years.

Field investigations were conducted by Beacon staff on Berczy Creek as it flows through the property. The stream morphology consists of mixed pools, runs and riffles throughout the Subject Property. This diversity signifies a healthy condition that provides spawning, feeding and refuge habitat for the species present in the system. The substrate includes a mix of sand, gravel and cobble which provides aeration, spawning substrate and habitat for benthic invertebrates which are a food source for the fish community. Undercut banks and tree cover are present in several locations creating suitable cover. In other areas, grasses overhang the banks, which provide ideal cover for certain cyprinids including Redside Dace. In other areas, mowing is occurring within 1-2 metres of the bank resulting in some bank erosion. Overall, the watercourse is in good condition as it flows through the property.

3.4.2 Bruce Creek

The Rouge River State of the Watershed Report (TRCA 2007) classifies Bruce Creek as a riverine warm water system. Groundwater discharge areas are present just upstream of the property but the influence of several golf courses and urbanization cause a warming effect, which results in the warm water designation. Bruce Creek provides very high quality fish habitat that supports Brook Trout (*Salvelinus fontinalis*) in the upper reaches upstream of the subject property and an abundant Redside Dace population through the mid-lower reaches including through the subject property. Similar to Berczy Creek, records as recent as 2005 have been documented at a sampling site immediately



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Legend

- Subject Property
- Watercourse
- Reach Break
- Piped Feature
- Existing Storm Sewer
- Surface Flow
- Burried/Stone Trench
- Auxiliary Water
- Tile Drain Flow Path
- Pond Segment

JD Barnes: Aerial Photograph, 2015.
MBTW: Subject Property, 2015.
Beacon Environmental, 2017. All other data.

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FIGURE 4: Existing Conditions Aquatic

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downstream of 16th Avenue. The reaches that flow through the subject property also have documented occurrences of migratory salmonids. The overall species profile for Bruce Creek is primarily warmwater with at least 26 species identified in recent years. Water quality is considered 'very good' in the mid to lower reaches of the subwatershed. Bruce Creek is the only watercourse with such a rating in the entire Rouge River watershed. The thermal rating is unstable and likely the result of on-line ponds on the tributaries.

Field investigations were conducted by Beacon staff on Bruce Creek as it flows through the property. The stream morphology is a mix of pools, runs and riffles, which signifies a stable system with good quality habitat for the various life stages of the fish community. The morphology of the downstream reaches is not as diverse. These reaches are characterized by long and uniform pool areas and consequently are lower quality habitat. The substrate was comprised of a mix of sand, gravel and cobble, which provides aeration and suitable habitat for benthic invertebrates. Undercut banks and tree cover are present in several locations. The undercut banks provide good quality cover and the trees provide overhead cover, allochthonous food sources and bank stabilization. Eroding banks were identified at several locations throughout the property indicating some measure of instability, likely the result of mowing to within two metres of the banks. A stormwater outlet is located approximately 300 m north of 16th Avenue.

3.4.3 Fish Community

Fish sampling records were obtained from the Rouge River Fisheries Management Plan (TRCA and OMNR, 2011). TRCA has designated each of the major subwatersheds in the Rouge River watershed as a unique Fisheries Management Zone (FMZ).

Berczy Creek is identified as FMZ 2 and managed for Redside Dace, Brassy Minnow *(Hybognathus hankinsoni)*, Rainbow Darter (*Etheostoma caeruleum*) and American Brook Lamprey (*Lethenteron appendix*). The report classifies Berczy Creek as a riverine cool water system based on the known groundwater discharge areas upstream of the subject property. Based on the fish community information from the Fisheries Management Report, the majority of the fish species located within Berczy Creek are a mix of warmwater, coolwater and coldwater species. All of the species can be found in riverine systems with varying depths and substrates. There are also several fish barriers in Berczy Creek, which prevent fish passage and may limit their occurrence compared to historical records. None of these barriers are present on the subject property,

Bruce Creek is identified as FMZ 3. The Rouge River FMP classifies Bruce Creek as a riverine warmwater system. Groundwater discharge areas are present just upstream of the subject property but the influence of several golf courses and urbanization cause a warming effect, which results in the warmwater designation. FMZ 3 is managed for the following key target species: Redside Dace, Brook Trout (*Salvelinus fontinalis*); Rainbow Darter; Mottled Sculpin *(Cottus bairdi)*; and American Brook Lamprey.

A total of 37 species have been captured in Bruce Creek and are a mix of coolwater and coldwater species. All of the species can be found in riverine systems with varying depths and substrates. There are also several fish barriers in Bruce Creek which prevent fish passage and may limit the occurrence of various species compared to historical records.

Both Bruce and Berczy Creek as they flow through the subject property are identified by MNRF as a Redside Dace occupied reaches with records as recent as 2009. Redside Dace habitat includes the active channel, as well as the meander belt + 30 m. Redside Dace is discussed further below in Section 3.4.6.

3.4.4 Ponds

There are a total of nine (9) ponds on the subject property, five of which are irrigation ponds located within the Bruce Creek floodplain (Ponds C to F and Pond A). The remaining ponds are located in the northeast corner of the property (Pond H – existing SWM Pond), one near the clubhouse (Pond B) and two smaller ponds within the golf course (Pond G and Pond I).

Pond A is located at the southern extent of the property adjacent to Bruce Creek. The water level in this pond is controlled with a spillway. Overflow from the pond spills into Bruce Creek.

Pond B is used for irrigation purposes and was constructed after 2009. This pond is contained within a large berm and does not discharge to Bruce Creek.

Ponds C, D, and E function in series and are used for golf course hazards and irrigation purposes. Pond E discharges to Bruce Creek at its southern end. The outlet was not flowing at the time of field investigations. Pond F is also an irrigation and water hazard pond which is located south of the existing driveway crossing. Through discussions with golf course staff, these ponds have not overtopped their banks in this history of the golf course. The ponds likely provide habitat for warmwater tolerant fish species, and provide habitat for common breeding amphibians (refer to Section 3.3.2).

Pond H is a SWM pond that receives drainage from the east side of Kennedy Road and possible surface water run-off from the adjacent old field meadow through Surface Drainage Feature A (SDF-A). Pond H discharges in three different ways to three different locations described below:

- To Bruce Creek via a storm sewer.
- Auxiliary pipe connection to Pond E to augment water for irrigation. Pond H was retrofitted in the early 2000's with a pipe and valve system and water was conveyed through a pipe under Bruce Creek and discharged in to Pond E as a backup.
- A buried stone trench connects Pond H to a Reed Canary Grass Meadow Mineral Marsh (ELC unit 18) but the control valve is not functional. In the event of an extreme precipitation event flow is conveyed overland.

Pond G and Pond I are isolated golf course hazard ponds with no connection to Bruce Creek.

3.4.5 Headwater Drainage Features

Several small surface drainage features were identified through aerial photo interpretation and were investigated as part of the field program. Assessments of the features were completed on several occasions including May 10 and November 10, 2011, July 19, August 3 and August 17, 2016, and April 10, July 28 and September 21, 2017.

These features are identified on **Figure 4**. The configuration of ponds and surface drainage features is highly altered because of the golf course use. The descriptions herein provide a general overview of functions and flow assessment based on the field investigations and discussions with golf course staff. A complete Headwater Drainage Feature Assessment (HDFA) has been completed for the property and is provided in **Appendix E**.

Surface Drainage Feature A

Surface Drainage Feature A (SDF-A & SDF-A2) are small undefined drainage features that appear to originate near Kennedy Road and drain into Pond H in the northeast corner of the property. Pond H, a SWM pond, currently services Upper Unionville, but only temporarily. A valve at the outlet to Pond H controlled discharge historically but it no longer functions. Consequently, SDF-A terminates in Pond H.

Surface Drainage Feature B

Surface Drainage Feature B (SDF-B) originates from a pipe that conveys flow from irrigation and rain events across the driving range and discharges at the top of Unit 18. Both Unit 18 and SDF-B were completely dry during most of the field investigations. But water was observed flowing from this pipe during some of the site visits. Unit 18 likely contributes some flow to SDF-B; however, the results from the hydrogeology assessment completed by Burnside (2017) show there is no groundwater contribution to flow in SDF-B downstream of Unit 18. Consequently, the flow contribution is limited to surface water. Flow from SDF-B is then conveyed through a pipe under the golf course fairway where it daylights in the Fresh Moist White Cedar Hardwood Mixed Forest (FOM7-2/ELC Unit14). A small, defined meandering channel traverses this feature. During the July and September, 2017 site visit, very minimal flow was observed from the culvert At the time of these observations no flow was present at the upstream end of the pipe. The water discharging from the culvert conceivably originates from a piping system that drains the fairway. SDF-B flow is then conveyed under another fairway before it reappears in the Fresh Moist White Cedar Hardwood Mixed Forest (FOM7-2) (ELC unit 35) where it converges with flow from SDF-C, splits into two channels and finally discharges into Bruce Creek. Majority of flow was observed in the eastern channel to Bruce Creek. Based on field investigations, SDF-B flows in response to precipitation events and spring runoff. No floodline or top of bank is associated with this feature.

Surface Drainage Feature C

Surface Drainage Feature C (SDF-C) originates in the isolated eastern woodlot/wetland (Feature 1). Its flow is captured in a small culvert that crosses a laneway. The channel is narrow and is choked with vegetation. Standing water with very minimal flow was observed within the upper reach of SDF-B during field investigations conducted in 2017. SDF-C is then piped under the golf course fairway for approximately 80 m where it flows into an open channel in the Fresh-Moist White Cedar-Hardwood Mixed Forest (ELC unit 35). Where it flows under the fairway, no flow was observed at the downstream end of the culvert during the September 2017 site visit. The surface water is conveyed through the open channel for a distance of approximately 50 m before flowing through a culvert under a second golf course fairway. The intermittent feature discharges through a CSP culvert into a defined channel that converges with SDF-B and meanders, splitting into two channels through Woodlot Feature 2 where it

enters Bruce Creek. Burnside's hydrogeological investigations confirm wetland unit 33 provides groundwater discharge to the upper reaches of SDF-C.

Surface Drainage Feature D

SDF-D is a small wetland feature (ELC unit 23) which drains to Bruce Creek at 16th Avenue. There is no clearly defined path, and the majority of the feature was dry with some standing water during the April 2017 site visit.

Surface Drainage Feature E

SDF-E is a gully feature that originates on the west side of a golf cart trail and connects to Berczy Creek on the east bank. Flow is conveyed under the trail through a small CSP culvert. The culvert discharges into a defined channel through a Cultural Woodland (CUW-1/ELC unit 1). The channel is approximately 20 m long and consists of poorly vegetated banks with signs of scouring. The substrates consist of cobbles, silt/sand with small boulders. The feature was flowing in July 2017, but dry in September.. Flow in this feature is ephemeral meaning that it flows in response to precipitation events and spring runoff. The source of flow is from drainage collected from the western part of the golf course. No floodline or top of bank is associated with this feature. At most, it contributes sporadic flow to Bruce Creek.

Surface Drainage Feature F

SDF-F is predominately a roadside ditch on the north side of 16th Avenue, and contributes flow to Berczy Creek just upstream of the road crossing. This feature was dry during all site visits.

3.4.6 Redside Dace

Redside Dace is a small colourful minnow that reaches a maximum length of about 12 cm. In Canada, this species is present only in southern Ontario where it occurs most frequently in streams between Oshawa and Hamilton including the Rouge River watershed, in the Holland River drainage, one tributary of the Grand River and three tributaries of Lake Huron.

Redside Dace require cool, clear flowing water with riffle-pool morphology and overhanging streamside vegetation. Stream sections flowing through open terrestrial habitats with overhanging vegetation, undercut banks and submerged branches and logs are most suitable. Channel depths are typically less than 1 m and substrate can vary from fine sediment to cobbles and boulders; however they are most often present in gravel/cobble bed habitat and often with a shallow surface covering of silt or detritus (RDRT, 2010). Redside Dace are a coolwater species and are usually associated with water temperatures of less than 24°C and dissolved oxygen concentration are at least seven milligrams per litre (McKee and Parker ,1982).

Spawning occurs when water temperature reaches 16°C to 18°C on gravelly riffles. It occurs with common tolerant coolwater fishes such as Creek Chub (*Semotilus atromaculatus*) and Common Shiner (*Luxilus cornutus*), and lays its eggs in the gravel nests of these ubiquitous species. This strategy

improves egg survival through the guarding behaviour of these species as they provide protection and keep the eggs free of silt. The Redside Dace is a surface feeder and relies on a visual search of prey. It often leaps several centimetres out of the water to capture aerial insects (COSEWIC, 2012) and uses the overhanging vegetation as cover and insects are often concentrated in these areas.

These specialized spawning and feeding strategies make Redside Dace more susceptible to habitat disturbance. They are most often associated with small, cool headwater streams, are sensitive to siltation, and tend not to be widely dispersed because of this habitat preference. Destruction and degradation of habitat have been the major factors in the reduction of Redside Dace distribution. Siltation, removal of riparian vegetation, channelization, agricultural run-off, and pollution of streams in urban areas all reduce suitable habitat and food sources for this species. For this reason, Redside Dace can be a useful indicator of the health of the aquatic ecosystem because when habitat quality starts to decline, Redside Dace are immediately affected (OMNR and OSCIA, 2002).

Redside Dace is listed as Endangered by COSSARO and is therefore protected under the Ontario *Endangered Species Act* (2007). It has an S-rank of S2 indicating that it is imperiled and vulnerable to extirpation (NHIC, 2012). Recently (2016), it was listed as Endangered in the federal *Species at Risk Act.*

Redside Dace Recovery Strategy (RSRT, 2010) provides direction for the protection, enhancement and restoration of habitat for creek and stream systems where the species occurs at present or historically. The strategy indicates that the "*significant portions of the habitat*" of Redside Dace (in relation to the treatment of "Threatened" species by the *Provincial Policy Statement*) should be determined by consideration of the Strategy's definition of an "occupied reach".

Bruce and Berczy Creeks are identified by MNRF as Redside Dace occupied reaches with records as recent as 2009. In this regard, discussions will be undertaken with MNRF and DFO to determine impacts to Redside Dace habitat as a result of the proposed development, and requirements under the provincial *Endangered Species Act* and federal *Species at Risk Act*.

3.5 Natural Heritage Features

An analysis of the existing conditions within the subject property identifies the following key natural heritage features, which are illustrated on **Figure 5**:

- Wetlands (Feature 1 woodland/wetland, wetlands associated with Bruce Creek)
- Significant Woodlands (Feature 1 woodland/wetland, Feature 2 woodland, woodlands associated with Berczy and Bruce Creek)
- Significant Valleyland (associated with Bruce and Berczy Creeks)
- Significant Habitat of Endangered or Threatened Species (Bruce and Berczy Creeks, Barn Swallow nests, Butternut)
- Fish Habitat (Bruce and Berczy Creeks)
- Permanent Watercourses (Bruce and Berczy Creeks, Tributary [SDF-C])

Outside of the watercourse corridors, natural / naturalized habitat is generally confined to two larger features on the subject property, identified on **Figure 2**. Both are located in the east block plan area. These are identified as Feature 1 Woodlot/Wetland and Feature 2 Woodlot. Some woodlands and

wetlands associated with Bruce and Berczy Creeks have been deemed significant using criteria from the OP. A description of each of these features is provided below. Any features not addressed below do not meet the criteria for Key Natural Heritage Feature; however any impacts to these features are discussed in the following sections of this report.

Feature 1 – Woodlot / Wetland

This feature is approximately 4.3 ha in size and is comprised of cultural woodland, mixed forest, deciduous swamp, and meadow marsh. This area has been disturbed as a result of past agricultural land uses, including tree thinning and grazing as evidenced by sparse mature tree cover, relatively low native species diversity, and an abundance of successional shrubs, notably Buckthorn, apples, and hawthorns. The interior of the feature is less disturbed and supports mixed cedar hardwood forest community. The wetland in the south end of this feature is of relatively higher quality, although Buckthorn is invading. The wetland supports several regionally rare plants including Rough-leaved Goldenrod and Water Horsetail. No breeding amphibians were recorded in the area.

As part of the Hydrogeological Assessment completed by Burnside (2017) two piezometers were installed in Feature 1 – PZ5s/d is in the wetland feature and PZ8s/d is located in the woodlot. Groundwater levels in this feature were below ground surface at the beginning of monitoring and have steadily risen to or above ground surface into the summer of 2017. Data shows an upward gradient at PZ5s/d with discharge conditions since April 2017. At PZ88s/d data shows a downward gradient and recharge possibly discharging to the wetland. Burnside has interpreted this data to mean the woodlot/wetland feature is supported by both surface water runoff and groundwater.

The wetland (ELC units 23 and 33) was staked with MNRF and TRCA in September 2016.

Feature 2 – Bruce Creek Valley Woodlot

This feature is approximately 3.8 ha in size and encompasses portions of the valley slope and floodplain along Bruce Creek. It is comprised predominantly of mature mixed cedar-hardwood forest, as well as oak-hardwood forest, poplar forest, cultural meadow, and meadow marsh along Bruce Creek. The condition of the vegetation communities is generally good with a relatively high proportion of native species. Disturbances include a golf course path, and a clearing near the southeast corner has recently been used a dumping area. The vegetation in this patch contributes to erosion control, flood attenuation, and buffering to watercourses including Bruce Creek and a smaller drainage (Feature B).

Bruce and Berczy Creek Corridors and SDF-C

Both Bruce and Berczy Creeks are considered Significant Valleyland, permanent watercourses and fish habitat. There are riparian woodlots and wetlands associated with these features. Furthermore, both of these watercourses are considered habitat for the endangered Redside Dace. SDF-C is a permanent tributary receiving groundwater discharge from the upstream wetland unit.

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Legend

- Subject Property
- Significant Valleyland
- Significant Woodland
- Wetland
- Permanent Watercourse
- Fish Habitat

Endangered and Threatened Species

- Barn Swallow Nests (THR)
- Butternut (END)
- Redside Dace Habitat (END)

JD Barnes: Aerial Photograph, 2015.
MBTW: Subject Property, 2015.
Beacon Environmental, 2017. All other data.

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FIGURE 5: Key Natural Heritage Features

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Habitat of Endangered or Threatened Species

Although not explicitly tied to natural /naturalized habitat within the subject property, two additional species subject to the *Endangered Species Act* have been identified on the subject property. Butternut trees are discussed in Section 2.2.3 and Barn Swallows are discussed in Section 3.3.1.

3.6 Landscape Connectivity

Landscape connectivity and natural linkages have become common parlance when discussing environmental planning. The idea is that variously sized habitat patches, so-called 'core' natural areas, and supporting features are linked by natural corridors in an often fragmented landscape of land uses. Current planning policy typically includes provisions for the maintenance of such corridors.
For example as in section 2.1.2 of the Provincial Policy Statement (MMAH 2014):

> *"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 or, where possible, improved, recognizing linkages between and among natural heritage features and areas, surface water features and ground water features."*

Corridors can be major river valleys, or can be smaller in scale such as those associated with creeks. Corridors serve various ecological functions depending on their size and quality. These functions can include providing shelter from predators and the elements, providing breeding habitat, connecting core natural areas, and facilitating seed dispersal and exchange of genetic material. Wildlife use of corridors likely varies. In the fragmented landscapes of southern Ontario, corridors are usually discontinuous stepping-stones acting as corridors in concert to provide elements of connectivity.

Fish migrate along watercourses and this aspect of corridor ecology is important in the Subject Property as fish are present in both Bruce Creek and Berczy Creek. Riparian corridors also provide shade over watercourses which maintains cooler temperatures for temperature sensitive fish species.

On the other hand, some studies have shown that corridors can have some undesirable effects, for example on the breeding success of certain bird species through increased nest predation facilitated by edge effects and ease of movement for predators (Weldon 2006). The role of corridors or linkages for maintaining plant populations or dispersal of a species at the larger landscape level is still not well-documented, although it has been identified as a factor for the spread of some invasive species such as Garlic Mustard. There remains considerable scientific debate surrounding the role of corridors and the importance of connectivity.

As the subject property is situated within the built up area of the City of Markham, there are only a few large core natural areas in the vicinity of the subject lands, generally associated with the stream corridor. There is likely some local level of connectivity occurring along Bruce Creek and Berczy Creek.

4. Constraint Mapping

Section 4 of the York Downs MESP TOR (**Appendix A**) requires the establishment of opportunities and constraints mapping to determine developable areas and undevelopable areas. The findings of the biophysical inventories, assessments and evaluations presented in Section 3 of this report provide the technical basis for the identification of constraints and opportunities for the proposed development within the subject property.

Field staking took place as part of the Environmental Analysis Study (Beacon, 2010). Top of bank and dripline were staked in the presence of City staff and TRCA staff. The top of bank and dripline were re-staked on March 4, 2016. Wetlands were staked with TRCA and MNRF on September 29, 2016.

The Bruce Creek and Berczy Creek Valleylands are the primary constraints on the subject property. Features 1 and 2 are also constraints. A discussion of the appropriate buffers to be applied to these constraint areas is provided in Section 7.1.

Development constraint lines, as depicted on **Figure 6**, were driven by:

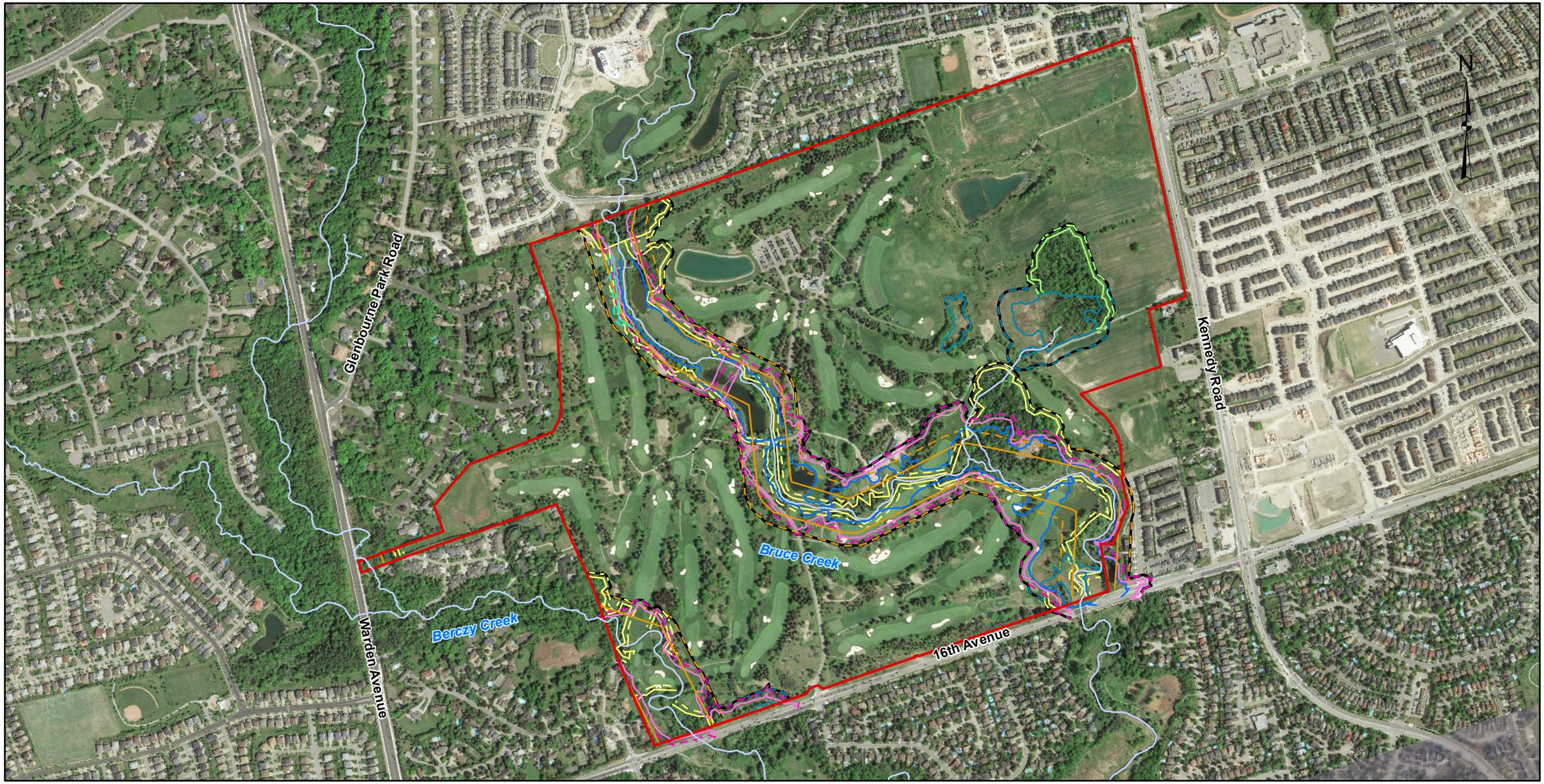
- Staked physical top of slope;
- Long-term stable top of slope;
- Proposed Regional floodline;
- Staked dripline;
- Staked wetland limit and,
- Limit of Redside Dace habitat (Meander belt + 30 m).

The Feature 1 dripline was staked in 2010 and again in 2016. A 10 m buffer has been applied as outlined in Section 2.2.2.9 of the City of Markham OP. A small wetland (ELC units 23 and 33) is located on the western side of Feature 1, and was part of the staking exercise in September 2016. Generally, a 30 m buffer has been applied to this wetland and defines the development limits around this feature.

The remainder of the natural heritage features on site area are associated and contiguous with watercourse valleys of Bruce and Berczy Creek. A meander belt assessment was completed by Beacon Environmental (2016) to delineate Redside Dace habitat, and is presented on **Figure 6**. The floodplain illustrated on **Figure 6** was derived from a floodplain analysis completed by Stantec in 2017. A stable slope analysis was required at the upper reach of Bruce Creek on the west side, immediately south of the northern property boundary and the eastern bank of the northernmost reach of Berczy Creek within the subject property. These analyses were completed by Golder Associates (2016a and 2016b), and results are presented on **Figure 6**. Each of these studies is discussed below.

The development limits were generally defined by the following:

- Proposed Regional Floodline + 10 m buffer,
- Meander belt + 30 m (Redside Dace habitat),
- Physical top of slope and/or dripline + 10 m buffer, whichever constraint governs;
- Wetlands + 30 m; and
- Long-term stable top of slope + 10 m setback.



Stantec
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BURNSIDE

1:9,000 0 50 100 200 300 400

Legend

- Subject Property
- Ultimate Constraint
- Watercourse
- Long Term Stable Top of Slope + 10 m setback (Golder, 2016)
- Long Term Stable Top of Slope (Golder, 2016)
- Meander Belt Width
- Limit of Redside Dace Habitat
- 100 Year Floodline (Stantec)
- Proposed Regional Floodline (Stantec)
- Proposed Regional Floodline + 10 m (Stantec)
- Staked Wetland (MNRF, 2016)
- Staked Wetland + 30 m
- Staked Top of Slope/Dripline (TRCA, March 2016)
- Staked Top of Slope/Dripline 10 m Buffer
- Staked Dripline (City of Markham, TRCA March 2016)
- Staked Dripline 10 m Buffer

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FIGURE 6: Constraints

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JD Barnes: Aerial Photograph, 2015.
MBTW: Subject Property, Development Plan, 2015.

4.1 Additional Studies

Several additional studies were required to determine the development constraints described above. These include the Fluvial Geomorphology Report (Beacon 2017), Slope Stability Assessment (Golder 2016), and a Floodplain Analysis, included in the SGR (Stantec 2017).

4.1.1 Fluvial Geomorphology Study

A geomorphic assessment was also completed by Beacon for the subject property. The purpose of this assessment was to characterize existing fluvial geomorphic conditions, contribute to the determination of development constraints, and provide input to stormwater servicing plans for the subject property. A historic assessment was undertaken to determine changes in land use and channel planform over time. Results of this assessment identified extensive channelization of both Berczy and Bruce Creek within the subject property between 1961-present. Many of the ponds currently being used by the golf course for irrigation are located in former channel meander bends. This information was referenced in the delineation of meander belt limits for stream corridors (unconfined watercourses) to aid in the determination of erosion hazard limits, and the delineation of occupied Redside Dace regulated habitat (referencing meander belt plus 30 m) for stream and valley corridors to aid in the determination of development limits for the subject property.

In order to understand the potential impacts of the proposed development plan on channel morphology, an impact assessment was undertaken with respect to stormwater erosion control, as well as road and servicing stream corridor crossings. For the erosion control analysis, a comparison pre- and post-development (controlled) flow conditions for the 25 mm, 30 mm and 35 mm storm events under 24 hour, 48 hour and 72 hour detention scenarios was undertaken for nodes located at the downstream limit of the subject property to evaluate how closely post-development conditions can replicate existing condition hydrograph (peak, volume and form), focusing on those portions of the hydrograph above the critical discharge. Results of the analysis indicated, that for both Berczy Creek and Bruce Creek, the 48-hour detention scenario was able to most closely replicate modelled existing conditions (i.e., difference in pre to post cumulative time of exceedance within 5%) without resulting in an over-control of flows. Overcontrol of stormwater within the system is undesirable as the transport of sand-sized material and washload within both Berczy and Bruce Creeks is critical to the maintenance of channel form and function. As such, the 48-hour detention scenario was identified as the preferred erosion control approach for Berczy Creek and Bruce Creek, through which existing rates of channel erosion are not anticipated under the post-development condition.

Only one road crossing of the Natural Heritage System (NHS) is proposed through the development plan. A 40 m clear span bridge is proposed to cross Bruce Creek. In accordance with the TRCA Crossings Guideline for Valley and Stream Corridors, an evaluation of channel planform (both current and historic) was undertaken at the proposed crossing location. Based on this evaluation, the 40 m span was deemed sufficient to accommodate the governing meander amplitude in vicinity of the crossing, in addition to a factor of safety which would accommodate for long-term adjustments in channel form. Further, a review of the HEC-RAS model output for more frequent storm events in vicinity of the proposed crossing indicated a minimal impact on instream hydraulics.

A sanitary sewer crossing of Bruce Creek is also proposed. The crossing will be installed using directional drilling and will achieve a depth of cover of 2 m under the existing channel bed. Based on

the results of the rapid assessments, which indicated widening as the dominant process along Bruce Creek, the 2 m depth of cover was deemed sufficient to mitigate long-term risk to this infrastructure due to active erosion (i.e., channel incision).

4.1.2 Slope Stability Assessment

A Slope Stability and Natural Hazard Setback Assessment was completed by Golder Associates Ltd (**Appendix F**). The slope stability analysis was completed along the west bank of Bruce Creek in June 2015. This study involved the use of boreholes to identify the soils. The sub-surface conditions consist of topsoil underlain by a surficial sandy silty clay deposit with trace organics. Visual observations of the slope indicate toe erosion in the form of undercutting which has likely led to slope failures at the toe and on the face of the slope. No signs of deep-seated slope instability were noted during the visual reconnaissance visit. Golder recommends a setback that varies from 27.2 m to 33.0 m along the assessment area of Bruce Creek (**Figure 6**). Further recommendations include, directing surface water run-off from the slope, no fill placement within the geotechnical setback and preserve all existing vegetation.

An Estimated Long Term Stable Top of Slope was developed by Golder Associates Ltd. (2016) (**Appendix F**) for two areas of concern identified along Berczy Creek during the staking exercise with TRCA in March 2016. Area 1 is located along Berczy Creek near the western property boundary and Area 2 is located approximately 150 m downstream. Boreholes drilled in the general area identify soil conditions to be soft to hard Silty Clay with zones of Till-like Silty Clay. Based on the assessment the setback requirement for Area 1 will be approximately 36 m from the creek and approximately 40 m from the creek in Area 2.

4.1.3 Floodplain Analysis

An existing and proposed conditions hydraulics assessment utilizing HEC-RAS 4.1.0 has been completed for both Bruce Creek and Berczy Creek by Stantec (2017). The proposed floodline has been determined with regard for grading changes as they relate to proposed SWM Pond 1 located within the edges of the existing Regional Floodline, the proposed compensating cut grading within Bruce Creek corridor, the proposed road crossing of Bruce Creek, the removal of existing golf course driveway crossing; and the removal of existing golf course ponds within the valley system. The floodline analysis has not taken into account the pedestrian crossings for the proposed trail system, as they will utilize existing golf cart path crossings so as to minimize overall disturbance. Further, these crossings are too minor to include in the Regional Floodline analysis (Stantec 2017). The proposed incremental cut and fill within the Bruce Creek corridor has been proposed so as to satisfy the TRCA Living City Policies, and has been included as part of the analysis to support the minor SWM Pond grading encroachment into the existing Regional Floodplain. This is further discussed in Section 7.6.1 below.

5. Official Plan Amendment

The City of Markham 2014 Official Plan – Map 5 Natural Heritage Features and Landforms and Map 6 Hydrologic Features identifies woodlands, wetlands and watercourses within the City boundary, including the subject property. The results of the field investigations that were completed in support of

the MESP/EIS, confirmed the boundary delineation of the woodlots and three areas identified as wetlands on Map 5. The associated ELC communities are described below:

- Unevaluated Wetland 1 was confirmed to be a mix of Fresh Moist Sugar Maple-Basswood Deciduous Forest (FOD6-5), Dry Moist Old Field Meadow (CUM1-1), Manicured and Cultural Thicket (CUT1) and not a wetland.
- Unevaluated Wetland 2 was confirmed to be Fresh Moist White Cedar Coniferous Forest (FOC4-1), Dry Fresh Oak Hardwood Deciduous Forest (FOD2-4), Fresh Moist White Cedar Hardwood Mixed Forest (FOM7-2) and Cultural Woodland (CUW1); therefore also not a wetland.
- Delineation of Unevaluated Wetland 3 was incorrect and the boundaries have been refined based on the wetland staking exercise to include the Reed Canary Grass Mineral Meadow Marsh (MAM2-2) and Paper Birch-Poplar Organic Deciduous Swamp (SWD7-1) associated with Feature 1.

Woodlots within the Bruce Creek corridor (ELC units 8 and 39, 9, 12 and 13 and Feature 2, the woodlot associated with Berczy Creek, (ELC unit 6) and ELC unit 14, a Fresh-Moist White Cedar Hardwood Mixed Forest (FOM7-2) were all confirmed on the landscape and refined based on Beacon ELC mapping. Each of these features is greater than 0.2 ha, and therefore meet the definition of woodland as provided by the Markham 2014 OP.

A watercourse portrayed in the east central area of the property was confirmed to be absent on the landscape. However, a watercourse (Surface Drainage Feature C) was determined to have permanent flow from groundwater discharge within the wetland portion of Feature 1.

Figure 7a presents a portrayal of Maps 5 and 6 as shown in the OP with a corresponding map that portrays the field verified features. As part of the OPA amendment, Maps 5 and 6 should be adjusted accordingly.

As part of this process Schedule I of the Town of Markham Official Plan (1987) was also reviewed. Schedule I presents the location of Hedgerows, Woodlots and Other Significant Vegetation Communities. The limits of these features have also been adjusted based on the staking exercise and ELC completed by Beacon (**Figure 7b**). The trees along the north property line identified as hedgerows in the Markham OP consist of an assortment of spruce and pines planted for golf course landscaping, mid-aged planted Silver Maple lining the entranceway, and young to mid-aged Basswood and Bur Oak along the fence line. The trees vary considerably in age, density, and spacing. Based on historic air photos, the clusters of Basswood and Bur Oak along the fence line represent the remnants of an agricultural hedgerow that existed before the golf course was developed. The Silver Maples and conifers were subsequently planted.

The trees and tree groupings identified as hedgerows in the Markham OP are disjointed and generally do not form cohesive or defined hedgerows or distinct landscape features. From an ecological perspective, hedgerows may contribute to landscape connectivity by providing connections between natural landscape patches, such as woodlands; however, on the subject property, the trees identified as hedgerows in the Markham OP do not provide this function. Therefore, the Hedgerow designations should be removed from the Markham OP Schedule I in the 1987 OP.

6. Proposed Development

6.1 Block Plan

The conceptual Development Plan proposes to develop the subject property as mixed residential and commercial uses. The proposed residential development is provided in the two draft plan of subdivision figures that accompany this MESP, both of which are dated September 2017. One draft plan covers the east portion of the property and one draft plan covers the west portion of the property. The west draft plan of subdivision includes all of the valleylands associated with both Berczy Creek and Bruce Creek. **Figure 8** illustrates the development plan for the subject property. Both the East and West draft plans of subdivision are comprised of a mix of residential, open space blocks, elementary school block, parks, and SWM ponds.

6.2 Servicing

A summary of the servicing plan is provided in this section as it relates to natural environment features. Full servicing details are provided in the Master Environmental Servicing Plan and Functional Servicing Plan prepared by Stantec (2017) and included in this submission.

6.2.1 Stormwater Management

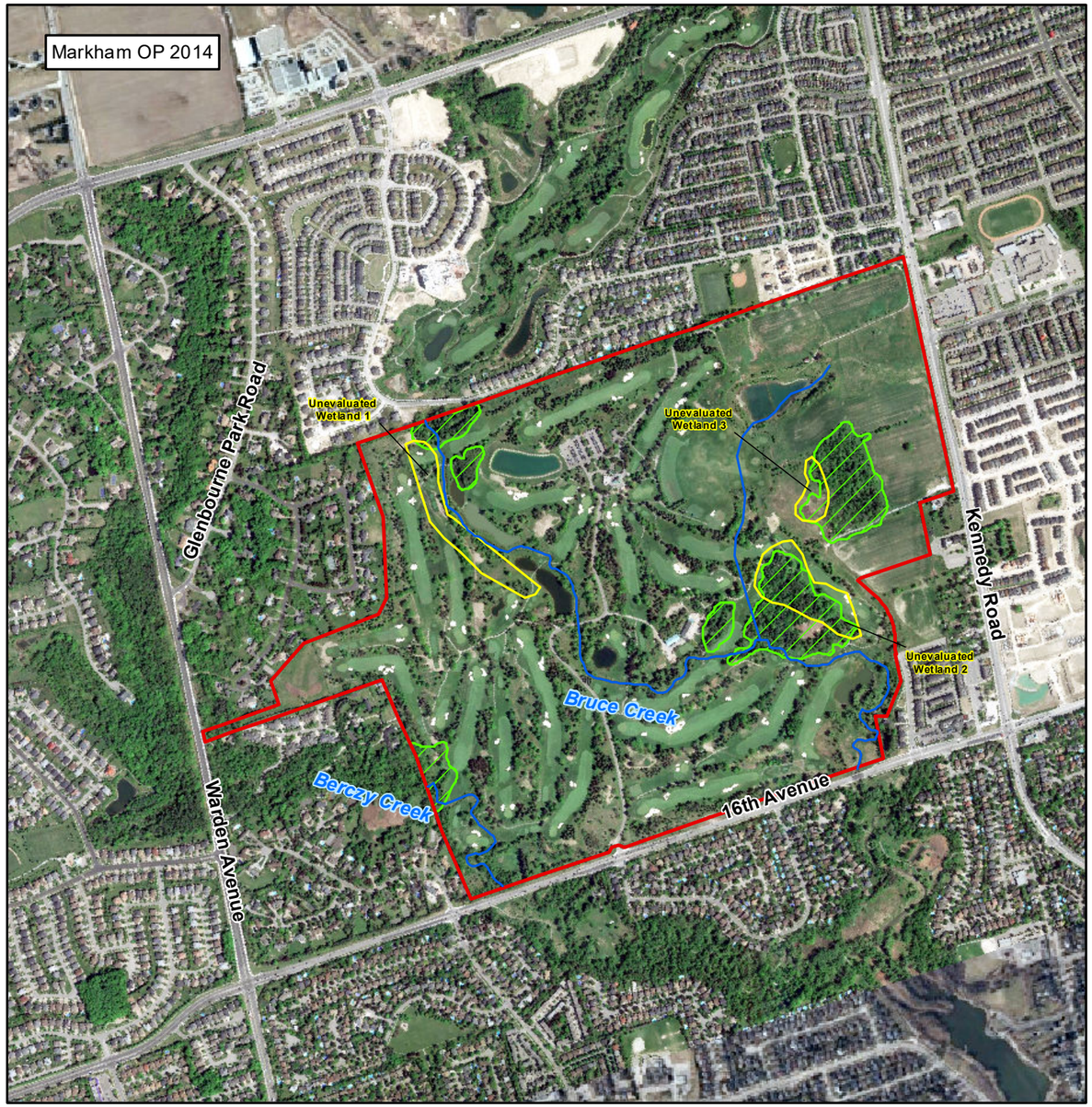
Four Stormwater Management facilities (wet ponds) and one end-of-pipe infiltration facility are proposed for the subject property. Ponds 1 and 2 will be located in the East development. Both will drain to Bruce Creek. Ponds 3 and 4 will be located in the West development. Pond 3 will discharge to Bruce Creek and Pond 4 will discharge to Berczy Creek (**Figure 8**).

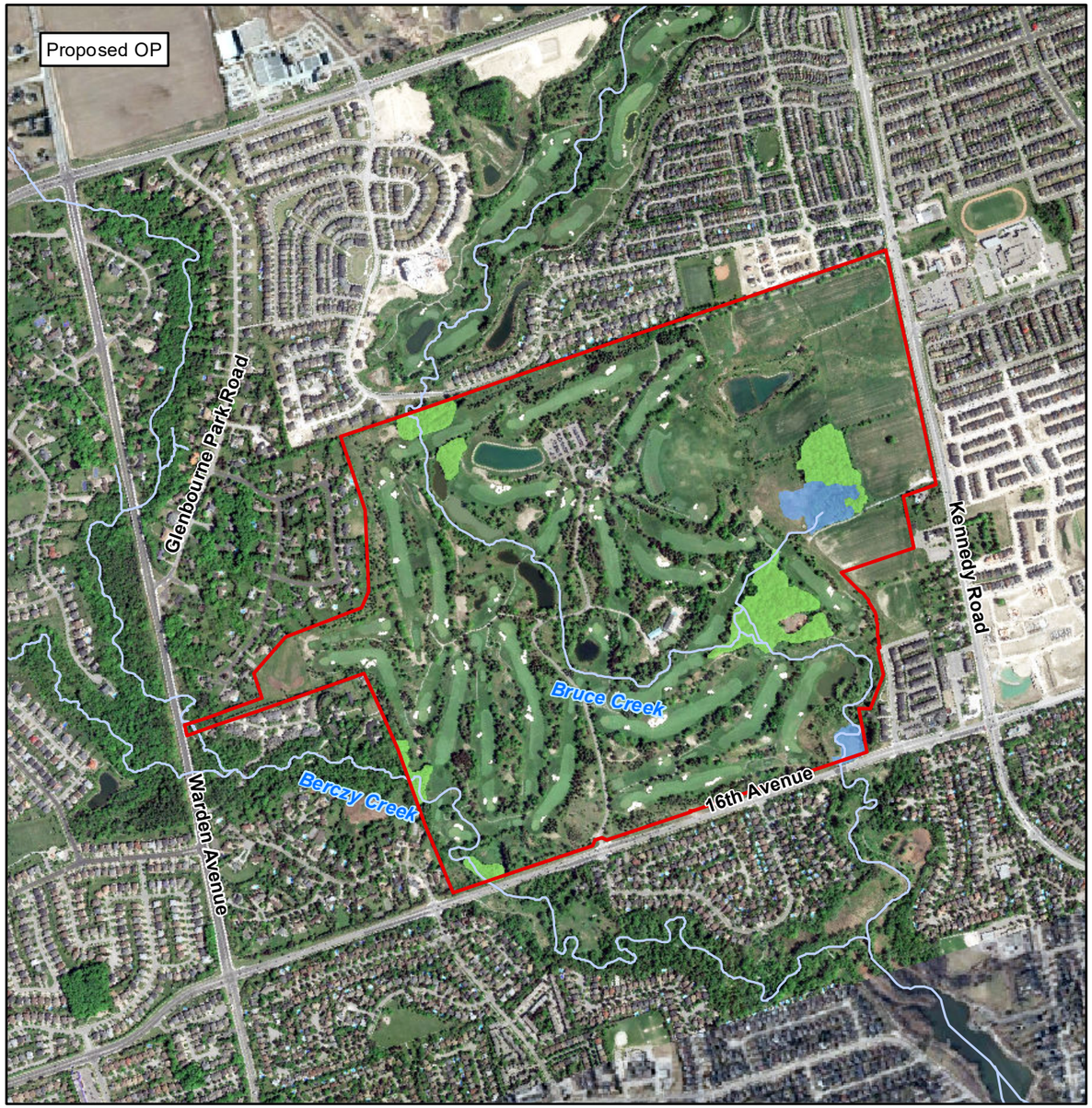
Based on the preliminary grading plan, SWM Pond 1 will require fill within the shallow fringe of the Regional Floodplain. The pond grading matches the existing grades along the limit of the proposed pond block.

All four SWM Ponds will discharge into Redside Dace habitat in both Bruce and Berczy Creeks. Therefore, the ponds have been designed in accordance with the Ministry of Natural Resources *Guidance for Development Activities in Redside Dace Protected Habitat* (OMNR, 2016).

An infiltration facility will be constructed in Block 9 within the Berczy Creek subcatchment. This facility is proposed in an area with a small drainage area and will provide extended detention storage, prior to discharge into a storm sewer and ultimately SWM Pond 4.

Storm sewers will also be constructed along municipal and private roads and will closely follow typical road cross-section configurations. The storm sewers within the subject property will be sized to capture and convey runoff for storm events up to and including the five year storm event and will discharge to SWM facilities. Flows greater than the five year storm event will be conveyed overland within the right-of-way (ROW).





Stantec
BEACON ENVIRONMENTAL
BURNSIDE

1:14,000 0 80 160 320 480 640

Legend

- Subject Property
- Permanent and Intermittent Streams (Map 6 Markham OP, 2014)
- Watercourse (Beacon)
- Unevaluated Wetlands (Map 6 Markham OP, 2014)
- Woodlands (Map 5 Markham OP, 2014)
- Woodland (Beacon 2016)
- Wetlands (Beacon 2016)

JD Barnes: Aerial Photograph, 2015.
MBTW: Subject Property, 2015.
Beacon Environmental, 2017. All other data.

MASTER ENVIRONMENTAL SERVICING PLAN FOR 4134 16TH AVE

FIGURE 7A: Official Plan Amendment

UTM Zone 17 N, NAD 83

Project 215200
October 2017

Stantec
BEACON ENVIRONMENTAL
BURNSIDE

0 65 130 260 390 520
1:12,000

Legend

- Subject Property
- Watercourse (Schedule 1 Markham OP, 1987)
- Woodlots and other Significant Vegetation Communities (Schedule 1 Markham OP, 1987)
- Hedgerow (Schedule 1 Markham OP, 1987)
- Watercourse (Beacon)
- Forest (Beacon 2016)

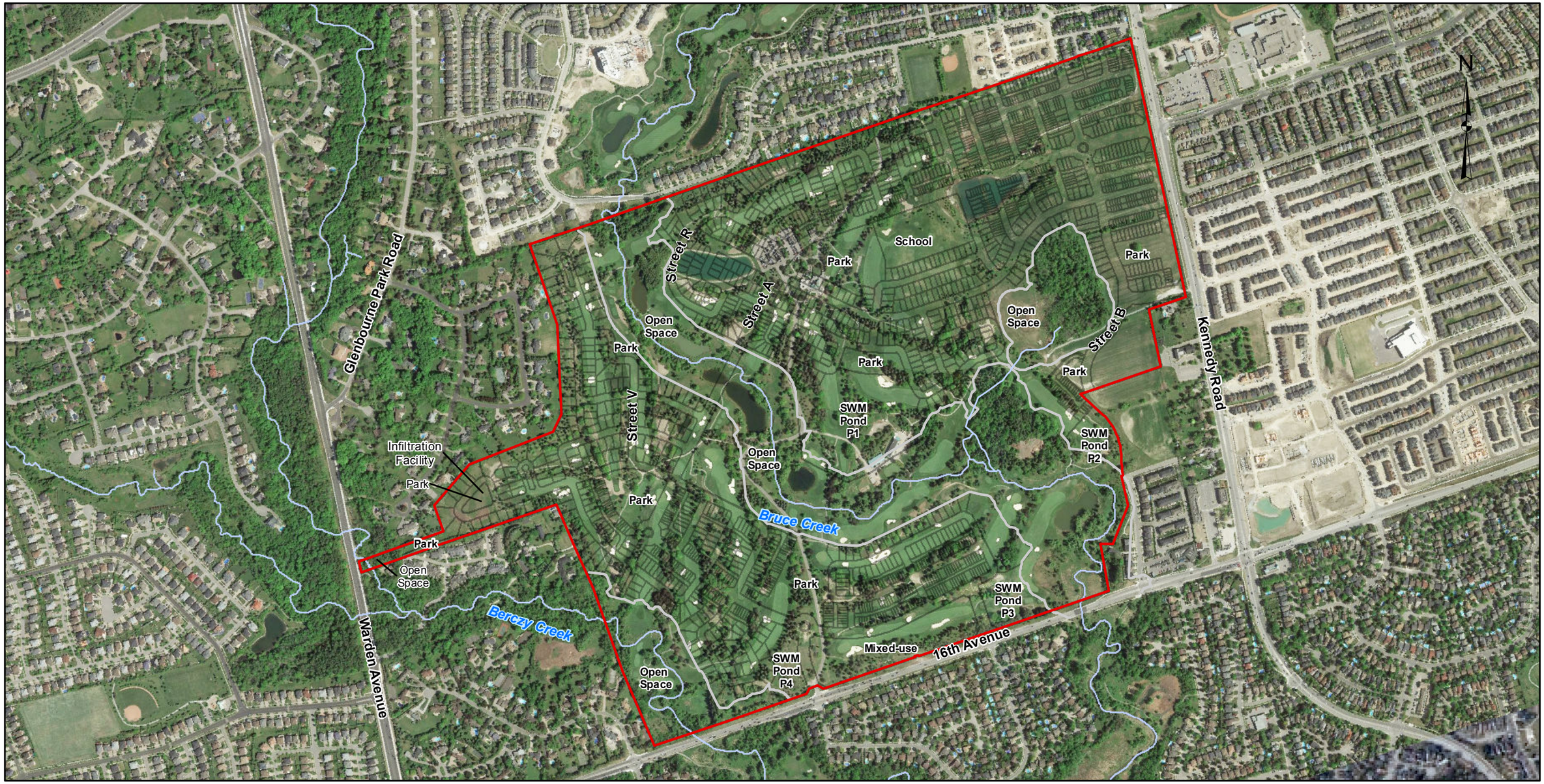
JD Barnes: Aerial Photograph, 2015.
MBTW: Subject Property, 2015.
Beacon Environmental, 2017. All other data.

MASTER ENVIRONMENTAL SERVICING PLAN FOR
4134 16TH AVE

FIGURE 7B: Official Plan Amendment

UTM Zone 17 N, NAD 83

Project 215200
September 2016



Stantec
BEACON ENVIRONMENTAL
BURNSIDE

1:9,000 0 50 100 200 300 400

Legend

- Subject Property
- Development Plan
- Watercourse
- Development Constraint

JD Barnes: Aerial Photograph, 2015.
MBTW: Subject Property, 2015, Development Plan, 2017.
Beacon Environmental, 2017. All other data.

MASTER ENVIRONMENTAL SERVICING PLAN FOR
4134 16TH AVE

FIGURE 8: Development Plan

UTM Zone 17 N, NAD 83

Project 215200
October 2017

A foundation drain collection (FDC) system is needed in areas where the storm sewer is not low enough for basement connections (Stantec, 2017). The FDC will collect cool, clean water which will be released directly in the valley system through stone trenches. In addition, roof drainage will be collected and conveyed to the ROW below the road surface. There is one location where a perforated roof leader collector (RLC) pipe will discharge to an FDC pipe which will then discharge to a wetland stone reservoir within the old golf course irrigation pond. This system would be located south of the proposed crossing (**Figure 8**).

As part of the Development Phasing process, a temporary SWM pond is required to service the same drainage area as SWM Pond 2. This pond will be removed once SWM Pond 2 is constructed.

Low Impact Development (LID) strategies such roof downspout disconnection, perforated roof leader collector drains, enhanced grass swales within lots, vegetated filter strips, and increased topsoil depths or amended topsoil have been recommended for the subject property (Stantec 2017).

6.2.2 Water Supply

The southwestern portion of the development will be serviced through a 300 mm diameter watermain which will connect to an existing 450 mm diameter watermain at each of the proposed intersections at16th Avenue. The southeastern portion of the development will be serviced with a 300 mm diameter watermain that will connect with an existing 300 mm diameter watermain at Yorkton Boulevard. The northern portion of the development with be serviced with the following:

- A 300 mm diameter watermain connection to the existing 300 mm diameter watermain at Angus Glen Boulevard;
- A 150 mm diameter watermain connection to the existing 150 mm diameter watermain at Saddleworth Road (east side of the ROW), and at Dancers Drive;
- A 300 mm diameter watermain connection to the existing 300 mm diameter watermain at Prospectors Drive (east side of the ROW);
- A 300 mm diameter watermain connection to the existing 300 mm diameter watermain at the east side of the existing PRV chamber on Bur Oak Avenue on the east side of Kennedy Road.

The locations of these connections are provided in the Functional Servicing Report prepared by Stantec (2017). The pipes will generally follow the right-of-ways but one crossing of the Greenway System and Bruce Creek is required along Street 'A', and a second crossing is now proposed north of Street A from Street R East on the east draft plan to Street "V" West on the west draft plan via trenchless technologies (**Figure 8**). The watermain along Street A will consist of an insulated pipe suspended from the crossing structure, or below Bruce Creek via trenchless construction method.

6.2.3 Wastewater and Sanitary Servicing

The sanitary sewers will be constructed along the municipal and private road right-of-ways and will closely follow typical road cross-section configurations. The proposed sanitary system will be designed based on gravity flow and will not require pumping stations or syphons and forcemains (Stantec, 2017). The proposed sanitary sewer design will utilize existing infrastructure as capacity allows.

The sanitary sewer will be extended under Bruce Creek and will utilize trenchless installation in order to avoid impacts to the creek. The trenchless construction will occur from lands adjacent to SWM Pond 1 to SWM Pond 3 located south of Bruce Creek. Stantec reviewed two options and locations for the sanitary crossing of Bruce Creek during the preliminary design process. These included:

1) Crossing Bruce Creek near the proposed road crossing; and

2) Extending from a low point on the east side to a low point on the west side.

Option 1 would require a deep sanitary sewer ranging from 6 m to 11 m due to grading and the distance travelled within the subject property, which is considered too deep for local servicing, is not an efficient and would require impacts to the road allowance for maintenance.

Option 2 is preferred, as the need for deep sewers is minimized (Stantec, 2017). For this option, the sanitary sewer will be 2.5 m below the creek bed.

6.2.4 Grading

The site will be graded in accordance with the City of Markham criteria. The proposed grading plan will satisfy the criteria as follows:

- Provisions will be made to minimize grading disturbances in the vicinity of the existing vegetation and natural heritage features identified for retention;
- Road grades have been designed to match existing roads and adjacent lot grades at the periphery of the subject property;
- Existing grades will be matched to minimize grading and cut/fill quantities and to minimize changes to the surface hydrology and hydrogeology, where possible;
- Provide major overland flow routes for flows in excess of storm sewer capacity;
- Accommodate external flows from adjacent properties based on current land use;
- Maintain adequate cover over storm and sanitary sewers and watermains, where possible;
- Minimize the need for rear lot catch basins;
- Minimize the need for retaining walls;
- Achieve the SWM objectives for the subject property.

The proposed grading plan will generally match existing grades along Berczy Creek with all grading occurring within the lots or within open space blocks that will be dedicated as part of the valley system. The proposed grading plan will generally match the existing grades along Bruce Creek. All grading in this vicinity will also occur in the lots or within open space blocks that will be dedicated as or the valley system. A few locations adjacent to the Bruce Creek valley will require minor grading into the buffer. These grading encroachments are further discussed in Section 7.6, unless otherwise noted.

1. Minor grading may encroach into the buffer of Feature 2 Woodlot adjacent to Bruce Creek (refer to Drawing 5.2, Stantec 2017).
2. Limited grading encroachments are required for the proposed road crossing of Bruce Creek (see Section 7.7.1 below).
3. A portion of proposed SWM Pond 1 will encroach into the Regional Floodline portion of the Valley feature, and will match the existing grades along the limit of the proposed block. A floodplain cut grading design will be implemented as described in the Stantec (2017) SGR.

Stantec
BEACON ENVIRONMENTAL
BURNSIDE

1:9,000 0 50 100 200 300 400

Legend

- Subject Property
- Watercourse
- Potential Enhancement Areas
- Constructed Wetland

Areas Proposed for Removal

- Upland
- Wetland
- Pond

JD Barnes: Aerial Photograph, 2015.
MBTW: Subject Property, 2015, Development Plan, 2017.
Beacon Environmental, 2017. All other data.

MASTER ENVIRONMENTAL SERVICING PLAN FOR
4134 16TH AVE

FIGURE 9: Potential Impacts, Mitigation and Enchancements

UTM Zone 17 N, NAD 83

Project 215200
October 2017

The cut grading would occur along the western valley bank south of the existing golf course driveway crossing that will also be removed.

4. The existing golf course irrigation ponds within the Bruce Creek Valley will be dewatered and filled with topsoil to the match the existing waterline levels with the exception of Pond E which will be filled to existing waterline and retained as a wetland feature.

Feature 1 woodlot/wetland located east of Bruce Creek is surrounded by lots and roads. The proposed grading around this feature will tie into existing ground at the buffer limit of the feature, where possible. A small portion of the road along the east limit of this feature extends to within 15 m of the feature.

6.2.5 Roads

One road crossing of Bruce Creek is required for connectivity, traffic flow and neighborhood structure. The crossing location has been selected in an area that is relatively narrow and perpendicular to the valley corridor and where the watermain crossing is proposed. The road crossing is proposed to be a clear span bridge.

A narrow property corridor is located at the western limits of the subject property and was set aside as a connection to Warden Avenue. The need for this connection and associated environmental impacts were assessed and based on the conclusions off this assessment, the Draft Plan does not include a connection to Warden Avenue. Additional discussion is provided in Section 7.7.3.

6.2.6 Amenities – Trails and Parks

A trail system is proposed that will extend along the Bruce and Berczy Creek corridors, as well as within SWM pond blocks and through Park Block 7. Four pedestrian crossings are proposed over Bruce Creek, utilizing existing crossing locations. The trail is also proposed to extend to the west of the subject property though Park Block 11 adjacent to Warden Avenue. The proposed trail system is presented in the MBTW Community Design Plan 2017.

Eleven park blocks have been included, as well as various open space areas adjacent to Bruce Creek and Berczy Creek.

7. Potential Impacts and Mitigation

7.1 Buffers

Once feature limits have been identified and defined in the field through staking, buffers (or VPZs) are applied to minimize the impact of adjacent development on the ecological function of these features. Buffers are generally prescribed by applicable Official Plans.

The features and their prescribed buffers have determined the overall development limit illustrated on **Figure 6**. The application of buffers to the natural features creates the Natural Heritage System. The

extensive protection provided by this system will contribute to the preservation of the valley and its features / functions.

7.2 Water Balance

The elements of the water balance are dependent on climate, topography, soil texture and hydraulic conductivity and land cover conditions. Precipitation, interception, evapotranspiration, change in groundwater storage, surface runoff and infiltration are the individual elements that are used to estimate the balance. Because the impervious surfaces increase through the development process, infiltration is reduced and surface runoff is increased. Also, the removal of vegetation decreases the amount of evapotranspiration. These changes need to be mitigated to maintain the hydrologic regime of the watercourses as well as the hydrogeological regime of the subject property. Further details regarding the Water Balance and site topography and conditions are provided in the Hydrogeological Assessment and Water Balance (Stantec 2017).

The subject property is located within a Low Groundwater Recharge Area (LGRA) as described in the 2012 TRCA Stormwater Management Guidelines. This guideline requires a "best effort made" approach to the maintenance of groundwater recharge (Stantec 2017).

An overall water balance was completed for the subject property as part of the Hydrogeology Assessment and Water Balance Report prepared by R.J. Burnside Associates (2017). The water balance calculations estimate that, following development, the potential infiltration, without mitigation could decrease by approximately 35% for the overall site from 182,800 m^3/yr to 118, 100 m^3/yr. Analysis shows that runoff could increase by approximately 130% for the overall site.

Mitigation methods to improve post development infiltration include: designing grades to direct roof runoff towards lawns, side and rear yard swales. Amended soils are also proposed for select areas in East and West draft plans.

Additionally, certain natural features within the site require individual feature based water balance assessments to ensure ecological form and hydrologic function are maintained.

7.2.1 Feature Based Water Balance

Stantec identified the external drainage area for the Feature 1 woodlot/wetland near Kennedy Road. As detailed in the Stantec (2017) report, the drainage area (2.97 ha) for the woodlot is located around the eastern limits of the feature. Development is proposed within the existing drainage area to this feature. At present, Feature 1 receives 8,700 m^3/yr in Total Estimated Annual Runoff while in the post-development scenario, this area will slightly increase to 9,300 m^3/yr. The estimated pre-development infiltration volume is 8,000 m3/yr, and will reduce slightly to the post-development scenario of 7,800 m3/yr. Potential impacts to Feature 1 include:

- Slightly increased runoff from surrounding area;
- Change in vegetation in post-development drainage area.

To ensure that this feature continues to receive runoff and maintain its form and function, a feature based water balance assessment has been completed. Stantec (2017) proposed a new drainage boundary for Feature 1, which is presented in Figure 2.14 in their report. Mitigation measures include, backyard drainage from lots adjacent to Feature 1 will sheet flow to the feature. Roof drainage from selected lots will also be directed to Feature 1, as well, two separate RLC pipes are proposed to collect clean water from 8 roofs and release to Feature 1. A flow dispersal mechanism will be installed at the RLC outfall prior to release of flow into the open space area.

The feature based water balance calculations estimate that developing in the external drainage area to the feature, essentially eliminates surface water contributions from the upland area and creates a runoff deficit of approximately 4,200 m^3/a (~48% of pre-development runoff). The wetland and woodlot areas will remain the same in post-development. The volume of precipitation that will runoff and be directed as sheet flow to the woodlot/wetland feature as a result of runoff from rear yard lawns and downspout disconnection from approximately 5,400 m^2 of roof area is approximately 2,9000 m^3/a (~69% of target). The results of the Feature Based Water Balance for Feature 1 indicate that the proposed mitigation plan is able to maintain the pre-development infiltration volume and exceed the pre-development runoff volume by approximately 500 m3/yr (~6%).

A review of the monitoring data gathered in 2017, indicates a small groundwater contribution to this feature. Based on past discussions with TRCA staff, it was agreed that if groundwater contributions to this feature were found that a more detailed feature based water balance assessment may not be necessary as the feature was not solely surface fed. As such, the feature based water balance assessment previously completed as part of the 2016 MESP, and summarized above is considered suitable and has been updated to reflect the revised draft plan and mitigation plan. For further detail regarding the Feature Based Water Balance, please refer to Burnside (2017) and Stantec (2017).

7.3 Stormwater Management Plan

Without the implementation of a Stormwater Management (SWM) Plan and with the increase in impervious surfaces, there are several potential impacts to the natural environment including:

- Increased risk of flooding to downstream areas;
- Erosion of watercourses from un-controlled surface water runoff and flows;
- Impaired water quality and increased turbidity leading to impacts to fisheries, macroinvertebrates and aquatic vegetation.

Also, with the presence of habitat occupied by Redside Dace, impacts to this endangered species may result if the SWM plan has not been designed for their protection. With this in mind, the ponds have been designed, where feasible, according to MNRF recommendations that SWM ponds discharging to Redside Dace streams provide a 3.0 m permanent pool with a bottom draw outlet to mitigate temperature impacts (Stantec, 2017). If this type of design is not feasible, cooling trenches and low flow augmentation systems will be implemented within the proposed development.

The design must include best efforts to maintain the following conditions:

- Discharge temperature below 24°C;
- Dissolved oxygen concentration at discharge of at least seven milligrams per litre; and

- TSS of <25 mg/L above stream background (MNRF 2016).

A complete SWM plan has been developed by Stantec (2017). The analysis determined that four end-of-pipe wet pond facilities are required for quality control and quantity attenuation and one end-of-pipe infiltration facility providing quantity control. The locations of these facilities are provided on **Figure 8**.

SWM Pond 1 will require grading and filling within the shallow fringe of the Regional Floodplain. The pond grading will match the existing grades along the limit of the proposed pond block. The normal water level of the pond will be below the water table, therefore a pond liner will be required as well as perimeter subdrains. As SWM Pond 1 will be within the water table, the full 3 m permanent pool will be provided to satisfy MNRF Redside Dace criteria. Temporary dewatering will be required for the construction of the pond. The SWM Pond will discharge to Bruce Creek and the outfall will be located outside of Redside Dace habitat.

The proposed location of SWM Pond 2 and required grading will all occur outside of the constraint limits. The normal water level of Pond 2 will also be below the water table, therefore a pond liner will be required as well as perimeter subdrains. As SWM Pond 2 will also be within the water table, the full 3 m permanent pool will be provided to satisfy MNRF. Temporary dewatering will be required for the construction of the pond. The pond will outlet to Bruce Creek through the existing outlet constructed for Pond H within the valley. No modifications to the existing headwall are proposed.

The proposed location of SWM Pond 3 and required grading will all occur outside of the constraint limits. SWM Pond 3 will also be within the water table, the full 3m permanent pool will be provided to satisfy MNRF. Temporary dewatering will be required for the construction of the pond. The outlet is proposed to drain to Bruce Creek and will be located outside Redside Dace habitat.

The proposed location of SWM Pond 4 and required grading will all occur outside of the constraint limits. the normal water level of this pond will also be below the water table, therefore a pond liner will be required as well as perimeter subdrains. The full 3 m permanent pool will be provided to satisfy MNRF Redside Dace criteria. Temporary dewatering will be required for the construction of the pond. The pond will discharge to Berczy Creek and will be located outside Redside Dace habitat. According to the 2012 TRCA Stormwater Management Guidelines, Berczy Creek downstream of Warden Ave does not require quantity flood controls. This determination is made by TRCA through hydrologic studies and subwatershed level stormwater management studies.

SWM Facilities will maintain water quality and quantity for the proposed development conditions and minimize impacts to the watercourse related to sediment and temperature. The ponds will include a bottom draw outlet for thermal mitigation, and both ponds and outfall structures have been designed to provide 48-hour detention of the 25 mm storm, and peak flow reduction to pre-development levels. This design will be sufficient for minimizing erosive flows.

The infiltration facility will treat roof, lot and road drainage, which will enter the facility at curb cut locations. The drainage will be pretreated by landscaping, engineered sand, soil and organic filter medium prior to release into the underdrain and ultimately the storm sewer. Additional pretreatment measures could be investigated at detailed design.

Low Impact Development (LID) techniques will be implemented where appropriate throughout the development, to lessen the impacts associated with stormwater. These are discussed in detail in Section 2 of the MESP Servicing Plan (Stantec 2017) and include extra depth topsoil, direction of

residential roof downspouts to ground surface, grassed swales in sideyards and backyards, enclave biorentention facilities, infiltration facilities, infiltration galleries and perforated roof leader collection (RLC) pipes within the right of way.

The interim SWM pond will be located in an easement north of SWM Pond 2. Impacts associated with the construction of this temporary pond may include vegetation removal. This area will be restored as outlined in Section 8.

As all stormwater will ultimately discharge to Redside Dace occupied reaches, the SWM plan has been designed so as to protective of this species. The SWM plan will be discussed with MNRF as it relates to the *Endangered Species Act*.

7.4 Water Supply Servicing

To facilitate the installation of the watermain along Street A, it will be necessary to cross Bruce Creek. The crossing of the watermain will be located along the road crossing. The watermain will either be suspended from the bridge structure, or a trenchless construction method to install the infrastructure below the creek invert will be undertaken. A second crossing of the watermain between Street R East on the east draft plan to Street V West on the west draft plan has been proposed. This crossing will utilize trenchless construction methods.

Environmental impacts associated with suspending the watermain from the bridge structure would be limited to works associated with the road crossing construction.

The installation of the watermain under Bruce Creek using trenchless construction methods will avoid impacting Redside Dace habitat to the extent possible. All efforts will be made to ensure construction activities remain outside Redside Dace habitat (i.e., entry and exit pits). The preferred methodology will be determined as the development process advances.

7.5 Wastewater and Sanitary Servicing

The proposed sanitary sewer will cross under Bruce Creek via trenchless method at a depth of 2.5 m below creek bed. A gravity sewer is proposed as the primary option for this crossing. This option will be feasible provided that sufficient cover is available over the pipe to meet the design criteria for TRCA. All efforts will be made to ensure construction activities remain outside Redside Dace habitat (i.e., entry and exit pits).

Potential impacts associated with the proposed sanitary sewer crossing of Bruce Creek include potential cave-ins, release of drilling fluids, and dewatering. Various environmental and design mitigation measures will be implemented to ensure the protection of Bruce Creek habitat and aquatic life. This will include developing detailed plans for ESC, construction and post-construction monitoring, and contingency plans.

The Guidance for Development Activities in Redside Dace Habitat (MNRF 2016) recommends an installation depth of 2.5 m where feasible. In this regard, the proposed installation of sanitary sewer follows MNRF, as well as TRCA guidance.

7.6 Grading

The proposed grading plan has been designed to mimic the existing drainage divide to Bruce and Berczy Creeks to the extent possible. A drainage diversion is proposed from Bruce Creek to Berczy Creek which is approximately 0.5 ha and approximately 0.3% of the Berczy Creek subcatchment (Stantec 2017).

Grading for the site has generally been driven by existing infrastructure, pond elevations, natural heritage features, matching existing grades, road and lot grading criteria and pipe cover. There is a considerable grade differential of 20 m across the subject property which will require earth cuts and fills of up to 4.0 m in depth. This will provide positive drainage for local services and will address topographic and environmental constraints. The grading design for roads is dictated by the depth of cover required over top of sanitary and storm sewers.

The preliminary grading design and road profile for the subject property maintain the major storm water drainage flows within the subdivision with conveyance over the local road network and through dedicated overland flow routes to the SWM facilities. In addition, road grades at connections to existing roads are designed to ensure that offsite drainage is generally maintained external to the subject property, and to maintain internal site drainage within the subject property (Stantec 2017). Lands have generally been graded to direct overland flow to the ponds. The Master Servicing Plan and Grading Report (Stantec 2017; Chapter 5) details all grading requirements for the site. Significant grading changes are illustrated on Drawing 5.4, which also shows the areas of cut and fill.

The grading design recognizes the existing boundary conditions including valley systems and natural heritage features. The site grading has been completed to retain these features while minimizing cut and fill operations and will replicate the existing subwatershed drainage boundary divide to the best extent possible. Minor grading encroachments into the Natural Heritage System are proposed in order to minimize disturbance and prevent the use of unnecessary retaining walls, while tying in proposed grades to existing grades. Further, the impact of these encroachments on the final NHS are reversible as all disturbed areas will be tilled or loosened and topped with sufficient topsoil in order to support the establishment and long-term growth of proposed plantings.

7.6.1 Proposed Cut and Fill

As per the Master Servicing and Grading Plan (Stantec 2017), fill within the Regional Floodplain will be necessary to construct SWM Pond 1. In order to mitigate this encroachment, a floodplain cut grading design will be implemented to satisfy the TRCA LCP 8.12.2. The results of an incremental cut and fill assessment completed by Stantec identified that the proposed filling is located within the shallow fringe of the floodplain and the pond grading matches the existing grades along the Redside Dace Habitat limit (meander belt limit + 30m) and/or limit of the pond block. The proposed compensating cut within the valley would need to occur within the meander belt + 30 m (Redside Dace habitat), as the existing Regional Floodplain is off-centre from the meander belt width.

As outlined in the TRCA LCP, cut and fill operations should not encroach into the meander belt width and should avoid natural features; however the majority of this area is manicured golf course and is proposed to be renaturalized (see Section 8). Nonetheless, discussion with MNRF and TRCA will be required to ensure compliance with both the LCP and the ESA.

7.6.2 Ponds

As detailed above, the existing golf course irrigation ponds within the Bruce Creek Valley will be dewatered and filled with topsoil to match the existing waterline levels. These areas will be stabilized with native vegetation. Isolated Ponds B, G, H, and I will also be removed from the landscape.

The storage capacity of the ponds within the Bruce Creek corridor have not been included in the hydraulic modelling completed by Stantec. Currently these ponds operate in a series and continually discharge to Bruce Creek, increasing water temperatures and decreasing water quality. Pond C is proposed to be filled, but will be converted into a constructed wetland to diversify the riparian habitat within the creek corridor. Further details of these enhancements are provided in Section 8.

7.7 Road Crossings

7.7.1 Street A crossing of Bruce Creek

One crossing of Bruce Creek is proposed for connectivity, neighborhood structure and traffic flow. The Crossings Guideline for Valley and Stream Corridors prepared by TRCA (2015) was reviewed in relation to the proposed crossing. TRCA outlines objectives for the road crossings in relation to natural hazards and natural heritage functions. These objectives are consistent with TRCA's Living City Policies (2014). Given Bruce Creek is an occupied reach in this location, the presence of Redside Dace has also been considered.

This crossing is subject to a Class Environmental Assessment, which is currently underway, and is being led by GHD. Nonetheless, potential impacts and proposed mitigation have been detailed below.

Potential impacts associated with the road crossing of Bruce Creek include:

- Potential for restricted flows and impact to fish passage based on the type and size of structure;
- Reduced light penetration;
- Exacerbated erosion through poor site selection;
- Water quality impairment from construction and surface water runoff from crossing structure; and,
- Removal of riparian vegetation and Redside Dace habitat.

TRCA crossing objectives states that for new crossings, many aspects of natural hazards and natural heritage objectives can be accomplished through proper siting of the infrastructure.

For natural hazards, the objectives pertain to avoidance and mitigation of flood risk, geotechnical risk from slope stability and geomorphic risk that may result from channel migration over time. The proposed crossing must not increase flood risk for storm events up to and including the Regional storm. Further, the crossing structure should span the zone of potential future channel migration as defined by the meander belt, unless alternative designs supported by geomorphic studies have been produced.

For natural heritage function, the objectives relate to terrestrial and aquatic habitat and connectivity functions:

- Terrestrial Objectives
  - Avoid siting infrastructure in locations of existing forests, wetlands, seepage areas, and other sensitive habitats;
  - Minimize footprint impacts of crossings on important terrestrial features and their ecological functions through site selection and design;
  - Maintain terrestrial habitat and wildlife connectivity functions by avoiding the priority areas for habitat and wildlife connectivity or by siting and designing crossings to structurally connect habitat patches and to permit wildlife movement.

- Aquatic Objectives
  - Avoid sensitive aquatic habitat features (e.g. critical spawning areas, important feeding or refuge areas for sensitive/locally rare/indicator species);
  - Avoid channel realignment, hardening, or other modifications;
  - Minimize footprint impacts of crossings on important aquatic features and their ecological functions (e.g. groundwater upwellings and discharge areas, maintaining natural sediment transport) through site selection and design;
  - Maintain aquatic habitat and fish passage functions by avoiding the priority areas or by siting and designing crossings to permit fish passage.

A single road crossing has been selected to minimize the number of stream crossings and still meet the traffic requirements of the proposed development. The proposed crossing location was selected in an area that is relatively narrow and is perpendicular to the valley corridor. This crossing location will not impact any woodlots or wetlands as it is a currently manicured golf course area. There are no observed/known seepage areas in the vicinity of the bridge or unstable slope areas.

The reach of Bruce Creek at the proposed road crossing is fairly consistent with the habitat described in Section 3.4.2. The substrates consist of cobble, silt and gravel with woody debris and aquatic vegetation providing cover. Stream morphology within this reach is mostly riffle/run with some areas of pools associated with the meanders. Canopy cover was low, however there was abundant overhanging vegetation. Pockets of Watercress were observed throughout this reach. Watercress is often an indicator of groundwater discharge. Groundwater seepage contributes to stream base flow and cools water temperatures during the summer resulting in more favourable conditions for coolwater and coldwater fish species.

The bridge is proposed to be a 40 m clear span bridge which avoids any obstructions to fish passage and will permit the movement of wildlife under the bridge. The wide meander belt width in this reach of the valley corridor precludes construction of a complete span of the meander belt. Refer to the Beacon Geomorphic Assessment (2017) for additional studies which support the proposed design. The proposed bridge will be within Redside Dace; however construction of a 40 m span crossing of Bruce Creek within the Angus Glen Village Gate Development just north of the subject property was recently completed and approved by the Ministry of Natural Resources and Forestry (MNRF) with a Section 17(2)(c) permit under the ESA (Beacon 2014).

Additional mitigation measures will be implemented to ensure no impact to fish or fish habitat in Bruce Creek, including Redside Dace. These mitigation measures will include, but are not limited to, the following:

- Limit vegetation removal where possible, and stabilize cleared areas to prevent surface water runoff and sedimentation into watercourse;
- Develop and implement an Erosion and Sediment control plan to minimize risk of sedimentation into watercourse, complete regulator inspections of control measures and repair when required;
- Develop a Spill Prevention plan and ensure spill kits are kept on site;
- Restore disturbed areas with native plants; and,
- Adhere to the appropriate timing works if in water works are required.

Refer to the MESP Servicing and Grading Report prepared by Stantec 2017 for further details on the proposed crossing

7.7.1.1 Street B (west of Feature 1)

A small portion of Street B, the extension of Yorkton Boulevard will encroach to within 15 m of the eastern limit of Feature 1. No grading is required within 15 m of the feature and the feature based water balance ensures the hydrology of the wetland post development (see Section 7.2.1). Buffer plantings can be augmented in this location to offset the encroachment. Other alternatives were considered but any adjustments further south or east would not maintain sight lines required for traffic safety.

7.7.2 Road Easement Connection to Warden Avenue

An assessment of the road connecting the proposed development to Warden Avenue was completed by Poulos & Chung (2016). The study determined that:

- *The easement road must be located on an elevated structure in order to match the grade of Warden Avenue;*
- *The elevated structure would be located directly over a meandering stream;*
- *The elevated structure would have to traverse through significant land contour changes, and;*
- *Through sensitive wooden and topographical areas.*

A connection to Warden Avenue at the location of the existing easement would result in substantial environmental impacts that may not be mitigatable. These include:

- The road would require a crossing of Berczy Creek which is designated as occupied Redside Dace habitat by MNRF;
- The alignment would require the removal of a mature woodlot feature east of Warden Avenue;
- The crossing location would be close to several existing crossings of Berczy Creek and Carlton Creek, including two crossings of Warden Avenue, two crossings located at Berczy Creek Way, Glenburn Forest Way and Old Farm Lane Way, increasing the number of crossings on Berczy Creek;
- The proposed road crossing would be located at a large meander in Berczy Creek.

7.7.3 Removal of Existing Golf Course Driveway

The development plan will require the removal of the existing golf course driveway which crosses Bruce Creek. For the purposes of construction, the crossing will remain in place during earthworks operations. Removal of this structure will allow for re-naturalization of Bruce Creek through this reach. All appropriate mitigation measures will be implemented during the removal of the existing driveway crossing.

7.8 Trails

The proposed development requires pedestrian crossings of the Bruce Creek other than at the road locations. Several crossings for the golf course are located throughout the subject property. The trail plan will make efforts to incorporate these existing crossings wherever a trail crossing of the creek is proposed in order to minimize disturbance and impacts to the natural environment (Stantec, 2017). These existing crossings are preferred in order to minimize potential impacts to Redside Dace habitat that would result from new crossings. Should existing crossings require upgrading, all efforts will be made to avoid disturbance of bed and banks of the watercourse at these locations. Existing crossings that are not incorporated into the trail plan will be removed and the area will be re-naturalized. MNRF, TRCA and the City will be included in trail discussions.

7.9 Pickering Airport

The Pickering Airport Site Zoning Regulations apply to the land adjacent to and in the vicinity of the future Pickering Airport site. The purpose of the proposed Regulations is to prevent lands adjacent to or in the vicinity of the future Pickering Airport site from being used or developed in a manner that is incompatible with the safe operation of an airport or aircraft.

The subject property is within a “Secondary Bird Hazard Zone”. –The Canadian Aviation Regulations (CARs) state that no owner or lessee of land within the limits of the bird hazard zone shall permit any part of that land to be used for activities or uses attracting birds that create a hazard to aviation safety and are therefore incompatible with the safe operation of the airport or aircraft.

A Wildlife Hazard Assessment report has been provided by Beacon in **Appendix G** to comply with the Airport Wildlife Planning and Management regulation under the CARs which came into force on December 30, 2006.

7.10 Vegetation Removal

Most of the subject property is utilized as golf course and consists of landscaped areas. Almost of the trees situated within the areas to be developed will need to be removed with the exception of trees that have been integrated within park or buffer blocks, or in some cases rear lots of larger residences. Considerable effort has been used to preserve as many trees as possible. The naturally vegetated areas on the block are mainly contained within the valley corridors and hence will be protected as part of the natural heritage system.

Wetland Communities

Three isolated wetland communities will be removed to accommodate the proposed development. This includes the following communities, illustrated on **Figure 9**:

- Common Reed Mineral Meadow Marsh (MAM2, ELC unit 7);
- Forb Mineral Meadow Marsh (MAM2-10, ELC unit 30); and
- Reed Canary Grass Mineral Meadow Marsh (MAM2-2, ELC unit 18).

The Common Reed Mineral Meadow Marsh (ELC unit 7, 0.19 ha) will be converted into the Infiltration Facility and used as a park.

The Forb Mineral Meadow Marsh (Unit 30) is a small (0.10 ha) wetland feature that will be removed to accommodate the development.

The Reed Canary Grass Mineral Meadow Marsh (ELC unit 18, 0.43 ha) is associated with SDF B and receives its flow from the golf course drainage collection under the driving range and from surface runoff. This feature has been the subject of discussions with TRCA and MRNF. In a letter to TRCA (addressed to D. Cheng) dated August 22, 2017, Beacon provided a detailed description and proposed compensation for Wetland 18. Appended to this letter were technical memoranda from Beacon detailing HDFA and from Burnside detailing hydrogeological conditions. Results from Burnside's hydrogeological assessment confirm that no baseflow is provided by this feature to SDF B downstream. The HDFA concludes the portion of watercourse downstream of Wetland 18 has a management recommendation of "conservation", and is therefore able to be relocated. Stantec provided an analysis of the limited availability of water to maintain the feature in the post-development landscape. It is proposed that Wetland 18 and associated drainage be located to between Feature 1 and Feature 2, enhancing the Greenway System in this area and providing overall increased function. See Section 8 for more details.

The total area of wetland that will be removed is 0.72 ha. Proposed compensation for these removals is discussed in Section 8 and in the accompanying Compensation Report.

Upland Communities

The majority of forest communities are located within the two major valley systems that traverse the block as well as the eastern woodlot/wetland feature in the East Block. These communities will be undisturbed through the development process except for potential changes to the water balance and minor encroachment into buffers to accommodate grading. Without mitigation, less drainage may reach these features which could cause long-term impacts. However, using the results of the water balance and through the implementation of Low Impact Development (LID) measures, these impacts can be avoided. Section 7.2 addresses mitigation measures related to the water balance.

One woodland area (ELC unit 14) is located outside the proposed natural heritage system and is proposed for removal (see **Figure 9**). It is a Fresh Mist White Cedar Hardwood Mixed Forest (FOM7-2) and is 0.28 ha. A second woodland in this area (ELC units 12 and 13) will be preserved despite being located partially within the adjacent SWM block. It is anticipated that these trees will be retained once detailed grading of the SWM pond is finalized. Should it be necessary to remove any trees, they will be assessed by an arborist and included in the Compensation and Enhancement Plan (see Section 8).

The treed areas associated with wetland unit 18 are also proposed for removal. These include two mixed hardwood forest units (16a and 16b) and a deciduous forest (unit 17), as well as a cultural plantation (unit 1). The total area of these two upland communities is approximately 0.38 ha. These trees have been assessed in the arborist report and will be subject to compensation as proposed for those tree removals. Any additional upland communities, the majority of which are small (<0.2 ha) cultural woodlands, have been addressed in the Arborist Report (Beacon 2017) and will be incorporated into the overall compensation plan for the subject property (see Section 8).

The total area of upland communities that will be removed is 0.66 ha. Proposed compensation for these removals is provided in Section 8 and in the accompanying Compensation Report.

7.11 Wildlife

Wildlife, including birds, amphibians, fish, reptiles and mammals utilize the golf course property. It is anticipated that changes to the wildlife community will result from the proposed change in land use.

The current breeding bird community is generally typical of a suburban landscape. There are likely greater numbers of birds present due to the availability of habitat associated with the open areas of the golf course. The proposed redevelopment will likely result in a reduction in the overall number of birds that utilize the subject property for foraging, given that currently open habitats will be converted to residential development. However, the diversity of species will probably be maintained post-development, as the majority of the existing naturally vegetated areas will be retained and enhanced (e.g., along Bruce and Berczy Creeks). Also, areas within the subject property that are currently manicured lawn will be naturalized (e.g., riparian enhancement areas); and much of the existing and higher quality habitat (e.g., Feature 1 and Feature 2) will have naturalized (vegetated) buffers established adjacent to them which will remain relatively undisturbed.

Several treed cultural communities, tree groupings and individual trees will be removed from the tableland portions of the site. Most of these areas are anthropogenic and have limited function on the landscape. These trees have also been assessed in the arborist report and will be subject to compensation accordingly. The extent to which bats may utilize any of the trees on site is part of ongoing discussions with MNRF. Permissions from MNRF may be required, should these features be inhabited by any endangered bat species.

The golf course irrigation ponds (Ponds B through G, and I) and the SWM pond (Pond H) in the northeast will be removed. These ponds are likely to provide habitat for warmwater tolerant fish species, and breeding amphibian surveys have confirmed these ponds provide limited habitat for common amphibian species but they are not naturally occurring features. Their removal will improve water quality and temperature within Bruce Creek. Amphibian habitat will replaced through the construction of the various SWM ponds within the development plans, which are also not natural habitat, but clearly support amphibians. Pond E will also be converted to a constructed wetland to provide additional habitat for wildlife within the protected watercourse corridor. All appropriate permits from relevant agencies will be obtained to facilitate the removal of the ponds including wildlife relocation. Turtles and other reptiles (i.e., Eastern Garter Snake (*Thamnophis sirtalis*) will continue to use habitat within the Greenway System. As part of the Compensation and Enhancement Plan for the subject property (see Section 8), opportunities to provide reptile hibernacula and passageways will be explored.

Small mammals such as raccoon (*Procyon lotor*), grey squirrel (*Sciurus carolinensis*) and skunk (*Mephitis mephitis*) will continue to use the subject property post development. Larger mammals, such as white-tailed deer (*Odocoileus virginianus*) will continue to use the valley corridors for local migration.

7.12 Surface Drainage Feature Removal

SDF- A, ephemeral flow upstream of SWM pond H, will be removed in its entirety. This HDF has been assigned management recommendations of "mitigation". This catchment area will be directed to Bruce Creek via LID measures (e.g., roof leaders) which will provide flow to SDF-C and the enhancement area between Feature 1 and Feature 2 (see Section 8).

Minor flow from SDF-B (HDF management recommendation "conservation") from Unit 18 to where it daylights in Feature 2 will also be directed to Bruce Creek via LID measures (e.g., roof leaders) which will provide flow to the wetland created within the enhancement area between Feature 1 and Feature 2 (see Section 8). All portions of SDF-B and SDF-C within the proposed Greenway system which are currently enclosed, are proposed to be daylighted and the riparian areas restored. Flow from SDF-F (HDF management recommendation "mitigation") to Berczy Creek will be replicated via SWM pond 4. SDF-D and SDF-E will remain *situ.*

There are multiple small tile drains throughout the golf course lands which are proposed for removal (see Appendix E, HDFA). It is anticipated that flow from these features to Bruce Creek will be replicated via the three proposed SWM ponds which will outlet at various locations along Bruce Creek.

7.13 Species at Risk

7.13.1 Butternut

Twenty-three Endangered Butternuts were recorded during surveys on the property. Some of these will not be affected by the development and others are non-retainable. Non-retainable trees are not protected under the ESA due to the presence of large amounts of Butternut canker. The remaining trees that will be affected can be either directly removed or harmed under the ESA as long as the appropriate Registry (Section 23.7 of O. Reg. 242/08) or ESA permit process is followed. The Butternut Health Assessment, and subsequent audit by MNRF, confirmed that fourteen trees are Category 1, eight trees are potentially Category 2, and three trees are potentially Category 3. Hybridity testing will confirm the status of the potential Category 2 and 3 trees. These tests will be carried out in the fall of 2017 following which, the permitting process can begin.

7.13.2 Barn Swallow

Two nests of the Threatened Barn Swallow were recorded in two buildings on the central part of the property. These buildings can be removed; however, prior to removal, the MNRF Registry process must be followed and compensation structures built. Section 23.5 of Ontario Regulation 242/08 provides direction on this process. A Mitigation and Restoration record will be created and the structures are monitored for two years.

Although there will be a reduction in overall foraging habitat, both the Berczy and Bruce Creek corridors will remain, and foraging habitat will also be created within stormwater management pond blocks, parks and other areas of open space. To further protect the species, additional nesting cups can be provided in the compensatory nesting structures.

7.13.3 Redside Dace

Bruce and Berczy Creeks within the subject property are occupied Redside Dace habitat. The watercourse crossing will likely require a Section 17(2)(c) permit under the *Endangered Species Act*, and other works such as SWM ponds and the trail system that have the potential to impact RSD habitat will require discussions with MNRF. The crossing and the provision of Overall Benefit to Redside Dace is discussed in Section 8 below.

7.14 General Mitigation Measures

Erosion and Sediment Control

Prior to any construction, a detailed Erosion and Sediment Control Plan will be developed using the Greater Golden Horseshoe Area Conservation Authorities' Erosion and Sediment Control Guidelines for Urban Construction (2006). It will detail all necessary measures. Regional approval will be secured for the location of the temporary construction entrance.

Proposed erosion controls include the phasing of earthworks, seeding or hydro seeding, using erosion control blankets or the implementing of scarification, to limit the amount of exposed soils during construction.

Sediment controls will include mud mats at construction entrances, sediment control fencing and tree protection fencing, temporary sediment control ponds, temporary sediment traps and diversion swales with rock check dams. These measures will allow sediment to settle, and prevent sediment laden water from entering watercourses and other natural features. It will also keep public roadways free of debris during the construction period.

Tree Removal and Preservation

An arborist report has been prepared under a separate cover by Beacon Environmental. These plans detail single trees and groups of trees, including hedgerows that are outside the proposed Natural Heritage System. The Plan includes recommendations for retention or removal of each of these trees. The report also include general guidelines including nest surveys during the breeding bird season prior to removal of any specimens, as well as direction for the installation of tree protection fencing.

Timing Windows

The federal *Migratory Birds Convention Act* (1994) and provincial *Fish and Wildlife Conservation Act* protect the nests, eggs and young of most bird species from harm or destruction. As the breeding bird season in southern Ontario is generally from mid-April to mid-July, the clearing of vegetation should

occur outside of these periods. For any proposed clearing of vegetation within these dates, or where birds may be suspected of nesting outside of typical dates, an ecologist should undertake detailed nest searches immediately prior to site alteration to ensure that no active nests are present.

As both Berczy Creek and Bruce Creek are designated Redside Dace habitat, works within the regulated habitat (meander belt + 30 m for occupied and in water works for contributing features) must be conducted from July 1 to September 15, unless otherwise directed by MNRF.

Construction Dewatering

For any dewatering activities that may affect the creeks, the Redside Dace timing window (July 1 to September 15) would apply. Any water discharged to the tributaries should meet the criteria set in the Guidance for Development Activities in Redside Dace Protected Habitat (MNRF, 2016). A Permit to Take Water (PTTW) will be acquired from the Ministry of Environment and Climate Change (MOECC), should it be required give the anticipated dewatering activities.

8. Restoration and Enhancement Opportunities

8.1 Summary of Vegetation Removals and Additions

Very few natural communities are present on this block other than the valley corridors, both of which are being retained in their present form. Vegetation losses and gains have been categorized as upland, wetland and drainage features. The upland communities to be removed consist of disturbed cultural communities on the tableland including hedgerows, old field meadow, cultural plantation, and cultural thicket. These features provide minimal ecological function and do not make substantial contributions to the natural heritage system.

One woodland community (unit 14) is also proposed for removal. Given the land is currently a golf course, several small (<0.2 ha) pockets of forest communities will also be removed. The Arborist Report developed by Beacon Environmental for the subject property details single trees and groups of trees, including hedgerows that are outside the proposed Greenway System.

Two small (<0.5 ha) wetland communities are also proposed for removal. These features consist of a Forb Mineral Meadow Marsh (Unit 18) and a Reed Canary Grass Mineral Meadow Marsh (Unit 30).

Several restoration and enhancement areas have been identified across the site with the objective of:

- buffering and protecting existing habitats;
- providing connectivity between natural areas;
- creating new habitat; and
- enhancing and restoring existing habitats.

Enhancement areas have been proposed for five locations within the subject property. These are identified on **Figure 9**.

- Area A represents riparian and upland plantings along the Bruce Creek corridor;
- Area B represents riparian and upland plantings along the Berczy Creek corridor;
- Area C will be the creation of a wetland feature in Pond E;
- Area D consists of the infiltration gallery located in the Block 9 Park; and
- Area E is located in the Open Space area next to the Bruce Creek valley woodlot.

Some of this restoration will be proposed as part of the MNRF permitting for Redside Dace that will likely be required for the road crossing. Discussions will be undertaken with that agency as the development process advances.

A Compensation and Enhancement Plan will be prepared as an addendum to this report which will provide details on the proposed enhancement areas, as well as the compensation required for tree removals identified in the Arborist Report. This Plan will provide priority planting locations and habitat creation, as well as detailed plants lists.

9. Monitoring

The following section outlines, in general terms, the rationale for and type, duration, and frequency of the various elements of a monitoring program that could be considered appropriate for 4134 16th Avenue. Monitoring will focus on the performance of the stormwater management facilities, the effectiveness of the natural feature boundaries and the detection of any changes in the terrestrial and aquatic environments that might be attributable to the proposed development. The results of the monitoring plan will be analyzed and appropriate measures to resolve observed issues will be identified and implemented. Any monitoring that is required under additional legislation (i.e., Endangered Species Act) will be carried out as per the conditions of those agreements.

Construction Monitoring

Erosion and Sediment Control Measures
All ESC measures will be installed prior to construction and inspected regularly throughout construction phasing. Any damaged ESC measures should be repaired or replaced within 48 hours of the inspection.

Tree Protection Fencing
All fencing erected for the purpose of protecting trees from adjacent construction will be inspected at the same frequency as the ESC measures.

Long-term Natural Heritage Monitoring

Wetlands
Wetlands lying adjacent to the areas that are developed will be monitored during and post-construction. Wetland monitoring will examine any changes to the physical extent of the feature (boundary changes), integrity of its physical and biological attributes, invasive species, encroachments (e.g., debris, dumping of fill or garbage, cutting), etc. The wetlands shall also be examined to determine if existing hydrology

is having detrimental effects on its quality and function. This will include identification and documentation of areas where:

- Silt accumulation is evident;
- Erosion is occurring on a regular basis;
- Canopy species are declining;
- Native wetland species are being displaced by aggressive species (e.g., cattail, reed canary grass, tall reed grass, purple loosestrife) which are indicative of impaired water quantity/quality.

Woodlots
The edges of woodland units adjacent to development blocks will be periodically inspected and any observed impacts documented with photographic records. At least one monitoring cycle must be undertaken prior to the commencement of construction to establish baseline reference conditions. Monitoring should document the following:

- Encroachments (e.g., informal trails, yard waste disposal, vegetation removal/conversion, gates in fences or illegal structures);
- Tree canopy health and condition;
- Presence of problem plant species where they represent a significant portion of cover

Surface Water Features
The presence of Redside Dace in Bruce and Berczy Creeks precludes fish community sampling. The watercourses will be monitored for flow, water temperature, conductivity, dissolved oxygen, pH, salinity and Total Suspended Solids.

Buffer Integrity
The condition of the buffer areas will be inspected and evaluated through field reconnaissance. Buffers will be inspected post development to ensure that any area where encroachments (including but not limited to illegal dumping, fence removal, or presence of illegal structures) are documented, and subsequently reported to the City or TRCA.

Compensation and Enhancement Areas
All areas restored as part of the Compensation and Enhancement Plan will be monitored to ensure survivorship of plantings and “as built” conditions. A monitoring plan will be provided at the detailed design phase.

Stormwater Management

The SWM system components (including the LID measures and SWM ponds) will be inspected regularly to evaluate their operation. Specific monitoring parameters of SWM ponds that discharge to Redside Dace Habitat will be determined in consultation with MNRF under the ESA (2007).

10. Policy Conformity

A summary of federal, provincial and municipal environmental protection and planning policies and regulations applicable to the subject property discussed in **Section 2**. An evaluation of how the preferred land use option for the Subject Property complies with the applicable environmental policies and legislation is summarized below in **Table 4**.

Table 4. Policy Compliance Assessment

APPLICABLE POLICY / LEGISLATION	RELEVANT FINDINGS AND RECOMMENDATIONS	Compliance
Federal Fisheries Act (1985)	The watercourses within the subject property provide fish habitat. All watercourses and associated fish habitats within the subject property will be protected through appropriate setbacks and through implementation of appropriate mitigation measures that ensure fish habitat is not impacted.	Yes
Endangered Species Act (2007)	Habitat for Redside Dace (endangered), Butternut (endangered) and Barn Swallow (threatened) has been confirmed within the Subject Property. Studies to determine the extent to which endangered bat species may be using the property are ongoing. The habitat of Redside Dace has been confirmed with MNRF and the limit of future development has been established outside the habitat for this species. Some elements of the development such as a proposed road crossing of Bruce Creek in Redside Dace contributing habitat and a stormwater outfall will need to be constructed within the habitat for this species. Appropriate mitigation measures have been identified and will be implemented to reduce potential impacts to the fishery. A 17(2)(c) permit may be required. Several Butternut have been identified. Discussions with MRNF are ongoing, and these trees will be subject to the permit or registry process under the ESA/ Barn Swallow habitat will be removed from the subject property to accommodate the proposed development. Compensation for the removal of the habitat will be provided in accordance with *Endangered Species Act* regulations to the satisfaction of OMNR.	Yes (Subject to MNRF Permitting and Approval)
Provincial Policy Statement (2014) Section 2.1 – Natural Heritage		
1. Habitat for Threatened and Endangered Species	Habitat for endangered and threatened species has been identified on the Subject Property and is being addressed in conformity with the *Endangered Species Act* (see above).	Yes
2. Significant Valleylands	Bruce and Berczy Creek corridors are Significant Valleylands, both of which have been appropriately buffered.	Yes
3. Significant Wetlands	It is anticipated that two wetlands (ELC units 23 & 33, and riparian wetland unit (ELC unit 23at 16th Avenue) will be designated Provincially Significant. These features have been buffered	Yes

APPLICABLE POLICY / LEGISLATION	RELEVANT FINDINGS AND RECOMMENDATIONS	Compliance
	appropriately and feature based water balances have been undertaken as needed. Several unevaluated wetlands are located on the tableland. These wetlands are associated with anthropogenic surface drainage features. Some elements of the development, such as the construction of road "B"' will encroach into the wetland buffer. One small wetland will be removed from the landscape. Appropriate mitigation measures such as compensation for wetland loss due to roadways, application of buffers and maintenance of sediment and erosion controls will be implemented to reduce potential impacts to these wetland features as a result of accommodating essential infrastructure and servicing needs.	
4. Significant Woodlands	Three woodlands on the subject property are significant, under the York Regon OP and the 2014 Markham OP.	Yes
5. Significant Wildlife Habitat	None is present on the property	Yes
6. Significant Areas of Natural and Scientific Interest	The subject property does not overlap with any earth or life science ANSIs	N/A
7. Fish Habitat	See text above re: *Federal Fisheries Act.* Correspondence with DFO will be undertaken to ensure that all works with respect to Redside Dace are in compliance with the Federal SARA.	Yes (Subject to MNRF Permitting and DFO Review, as required)
City of Markham Official Plan (1987)	Section 2.2.2.9 f) of the Official Plan calls for the minimum width on an environmental buffer to be 10m from the drip line of the trees at the edge of a woodlot, or as defined by an Environmental Impact Study. The Greenway System on Map 4 has been respected. An OPA will be required for refinement.	Yes
York Region Official Plan (2010)	Sections 2.2.45 and 2.2.48 of the OP address woodland significance. Map 2 identifies the Greenland System. All significant woodlands are being protected and the Greenland System has been respected.	Yes
Toronto Region Conservation Area (TRCA) Regulations	The subject property includes watercourses and valley hazard lands (i.e., floodplains, slopes), all subject to TRCA regulation. The MESP has identified all features that would be subject to regulation, and the proposed development plan protects all regulated features. Some elements of the development, such as a proposed road crossing, watermain and sanitary sewer crossing of Bruce Creek and four stormwater outfalls, will need to be constructed within regulated areas and require TRCA permits. Appropriate mitigation measures have been identified and will need to be implemented to reduce potential impacts to the regulated features.	Yes (subject to TRCA permits)

11. Summary and Recommendations

This Environmental Study identifies the existing features and development impacts 4134 16th Avenue in the City of Markham. The site presents a variety of constraints that include: Greenbelt Plan Area, Species at Risk and high quality environmental features. The proposed development plan has incorporated all of the natural environment policies set out in the Town of Markham Official Plan.

Residual impacts will be minimal provided the proposed mitigation measures are implemented. These include:

- Completion of feature-based water balance to determine water supply to natural features;
- Monitoring quality and quantity of discharge of dewatering water to tributaries;
- Meeting MNRF criteria for SWM outlets and discharge;
- Implementation of monitoring plan and using adaptive management to address issues.

This document fulfills the criteria for the Natural Environment Report component of the MESP and provides sufficient detail to fulfill the requirements for an EIS as well.

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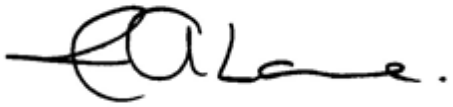

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Appendix A

Terms of Reference

Appendix B

Species at Risk Screening Letter - MNRF

Appendix C

Plant List

Appendix D

Breeding Bird Surveys

Appendix E

Headwater Drainage Feature Analysis

Appendix F

Slope Stability Analysis

Appendix G

Wildlife Hazard Assessment