APPENDIX D

Natural Environment Investigation (Palmer 2020)

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Memorandum

Date: March 25, 2020

Project #: 1903601

To: Fuad Curi, Tony Gallo – KGS Group

From: Angela Wallace and Austin Adams

cc: Dan McParland, Robin McKillop, Dirk Janas

Re: **Natural Environment Existing Conditions Review for TRCA's Ajax and Pickering Flood Control Dykes Rehabilitation Class Environmental Assessment**

1. Introduction

Palmer was retained by the KGS Group Ltd. (KGS) to complete a natural environment existing conditions review in support of the Ajax and Pickering Dykes Rehabilitation Class Environmental Assessment (EA) project that KGS is completing on behalf of the Toronto and Region Conservation Authority (TRCA). As part of the EA team, Palmer has also been retained to complete a fluvial geomorphology baseline assessment which will be provided to KGS separately.

The two existing flood control dykes are referred to as the Ajax Dyke and Pickering Dyke. The dykes are located within the Duffins Creek watershed. The Pickering Dyke follows the south side of West Duffins Creek, while the Ajax Dyke is on the east side of the main Duffins Creek (**Figure 1**). The overall "Project Study Area" for this natural environment existing conditions review is shown in red on **Figure 1.** The Project Study Area is focused on the Pickering and Ajax Dykes and the valley lands surrounding the dykes; but also includes private properties adjacent to the dykes, the road network surrounding the dykes, and the Pickering and Ajax Special Policy Areas (SPA). Two "Direct Study Areas" have also been defined for Ecological Land Classification surrounding the Ajax Dyke and Pickering Dyke (**Figure 1**).

2. Methodology

This report is based on the review and compilation of available information, including field data collected by the TRCA specifically for this project (**Appendix A**). Background information on the natural environment along with mapping of designated natural areas and rare species was obtained from several sources:

- TRCA flora and fauna data for the project study area (supplied to KGS);
- TRCA Ecological Land Classification data of the Direct Study Areas (supplied to KGS);
- TRCA fisheries data obtained for their open data portal;
- Ontario Ministry of Natural Resources and Forestry's (MNRF) Make-a-Map online website;
- Aquatic species at risk (SAR) information obtained using Fisheries and Oceans Canada (DFO) online mapping tool and discussions with the Ontario Ministry of Environment, Conservation and Parks (MECP);

- The document *A Watershed Plan for Duffins and Carruthers Creek* (Toronto and Region Conservation Authority, 2003); and
- The document *Fisheries Management Plan for Duffins and Carruthers Creek* (TRCA, 2004).

This past spring (2019), the TRCA Environmental Monitoring and Data Management (EMDM) Group staff completed a biological inventory of the Project Study Area, collecting data for the following:

- Flora Species;
- Frogs and Nocturnal Spring Birds;
- Breeding Songbirds; and
- Aquatic habitat information for a portion of West Duffins Creek near the Pickering Dyke; and
- Vegetation Communities (Direct Study Areas only).

Information about the TRCA's data collection methods are available in **Appendix A**. A butternut health assessment (BHA) was also completed by Palmer on August 12, 2019.

2.1 Background Information

The MNRF Natural Heritage Areas Make-a-Map website was reviewed (Ministry of Natural Resources and Forestry, 2019); the five 1x1 kilometre (km) grid squares (17PJ5457, 7PJ5557, 17PJ5657, 17PJ5556, 17PJ5656) that cover the project study area (**Appendix B and C**) show that the following provincial species at risk have been previously identified:

- American Eel (*Anguilla rostrate*) – Threatened
- Bank Swallow (*Riparia riparia*) – Threatened
- Butternut (*Juglans cinereal*) – Endangered
- Red Mulberry (*Morus rubra*) – Endangered
- Redside Dace (*Clinostomus elongatus*) – Endangered
- Snapping Turtle (*Chelydra serpentine*) – Special Concern

The MNRF Natural Heritage Areas Make-a-map website also indicated that the following identified natural areas exist within the project study area (**Figure 1**):

- Major-Spink Area – Environmentally Sensitive Area;
- Lower Duffins Creek Wetland Complex – Provincially Significant Wetland (PSW); and
- Unevaluated wetland along the main Duffins Creek north of the Pickering Dyke.

3. Natural Environment Existing Conditions

3.1 Wildlife Habitat

3.1.1 General Wildlife Habitat

In the Project Study Area (**Figure 1**), the West Duffins and Duffins Creeks flow through a diversity of forested habitats, which also contain inclusions of beach bars along the creeks, and open habitats, small wetlands and oxbow ponds within the mix of deciduous and coniferous trees. This wide range of natural features provides habitats for mammals, herptiles, birds and invertebrates. West Duffins Creek joins Duffins Creek near the Pickering Dyke, and Duffins Creek outlets into the Lower Duffins Creek Wetland

Complex and the Duffins Creek Coastal Wetland, providing a connection between Lake Ontario and natural areas north of the Pickering/Ajax urban boundaries.

3.1.2 Significant Wildlife Habitat

Significant Wildlife Habitat (SWH) is considered a significant feature in Provincial, Regional, and Municipal policies, following implementation of the Provincial Policy Statement (Ontario Ministry of Municipal Affairs and Housing, 2014). Significant Wildlife Habitat (SWH) is defined by the MNRF in the Significant Wildlife Habitat Technical Guide (OMNR 2000) and includes the following broad categories:

- seasonal concentration areas;
- rare vegetation communities or specialised habitats for wildlife;
- habitats of species of conservation concern, excluding the habitats of endangered and threatened species; and
- animal movement corridors.

Criteria for the identification of these features are also provided in the *Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E* (Ontario Ministry of Natural Resources and Forestry, 2015). These criteria were used to screen wildlife habitat within the Project Study Area for potentially significant wildlife habitat.

Potential SWH present within the Project Study Area would be associated with the large forested blocks, and riparian corridors which function as a local landscape feature providing wildlife movement functions and connectivity between Lake Ontario and upstream habitats. The SWH criteria were reviewed, and the Project Study Area has a higher potential to contain the following types:

- **Raptor Wintering Area:** The forested creek corridors provide linkages to the open meadow communities to the north, and may be attractive for birds of prey.
- **Bat Maternity Colonies:** many of the forested areas contain large, older trees near a water source. Older trees tend to have features such as loose bark and cavities that may function as roost opportunities.
- **Turtle Wintering Areas:** The oxbow pond near the Pickering dyke may provide still waters and loose gravel needed by turtles to hibernate.
- **Landbird Migratory Stopover Areas:** the area is a large woodland within 5 km of Lake Ontario, with a variety of habitats.
- **Rare Vegetation Communities:** Fresh – Moist Black Walnut Lowland Deciduous Forest Type (FOD7-4) is ranked as S2S3 by the Natural Heritage Information Centre (NHIC) (Ministry of Natural Resources and Forestry, 2019).
- **Bald Eagle and Osprey Nesting, Foraging and Perching Habitat:** the Project Study Area includes tall trees available for perches, adjacent to a watercourse.
- **Amphibian Breeding Habitat (Woodland):** The oxbow pond near the Pickering dyke provides an open water habitat >500 m^2 within a forested area. Frogs have been incidentally observed in the Project Study Area (**Figure 6**).

- **Special Concern and Rare Wildlife Species:** Snapping Turtle had previously been identified in the project study area and the TRCA field surveys identified the presence of Eastern Wood-pewee (*Contopus virens*). Both species are classified as Special Concern under the Species at Risk in Ontario (SARO) list.

3.2 Habitat Linkages and Corridors

The West Duffins and Duffins Creeks are considered Urban River Valleys that connect the Greenbelt Plan area north of Pickering/Ajax to Lake Ontario (Ontario Ministry of Municipal Affairs and Housing, 2017). Due to the presence of water and a variety of treed habitats, these areas provide a wildlife corridor for a variety of species moving between these two areas (**Figures 6 and 7**).

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3.3 Significant Vegetation Communities

3.3.1 General Vegetation Communities

Ecological Land Classification (ELC) mapping provided by the TRCA has been compiled and mapped for the Direct Study Areas and is presented in **Figures 3 and 4**. The ELC classification is based on the *Ecological Land Classification for Southern Ontario* (Lee, et al., 1998); however, some codes have been altered to describe site-specific conditions (CUT1-c).

The Pickering Dyke is surrounded by a mix of deciduous forest (e.g. FOD7, FOD8) and culturally modified but re-naturalizing communities (e.g. CUP, CUT, CUW), particularly on the south side of the dyke. This is reflective of the observed conditions, where forested communities contain large trees and natural species compositions, yet a certain degree of cultural influences are seen within most communities. A beach bar (BBO) is found within a meander of West Duffins Creek, as is an isolated oxbow pond (OAO), both within 25 m of the north side of the dyke.

The Ajax dyke is also surrounded by deciduous forest, along with a small patch of deciduous swamp on the east side of the dyke. There is a high degree of visible cultural influence, as the dominant tree in the area is Manitoba Maple, which is considered non-native in Ontario. A patch of planted coniferous trees stands out among the surrounding mainly deciduous landscape to the west side of the dyke.

3.3.2 Rare Vegetation Communities

Of the ELC Types mapped in the Direct Study Areas, the Fresh – Moist Black Walnut Lowland Deciduous Forest Type (FOD7-4) is ranked as S2S3 by the Natural Heritage Information Centre (NHIC) (Ministry of Natural Resources and Forestry, 2019). This community type is found north of Duffins Creek, on the opposite side from the Pickering Dyke. An S2S3 ranking shows that this community type is considered between "Imperiled" and "Vulnerable" in southern Ontario. For the FOD7-4 type, this is likely due to a limited habitat range, as it is largely associated with riparian habitats (Lee, et al., 1998), but also potentially from cultural influences.

3.3.3 Significant Woodlands

Following the Provincial Policy Statement (PPS), the Pickering and Ajax Official Plans define Significant Woodlands as "*an area which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size, or due to site quality, species composition, or past management history*". Criteria for determining significant woodlands are recommended by the Ministry of Natural Resources and Forestry (Ontario Ministry of Natural Resources, 2010), but an approach developed by a municipality that achieves or exceeds the same objective may also be used.

The woodlands in the study areas are large and diverse. The buffering and protection they provide the West Duffins and Duffins Creeks and the potential wildlife habitats and movement corridor opportunities are important functions of these woodlands. Therefore, these woodlands areas would likely meet the Ministry of Natural Resources and Forestry definitions of Significant Woodlands, and are mapped as part of the Natural Heritage System and Environmental Protection lands within the Pickering and Ajax Official Plans.

3.3.4 Significant Flora Species

Within the Project Study Area, the TRCA recorded flora Species of Regional Concern (ranked L1 to L3) and Urban Concern (L4) (Toronto and Region Conservation Authority, 2016). The species are listed in **Table 1**. All species noted during TRCA field studies were L3 or L4 (no L1 or L2 species). Species of Regional Concern are flagged as being at risk within the entire TRCA jurisdiction over the long term. Those species with an L3 rank may not currently be provincially rare, but they are highly sensitive to habitat loss and disturbances associated with changes in the surrounding landscape (**Figure 5**). Species and communities assigned an L4 rank are those that are widespread regionally but are vulnerable to long-term declines in urban areas.

Of these species, butternut (*Juglans cinerea*) is also listed on the SARO list as Endangered, and is protected by the *Endangered Species Act* (ESA) (Government of Ontario, 2007).

Table 1. TRCA Flora Species of Regional Concern

Common Name	Scientific Name	TRCA L-Rank	SARO
blue beech	*Carpinus caroliniana* ssp. *virginiana*	L4	
broad-leaved toothwort	*Cardamine diphylla*	L4	
bulblet fern	*Cystopteris bulbifera*	L4	
butternut	*Juglans cinerea*	L3	Endangered
clustered sanicle	*Sanicula odorata*	L3	
false nettle	*Boehmeria cylindrica*	L4	
long-styled blue cohosh	*Caulophyllum giganteum*	L4	
moonseed	*Menispermum canadense*	L3	
ninebark	*Physocarpus opulifolius*	L3	

paper birch	*Betula papyrifera*	L4	
red oak	*Quercus rubra*	L4	
silver maple	*Acer saccharinum*	L4	
white pine	*Pinus strobus*	L4	
white spruce	*Picea glauca*	L3	
wild ginger	*Asarum canadense*	L4	

TRCA L-rank: L1 to L3 considered to be of 'regional concern'
L4 considered to be of 'urban concern'
L5 considered to be 'not of concern'

3.4 Environmentally Sensitive/Significant Areas – Biological

In the Project Study Area, the Duffins Creek corridor between Brock Road and Kingston Road has been identified as the Major-Spink Environmentally Significant Area (Toronto and Region Conservation Authority, 1982). The 1982 report notes that "*much of the flood plain is dominated by willows (Salix spp.) and Manitoba Maple (Acer negundo). South of the river, patches of Eastern Hemlock (Tsuga canadensis) occur, while north of the river and east of Brock Road is an extensive mature forest of mixed species. The variety of tree species is a result of the change in moisture conditions, from the wet flood plain to the drier slopes. The area is located on the sand plain which was deposited in the shallow water environment of the glacial Lake Iroquois. Most of the soil is fine-grained sand*".

While information specific to the ESA is limited to the above, this report demonstrates natural heritage features and functions that would justify an ESA designation.

3.5 Fish and Fish Habitat

Both dykes are located in the Duffins Creek watershed (Toronto and Region Conservation Authority , 2004). The Ajax Dyke is located in the Lower Duffins subwatershed and the Pickering Dyke spans both the West Duffins and Lower Duffins subwatersheds. Within the Lower Duffins subwatershed, the main Duffins Creek is classified as large riverine; and within the West Duffins subwatershed, the streams are classified as intermediate riverine coldwater. The management target fish species for the Lower Duffins subwatershed is Smallmouth Bass (*Micropterus dolomieu*) and the target species for the West Duffins subwatershed is Redside Dace (*Clinostomus elongatus*) and Rainbow Trout (*Oncorhynchus mykiss*) (Toronto and Region Conservation Authority , 2004).

There is a sea lamprey barrier and trap located on the Lower Duffins Creek just west of Church and Mill Street in Ajax. The Sea Lamprey is a parasitic fish native to the Atlantic ocean and an invasive species in Ontario's freshwater ecosystems. Sea lamprey dams are either historical or purpose-built, and prevent anadromous adult Lamprey from entering watercourses to spawn. Similarly, larva and juvenile Lamprey require stream habitat for rearing and metamorphosis, and access to downstream lakes to complete its lifecycle to a parasitic adult. Freshwater fish in the great lakes that the Sea Lamprey parasitizes benefit from these damns, particularly the salmonids.

Habitat for the section of the Duffins and West Duffins Creeks in the vicinity of the Pickering Dyke is generally represented by riffle-run-pool stream morphology with a variety of in-stream habitat features, dense riparian areas and a larger surrounding natural feature.

The West Duffins Creek near DF003WM meanders through woodland with undercut eroded banks and point bars on most meanders. Iron deposits were detected on the banks of the watercourse in this stretch of the creek, suggesting the presence of springs or seeps. Aggradation in the watercourse is evidenced by riffles containing embedded coarse materials, the presence of medial bars and accretion on point bars. Some anthropogenic influence is present including armorstone walls installed on the south bank and undermined gabion basket. The creek is up to 500 mm deep in pools, with riffle depth averaging 230 mm during field investigations (**Appendix A**). In-stream aquatic vegetation is limited to filamentous and non-filamentous algae, with riparian grasses and shrubs and overhanging trees. In-stream fish habitat includes cover by woody debris and refuge in pools. The embedded coarse materials in the riffles may provide habitat to spawning salmon or salmonid species.

Downstream at the confluence of the West Duffins is a large oxbow on Duffins Creek. The Duffins has a wetted width of up to 7 m through this section with mid-channel depths of up to 250 mm. Duffins Creek contains a less prominent riffle-run-pool morphology, featuring longer stretches of runs. Fish habitat includes undercut banks, point bars and significant in-stream woody debris in this section of the watercourse. Aquatic vegetation is more abundant than in the West Duffins, with macrophytes and floating algae occurs though much of the watercourse.

The TRCA Open Data portal includes fish data for five sites in the general vicinity of the dykes (**Figure 2**), with two sites in the immediate vicinity of the Pickering Dyke: DF003WM and ACRES-SS (**Figure 2**). Site DF003WM is located west of Brock Road, approximately 150 metres (m) from the end of the Pickering Dyke on West Duffins Creek. This site is part of the TRCA's Regional Watershed Monitoring Program (RWMP) and is sampled on a three-year rotation. Sampling is conducted according to the Ontario Stream Assessment Protocol (OSAP) using a backpack electrofisher. Site DF003WM was sampled in 2003, 2006, 2009, 2012, 2015, and 2018. During those six sampling events, 12 fish species have been caught (**Table 2).**

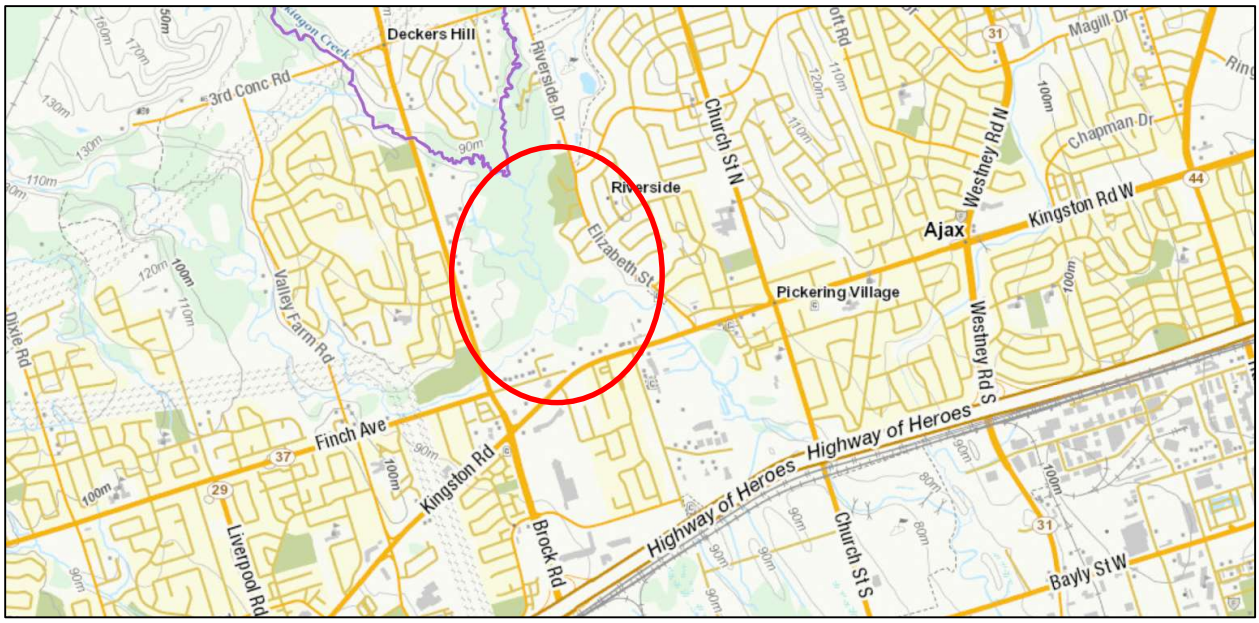
The ACRESS-SS site on the main Duffins Creek was sampled once in 2015 (**Table 2**). Eleven fish species were caught including Atlantic Salmon (*Salmo salar*). Atlantic Salmon were extirpated from Lake Ontario but have been stocked in Duffins Creek in an attempt to reintroduce the species.

The nearest RWMP site routinely sampled on the main Duffins Creek is DF001WM (downstream of Highway 401). DF001WM is approximately 1.7 km downstream from the Ajax Dyke. Because DF001WM is fairly close to Lake Ontario and the associated *Lower Duffins Creek Wetland Complex* (**Figure 2**), the fish species at this site are likely influenced by the Lake. Therefore, these fish species are presented in **Appendix D** but are not discussed as part of this memo. Fish data from RWMP sites DF004WM (upstream on Ganatsekiagon Creek) and DF005WM (upstream on Urfe Creek) are also presented in **Appendix D** for context but not discussed as part of this memo.

Table 2. TRCA Fisheries data near the Pickering and Ajax Dykes

	Main Duffins Creek	West Duffins Creek					
	ACRESS-SS	DF003WM					
	2015	2003	2006	2009	2012	2015	2018
Atlantic Salmon	X						
Blacknose Dace	X	X	X	X	X	X	X
Brook Stickleback	X						
Brown Trout						X	
Common Shiner	X	X	X	X			X
Creek Chub	X	X		X	X	X	X
Fathead Minnow	X						
Johnny Darter	X	X	X	X		X	X
Longnose Dace	X	X	X	X	X	X	X
Pumpkinseed		X		X			
Rainbow Darter	X	X	X	X	X	X	X
Rainbow Trout	X		X	X	X	X	
Smallmouth Bass		X					
Stonecat	X	X		X	X		
White Sucker		X	X	X	X	X	X

DFO aquatic SAR online mapping (accessed July 25, 2019) indicated that there was Redside Dace (provincially and federally Endangered) in Urfe and Ganatsekiagon Creeks, approximately 1 km north of the study area. Correspondence with the Ontario Ministry of Environment, Conservation, and Parks (MECP) indicated that the DFO map is out-of-date. During recent MECP sampling in spring 2019, Redside Dace were caught in the main Duffins Creek and the main Duffins Creek through the Project Study Area is now considered 'Occupied' habitat (J. Andersen, MECP, *pers. comm.*).



Map A: Snapshot of out-of-date DFO Aquatic Species at Risk online mapping (purple indicates SAR habitat; red circle indicates approximate Project Study Area).

3.6 Species of Concern

Information obtained from the MNRF Natural Areas Make-a-Map website (Ministry of Natural Resources and Forestry, 2019) indicated that there were five Threatened or Endangered SAR species within the Project Study Area, and one species of Special Concern, which include:

- American Eel (*Anguilla rostrate*) – Threatened
- Bank Swallow (*Riparia riparia*) – Threatened
- Butternut (*Juglans cinereal*) – Endangered
- Red Mulberry (*Morus rubra*) – Endangered
- Redside Dace (*Clinostomus elongatus*) – Endangered
- Snapping Turtle (*Chelydra serpentine*) – Special Concern

In addition, the 2019 TRCA fauna survey data indicated that the following species were observed in the Project Study Area:

- Chimney Swift (*Chaetura pelagica*) – Threatened
- Eastern Wood-pewee (*Contopus virens*) – Special Concern

In addition, there are three Endangered bat species in Ontario that could possibly inhabit a variety of forest habitats in southern Ontario:

- Little Brown Myotis (*Myotis lucifugus*) – Endangered
- Northern Myotis (*Myotis septentrionalis*) – Endangered

- Tri-colored Bat (*Perimyotis subflavus*) – Endangered

Protection provisions for species and their habitat within the *ESA* apply only to those species listed as Endangered or Threatened on the SARO list. The habitats of Species of Special Concern may be protected under the Provincial Policy Statement (Ontario Ministry of Municipal Affairs and Housing, 2014).

The TRCA noted that two Butternut trees (Endangered) were present in the Direct Study Areas, one near each of the dykes (**Figure 5**). A Butternut Health Assessment (BHA) was completed by Palmer on August 12, 2019, where an additional Butternut tree was observed on the Pickering Dyke (**Appendix E**). Butternut trees suffer from a highly transmissible fungal disease called butternut canker (*Ophiognomonia clavigignenti-juglandacearum*). Butternut canker is causing very rapid decline in this tree species across its native range. The fungal disease is easily transmitted by wind and is very difficult to prevent. Trees often die within a few years of infection by butternut canker (Ontario Ministry of Natural Resources and Forestry, 2014).

The BHA indicated that the Butternut tree near the Pickering Dyke and the tree directly on the Ajax Dyke (trees #1 and #3 – **Figure 5**) are Category 1 trees (non-retainable), while tree #2, further from the Ajax Dyke is a Category 2 tree (retainable) (Ministry of Natural Resources and Forestry, 2014). A hybrid butternut/walnut tree was also identified on the Ajax Dyke; hybrids are not protected under the ESA.

In summary, there are nine listed SARO species and two Special Concern species with potential or confirmed habitat within the Project Study Area. A habitat suitability screening is provided below, contrasting the list of potential SAR in the general vicinity of the proposed works with the observed species and available habitats (**Table 3**).

Table 3. SAR Habitat Screening

Species	Habitat Requirement Overview	Habitat Suitability
American Eel – Threatened	In fresh water, preferred habitat can be found in lakes and rivers including all waters extending from the high-water mark down to at least a 10 m depth.	Possible
Bank Swallow – Threatened	The Bank Swallow readily breeds in a wide variety of low-elevation (< 900 masl) natural and anthropogenic habitats, including: lake and ocean bluffs; stream and riverbanks; sand and gravel pits; roadcuts; and piles of sand, topsoil, sawdust, coal ash, and other materials. Nest burrows are nearly always in a vertical or near-vertical bank.	Possible / Probable
Butternut – Endangered	Butternut trees, which at one time were much more common to the south extending to the northern aspect of zone 6E, have been declining due to factors including forest loss and disease.	Confirmed by species presence
Chimney Swift – Threatened	The chimney swift is a Threatened species which breeds in Ontario and winters in northwestern South America. It is found mostly near urban areas where the presence of chimneys or other manmade structures provide nesting and roosting habitat. Prior to settlement, the chimney swift would mainly nest in cave walls and hollow tress. The chimney swift initially benefitted from human settlement; however, recent declines in flying insects and the modernization of chimneys are factors attributed to their current population declines.	Confirmed by species presence in appropriate habitat.
Eastern Wood-pewee – Special Concern	The eastern wood-pewee population has been gradually declining since the mid-1960's (The Cornell Lab of Ornithology, 2015). The eastern wood-pewee is a "flycatcher", a bird that eats flying insects, that lives in the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. It prefers intermediate-age forest stands with little understory vegetation. Threats to the population are largely unknown; however, causes may include loss of habitat due to urban development and decreases in the availability of flying insect prey (Ministry of Natural Resources and Forestry, 2014).	Confirmed by species presence in appropriate habitat.
Red Mulberry – Endangered	In Canada, red mulberry is only found in the Carolinian Zone (the small area of Ontario southwest of Toronto to Sarnia down to the shores of Lake Erie) near rivers, the shores of Lake Erie, and the slopes of the Niagara Escarpment (Ministry of Natural Resources and Forestry, 2015). In Ontario, red mulberry grows in moist forested habitats on both sandy and limestone-based loamy soils. It prefers areas where the forest canopy is open, allowing sunlight to reach the forest floor, but will tolerate some shade	Absent (Last recorded in Project Study Area in 1894)
Redside Dace – Endangered	Redside Dace prefer small streams and headwater areas with a gravel bottom. Overhanging grasses and shrubs provide ideal habitat as this species is adapted to jumping up to 10 cm out of the water to feed on insects. Changes to stream flow and shape resulting in loss of habitat caused by	Confirmed by MECP sampling event.

Species	Habitat Requirement Overview	Habitat Suitability
	urban and agricultural channel alterations are the most significant threats to this species (Ministry of Natural Resources and Forestry, 2014).	
Snapping Turtle – Special Concern	Snapping turtles spend most of their lives in water and travel slightly upland to gravel or sandy embankments or beaches to lay their eggs (Ontario Ministry of Natural Resources and Forestry, 2014).	Probable
Little Brown Myotis – Endangered	Maternal Roosts: Often associated with buildings (attics, barns etc.). Occasionally found in trees (25-44 cm in diameter at breast height [DBH]).	Possible
Northern Myotis – Endangered	Maternity Roosts: Often associated with cavities of large diameter trees (25-44 cm DBH). Occasionally found in structures (attics, barns etc.)	Possible
Tri-coloured Bat – Endangered	Maternity Roosts: Can be in trees or dead clusters of leaves or arboreal lichens on trees. May also use barns or similar structures	Possible

3.7 Exotic/Alien Invasive Species

The municipalities of Pickering and Ajax are part of the Greater Toronto Area (GTA), and as a consequence do contain a high percentage of exotic and non-native species. The Early Detection and Distribution Mapping for the Pickering and Ajax municipalities was reviewed (EDDmapS Ontario, 2019). Of the species recorded, the following flora species may be present within the Duffins Creek valley system with a noted degree of invasiveness:

- dog-strangling vine, European swallowwort - *Vincetoxicum rossicum;*
- European buckthorn - *Rhamnus cathartica;*
- European common reed - *Phragmites australis* ssp. *australis;*
- European frog-bit - *Hydrocharis morsus-ranae;*
- garlic mustard - *Alliaria petiolata;*
- giant hogweed - *Heracleum mantegazzianum;* and
- purple loosestrife - *Lythrum salicaria.*

The following aquatic and semi-aquatic exotic and non-native species have been recorded in Pickering and Ajax, and may be present within the Duffins Creeks themselves:

- goldfish - *Carassius auratus;*
- rainbow smelt - *Osmerus mordax;*
- round goby - *Neogobius melanostomus;*
- threespine stickleback - *Gasterosteus aculeatus;*
- white perch - *Morone americana;*
- amazon sailfin catfish - *Pterygoplichthys pardalis*
- rusty crayfish - *Orconectes rusticus;* and
- bloody red shrimp - *Hemimysis anomala.*

3.8 Wildlife Populations

3.8.1 Birds

The TRCA recorded 37 bird species during their field visits. Of the 38 species, three (3) were considered exotic species (L+) and 19 were considered 'not of concern' (L5). The L3 and L4 species are listed in **Table 4**. Bird species with a breeding status of 'probable' or 'confirmed' are shown on **Figure 6**.

Table 4. Birds of Regional Concern Observed in Project Study Area (TRCA 2019)

Scientific	Common Name	TRCA L-Rank	SARO	Breeding Status
Geothlypis philadelphia	mourning warbler	L3		Probable
Dumetella carolinensis	grey catbird	L4		Probable
Pheucticus ludovicianus	rose-breasted grosbeak	L4		Confirmed
Colaptes auratus	northern flicker	L4		Probable
Contopus virens	eastern wood-pewee	L4	Special Concern	Probable
Sitta carolinensis	white-breasted nuthatch	L4		Possible
Setophaga ruticilla	American redstart	L4		Probable
Vireo olivaceus	red-eyed vireo	L4		Probable
Corvus corax	common raven	L4		Non-breeding
Archilochus colubris	ruby-throated hummingbird	L4		Uncertain
Passerina cyanea	indigo bunting	L4		Probable
Ceryle alcyon	belted kingfisher	L4		Possible
Myiarchus crinitus	great crested flycatcher	L4		Possible
Picoides villosus	hairy woodpecker	L4		Possible
Chaetura pelagica	chimney swift	L4	Threatened	Possible

TRCA L-Rank: L1 to L3 considered to be of 'regional concern'
L4 considered to be of 'urban concern'
L5 considered to be 'not of concern'

3.8.2 Herptiles

The TRCA completed frog monitoring in spring 2019 as per the methods outlined in **Appendix A**. The TRCA staff observed two frog species within the Direct Study Areas – grey treefrog (*Hyla versicolor*) near the Pickering Dyke and green frog (*Lithobates clamitans*) near the Ajax Dyke (**Figure 7**). Midland painted turtle (*Chrysemys picta*) was also recorded in the Project Study Area, north of the Ajax Dyke.

The TRCA has categorized the grey treefrog as 'L2' and considers it as a species of 'regional concern'. "*Grey treefrogs live in a variety of forest habitats but require permanent or ephemeral wetlands for breeding (Canadian Herpetological Society, 2017). The wetlands are usually in open-canopy areas in close proximity to forest habitats* (e.g. the oxbow pond near the Pickering Dyke). *Breeding sites are typically fish-free and the introduction of predatory fish can result in the loss of the grey treefrog from the site"*.

The TRCA has categorized the green frog as 'L4' which means it is a species of 'urban concern'. This means that the species is common to rural/forested areas, but it is not usually found / no longer found within urban habitats within the TRCA jurisdiction. "*Green Frogs can be found in most aquatic habitats, ranging from large lakes and rivers to small creeks and ponds, but they require permanent bodies of water for breeding and hibernation*" (Canadian Herpetological Society, 2017).

Midland painted turtle is considered 'L3' by the TRCA, being of regional concern. "*Painted Turtles prefer shallow aquatic habitats with slow-moving water, soft bottoms, aquatic vegetation, and abundant basking sites. Painted Turtles overwinter at the bottom of water bodies or under submerged undercut banks*" (Canadian Herpetological Society, 2017).

The TRCA also recorded two other frog species north of the Project Study Area: Northern leopard frog (*Lithobates pipiens*) and wood frog (*Lithobates sylvaticus)*. Northern leopard frog has been ranked as a L3 species and wood frog are ranked as a L2 species.

All four of these frog species and midland painted turtle are considered 'Secure' (S5) in Ontario by the NHIC and are not listed under SARO (Ministry of Natural Resources and Forestry, 2019).

3.8.3 Other Wildlife

During the 2019 site visits (**Appendix A**), TRCA staff recorded five species incidentally: eastern chipmunk (*Tamias striatus*), eastern cottontail (*Sylvilagus floridanus*), woodchuck (*Marmota monax*), red squirrel (*Tamiasciurus hudsonicus*), and white-tailed deer (*Odocoileus virginianus*) (**Figure 7**).

All of these species are common, generalist and urban-adapted species. Other urban-adapted species such as grey squirrel (*Sciurus carolinensis*), striped skunk (*Mephitis mephitis*) and racoon (*Procyon lotor*) are also expected to be present.

3.9 Wetlands

Provincially Significant Wetlands (PSW) are not found in the Project Study Area. The Lower Duffins Creek Wetlands Complex PSW (**Figure 1**) is found south of the Project Study Area, merging with the Duffins Creek Coastal Wetland PSW at Lake Ontario. Several smaller unevaluated wetlands are found within the Duffins Creek system (**Figure 1**), though these are also not in the general vicinity of the dykes, with all being >120 m distant. However, a small inclusion of Silver Maple Mineral Deciduous Swamp (SWD3-2) was mapped on the east side of the Ajax Dyke during TRCA field surveys.

4. Discussion of Preliminary Constraints and Future Considerations

There are several SAR in the vicinity of the study area as well as potential habitat for SAR. The following SAR have been confirmed in the study area:

- Butternut (tree);
- Chimney swift (bird);
- Eastern wood-pewee (bird); and
- Redside Dace (fish).

Three Butternut trees, an Endangered species, have been confirmed on-site near the dykes (**Figure 5**). The BHA indicated that the Butternut tree near the Pickering Dyke and the tree directly on the Ajax Dyke (trees 1 and 3 – **Figure 5**) are Category 1 trees (non-retainable), while the tree further from the Ajax Dyke is a Category 2 tree (retainable) (Ministry of Natural Resources and Forestry, 2014).

Eastern wood-pewee and Chimney Swift have been confirmed in the Project Study Area. To mitigate potential impacts to SWH for these species and avoid Migratory Bird Convention Act (MBCA) implications during the construction phase of the project, compliance with the MBCA may be achieved using the following due diligence approach:

- Proponent awareness of the MBCA and the potential for bird nesting in the area and for inadvertent impacts to migratory birds, nests and eggs; and
- Avoiding vegetation removal within the "regional nesting period" for this area (generally **late April to August 1**).

The main Duffins Creek is designated as 'occupied' Redside Dace habitat. Although the West Duffins Creek is not currently designated as 'contributing' habitat, the MECP may decide to do so in the future. Because of the presence of SAR, the appropriate agencies (e.g. MECP) will need to be informed about the project, and the appropriate planning and permitting may be required. The area of habitat protection for Redside Dace typically includes the watercourse plus the nearby riparian areas and banks, which is determined as the meander belt width plus 30 m. For infrastructure projects, habitat protection is usually accomplished via adherence to best management practices (Ministry of Natural Resources and Forestry, 2016) and avoiding warmwater timing windows. As a measure of conservatism, all in-water and near-water works should be completed during the recommended timing window for this area (i.e. July 1 to September 15) (Ministry of Natural Resources and Forestry, 2014).

In addition to the observed SAR, there is a frog species of 'Regional Concern' in the study area. The grey treefrog, which was located near the Pickering Dyke, has a specific breeding habitat requirement of a fish-free wetland. There was an open area of water (labelled OAO1-T on **Figure 3**) north of the Pickering dyke which may be acting as the breeding area for this species. To avoid interactions with this potential SWH area, the OAO1-T area should be avoided during the main period for frogs (**early April to August 1**).

The following investigations/tasks are recommended to be conducted in support of subsequent study phases:

- Butternut tree health assessment – the trees in the study area have been identified and assessed by a certified Butternut Tree Assessor. Works within the 25 m habitat buffer of a butternut are considered an 'injury' to the tree under the ESA. Therefore, with the conditions and locations of the trees known, planning should be undertaken to avoid these trees to the extent possible, tree #2 in particular. Any unavoidable works within the 25 m habitat buffer of these trees must be registered on the MNRF Notice of Activity Registry, but are not expected to present a constraint to the project. While the Category 1

trees could be removed subsequent to Registry, mitigation or compensation would be required for injury/removal of the Category 2 tree (tree #2 – **Figure 5**) in order to comply with the ESA.

- Consideration should be given to determining the meander belt width for the study area to determine Redside Dace protected habitat in order to coordinate the project with the MECP.

- Project scheduling to avoid works near water within the breeding period for frogs (**early April to August 1**).
- Project scheduling to avoid the C2 "regional nesting period" for birds, which is primarily **April 15 to the end of August** (Government of Canada, 2019).

- To avoid potential impacts to bat species, all tree removals should be completed outside the bat maternity roost season and hibernation period of **May 15 to September 15** (Ontario Ministry of Natural Resources, 2011; Ministry of Natural Resources, 1984).

- By avoiding tree clearing within the **May 15 to September 15** timing window, potential impacts to both breeding birds and roosting bats should be avoided.

- If tree clearing cannot be avoided during the **May 15 to September 15** timing window, the trees to be cleared should be identified, and a "nest sweep" and bat activity survey should be completed by a qualified biologist.

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CLIENT: KGS Group

PROJECT: Pickering-Ajax Dykes EA

PREPARED BY: Palmer

0 100 200 300 metres

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PROJECT NO.	1903601
REVISION:	1-3
DATE:	Mar 24, 2020
SCALE:	1:16500
DRAWN:	BE
DATUM:	NAD 1983
CHECKED:	AA
PROJECTION:	UTM zone 17

LEGEND:

- Project Study Area
- Direct Study Area
- Provincially Significant Wetland
- Wetland (Not Evaluated)
- Dyke Centre Line (Approx.)
- Watercourse (TRCA)

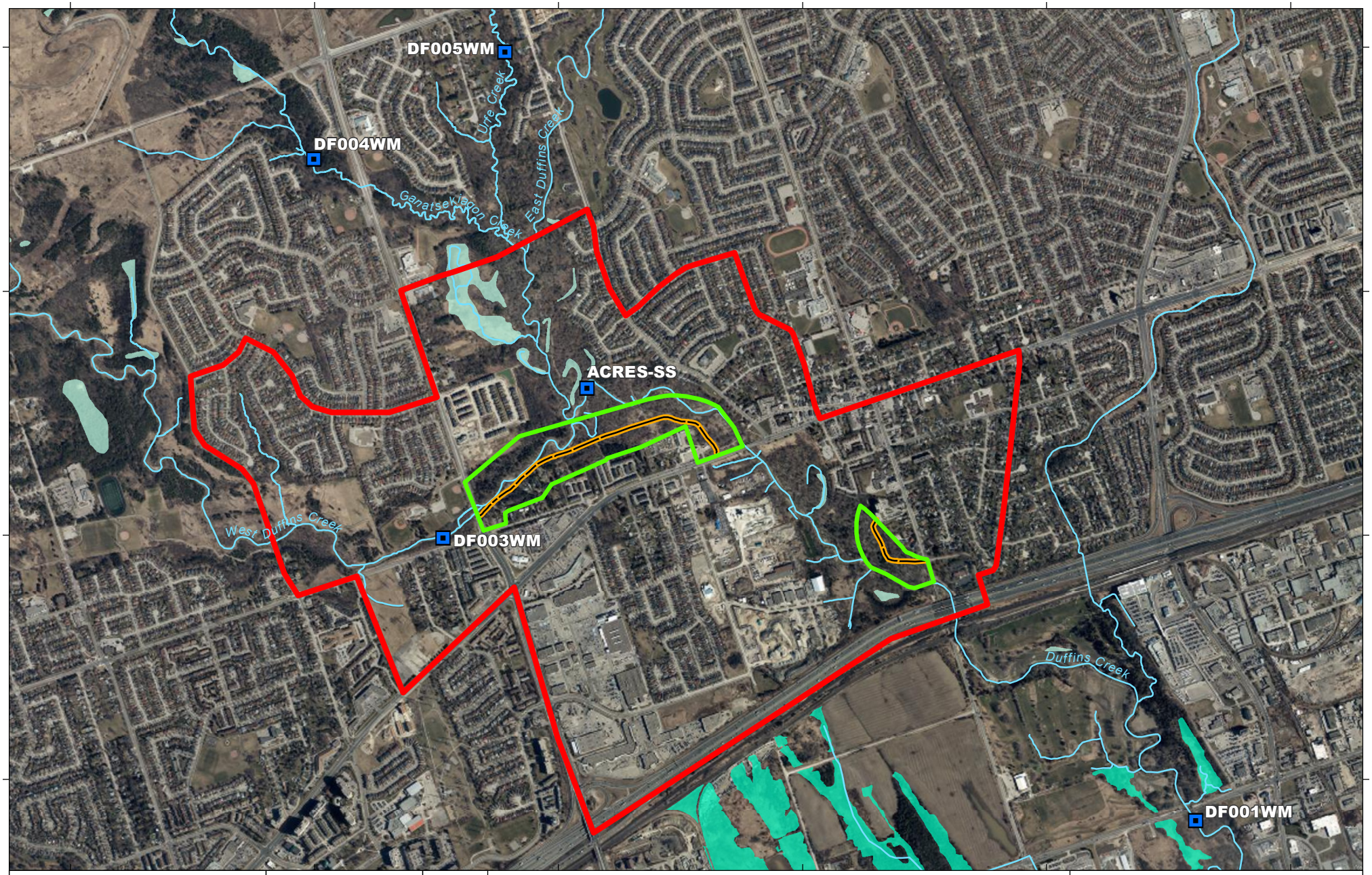
Imagery (2018) provided by TRCA

TITLE:

Study Areas

Figure 1

Document Path: C:\Egnyte\Shared\Projects\Active\19036 - KGS Group\1903601 - Pickering-Ajax Dykes EA\Mapping\Figures\5_ArcGIS\Ecology\1903601_1-1-2_Study Areas.mxd



CLIENT: KGS Group

PROJECT: Pickering-Ajax Dykes EA

PREPARED BY: Palmer

0 100 200 300 400 metres

N

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REVISION:	1-2
DATE:	Mar 23, 2020
SCALE:	1:21000
DRAWN:	BE
DATUM:	NAD 1983
CHECKED:	AA
PROJECTION:	UTM zone 17

LEGEND:

- Project Study Area
- Direct Study Area
- Dyke Centre Line (Approx.)
- Watercourse (TRCA)
- Fish Station (TRCA)
- Provincially Significant Wetland
- Wetland (Not Evaluated)

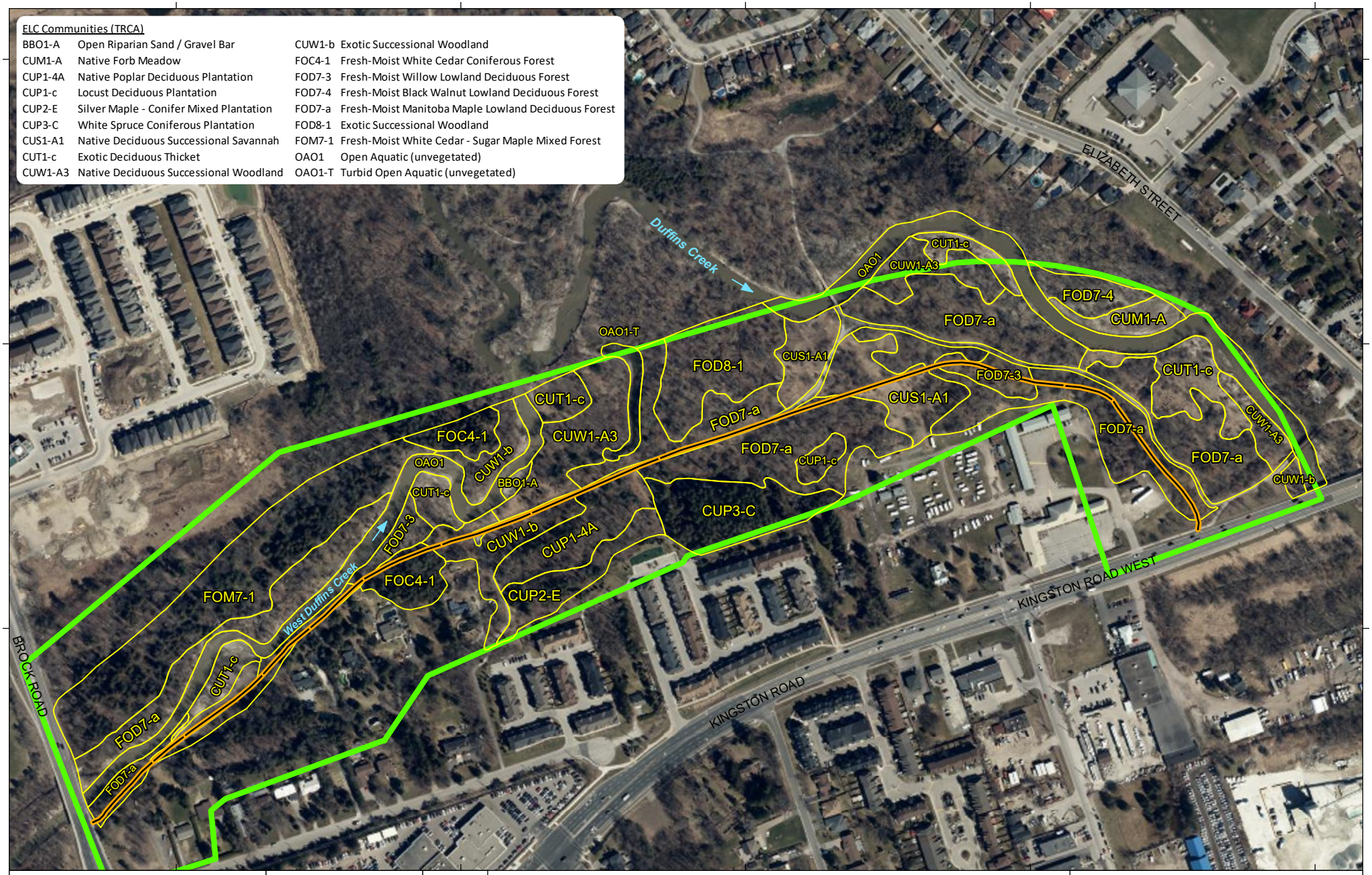
Imagery (2018) provided by TRCA

TITLE:

Aquatic Resources

Figure 2

Document Path: C:\Egnyte\Shared\Projects\Active\19036 - KGS Group\1903601 - Pickering-Ajax Dykes EA\Mapping\Figures\5_ArcGIS\Ecology\1903601_2-1-1_Aquatic Resources.mxd



CLIENT: KGS Group

PROJECT: Pickering-Ajax Dykes EA

PREPARED BY: Palmer

0 25 50 75 100 metres

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PROJECT NO.	1903601
REVISION:	1-2
DATE:	Mar 24, 2020
SCALE:	1:4500
DRAWN:	BE
DATUM:	NAD 1983
CHECKED:	AA
PROJECTION:	UTM zone 17

LEGEND:

- Direct Study Area
- ELC Community (TRCA)
- Dyke Centre Line (Approx.)

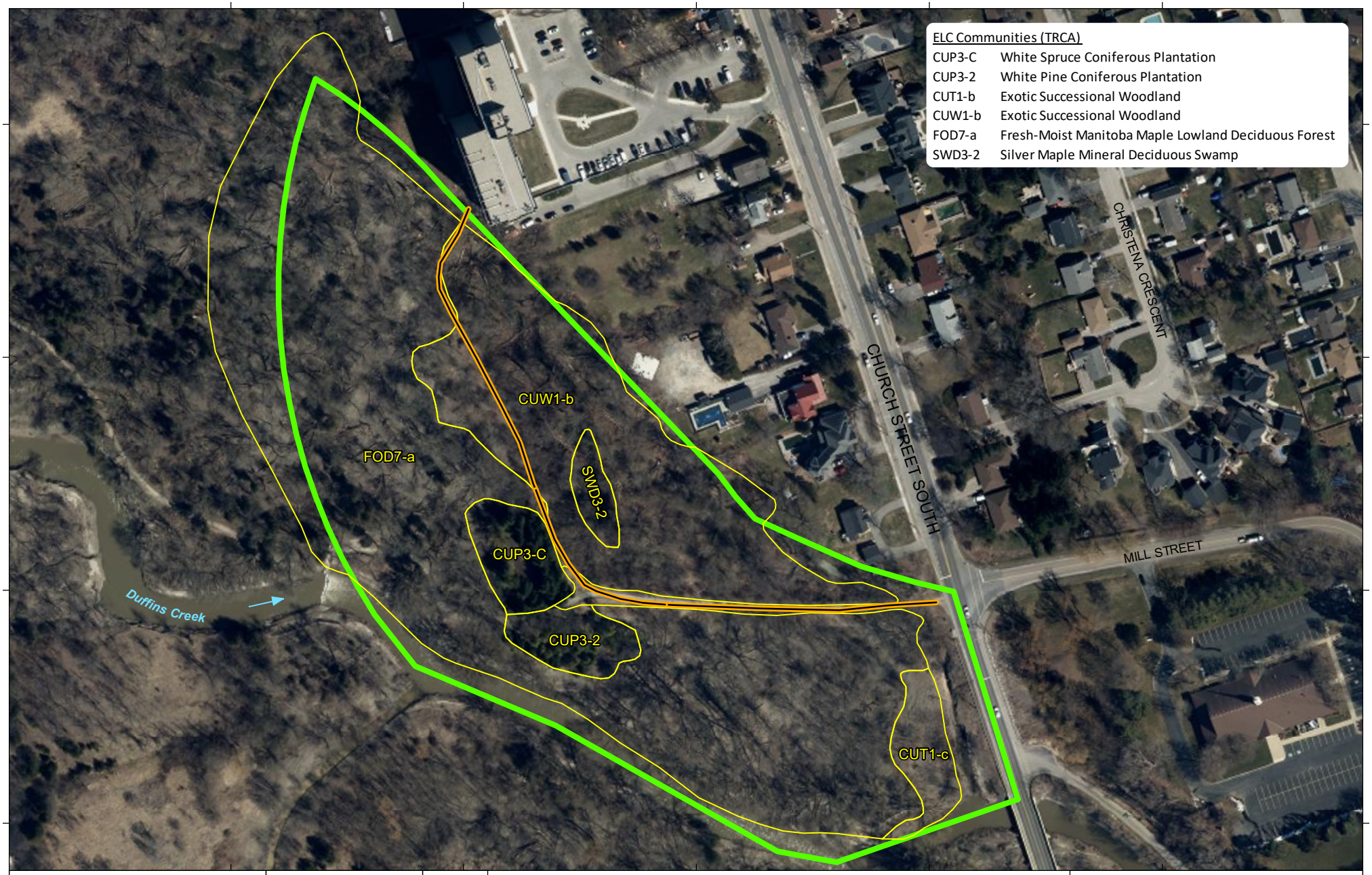
Imagery (2018) provided by TRCA

TITLE:

Terrestrial Resources - Pickering Dyke ELC

Figure 3

Document Path: C:\Egnyte\Shared\Projects\Active\19036 - KGS Group\1903601 - Pickering-Ajax Dykes EA\Mapping\Figures\5_ArcGIS\Ecology\1903601_3-1-1_Terrestrial Pickering ELC.mxd



CLIENT: KGS Group

PROJECT: Pickering-Ajax Dykes EA

PREPARED BY: Palmer

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metres

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DATE:	Mar 24, 2020
SCALE:	1:2200
DRAWN:	BE
DATUM:	NAD 1983
CHECKED:	AA
PROJECTION:	UTM zone 17

LEGEND:
- Direct Study Area
- ELC Community (TRCA)
- Dyke Centre Line (Approx.)

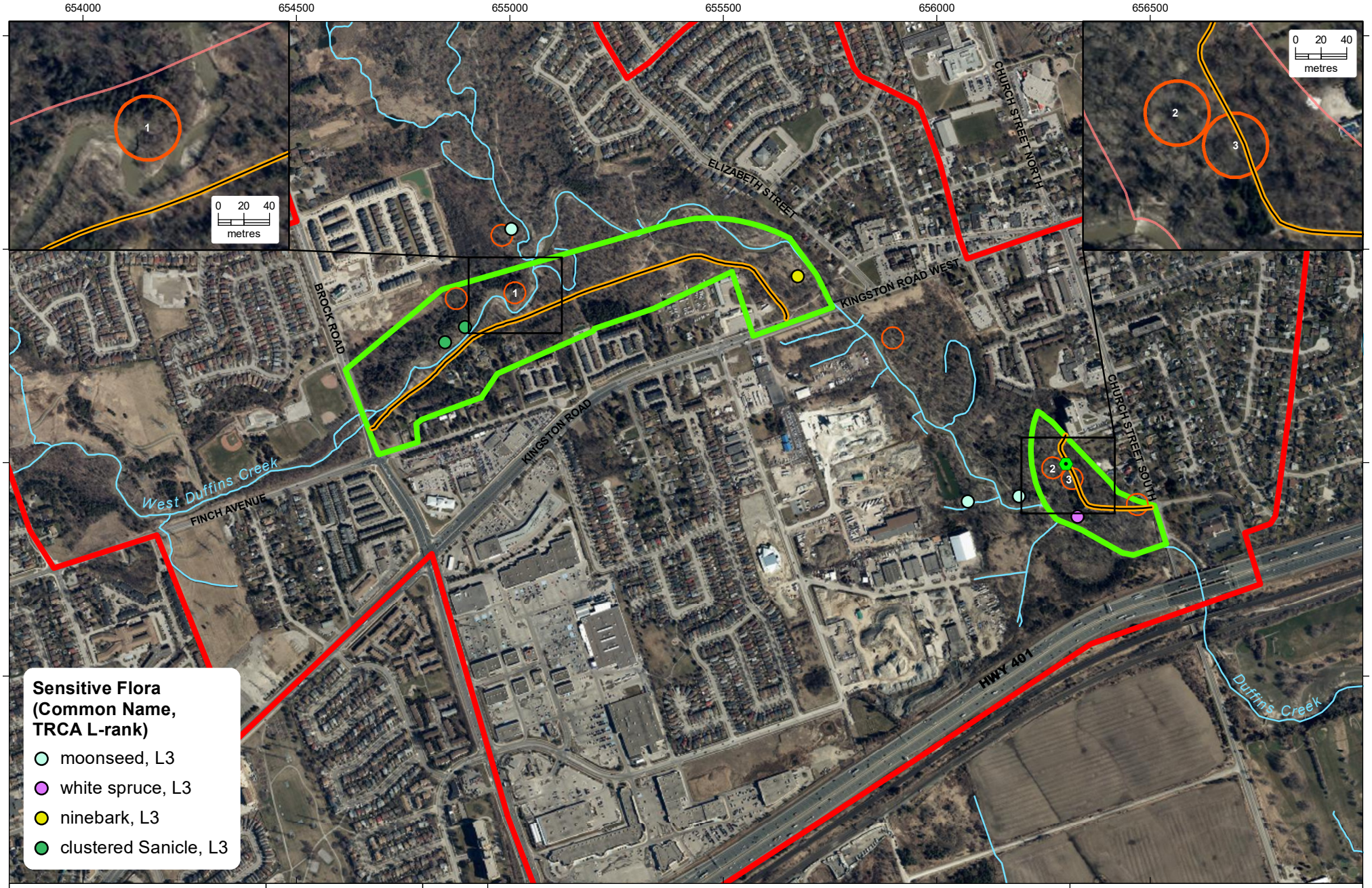
Imagery (2018) provided by TRCA

TITLE:

Terrestrial Resources - Ajax Dyke ELC

Figure 4

Document Path: C:\Egnyte\Shared\Projects\Active\19036 - KGS Group\1903601 - Pickering-Ajax Dykes EA\Mapping\Figures\5_ArcGIS\Ecology\1903601_4-1-1_Terrestrial Ajax ELC.mxd



CLIENT: KGS Group

PROJECT: Pickering-Ajax Dykes EA

PREPARED BY: Palmer

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DRAWN:	BE
DATUM:	NAD 1983
CHECKED:	AA
PROJECTION:	UTM zone 17

LEGEND:

- Project Study Area
- Direct Study Area
- Dyke Centre Line (Approx.)
- Watercourse (TRCA)
- Hybrid Walnut Species (Palmer)
- Butternut Tree General Location

Imagery (2018) provided by TRCA

TITLE:

Terrestrial Resources – Sensitive Flora

Figure 5

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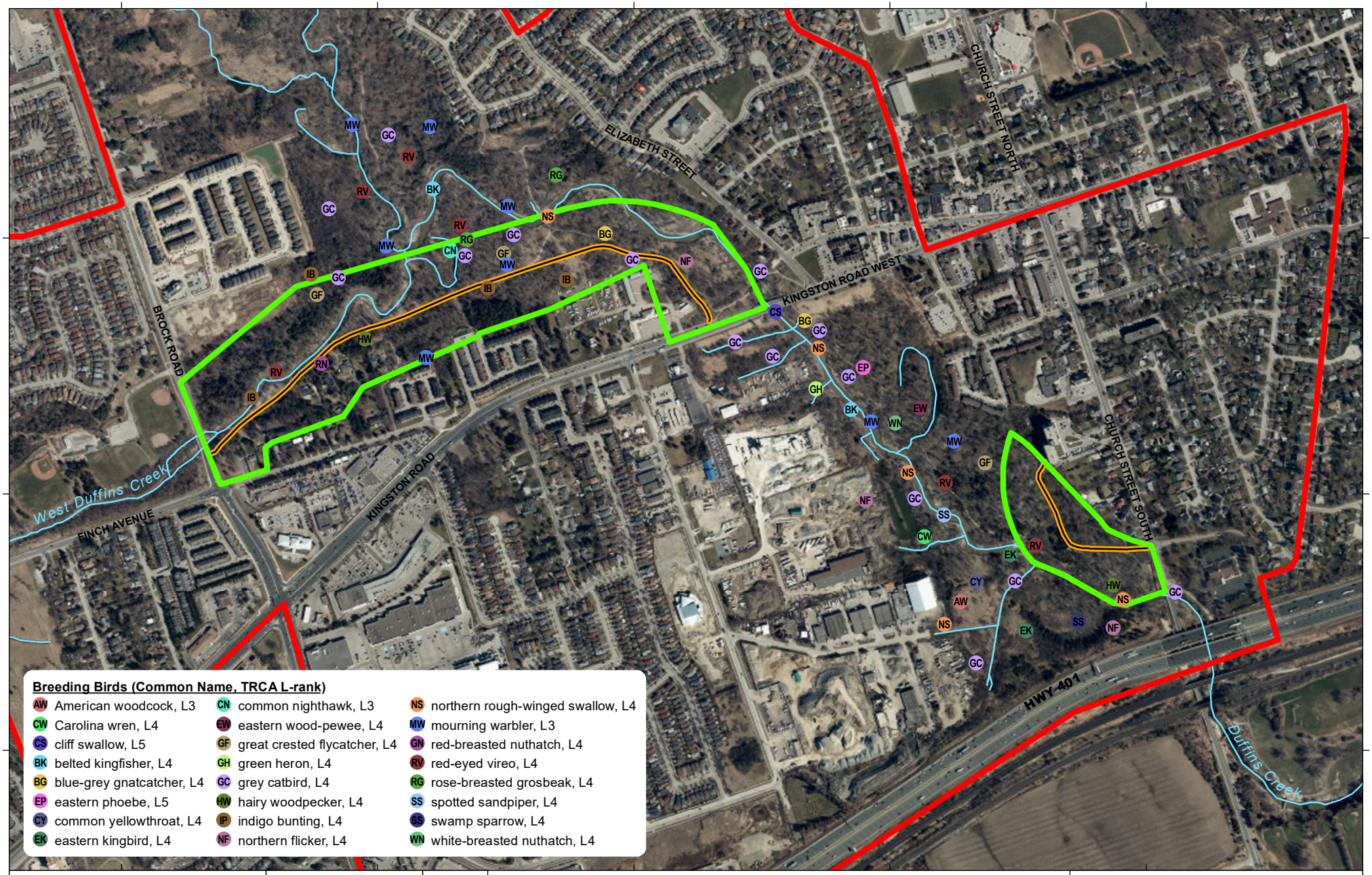

CLIENT: KGS Group

PROJECT: Pickering-Ajax Dykes EA

PREPARED BY: Palmer

0 50 100 150 200 metres

N

PROJECT NO.	1903601
REVISION:	1-2
DATE:	Mar 23, 2020
SCALE:	1:10000
DRAWN:	BE
DATUM:	NAD 1983
CHECKED:	AA
PROJECTION:	UTM zone 17

LEGEND:

- Project Study Area
- Direct Study Area
- Dyke Centre Line (Approx.)
- Watercourse (TRCA)

Imagery (2018) provided by TRCA

TITLE:

Terrestrial Resources – Breeding Birds

Figure 6

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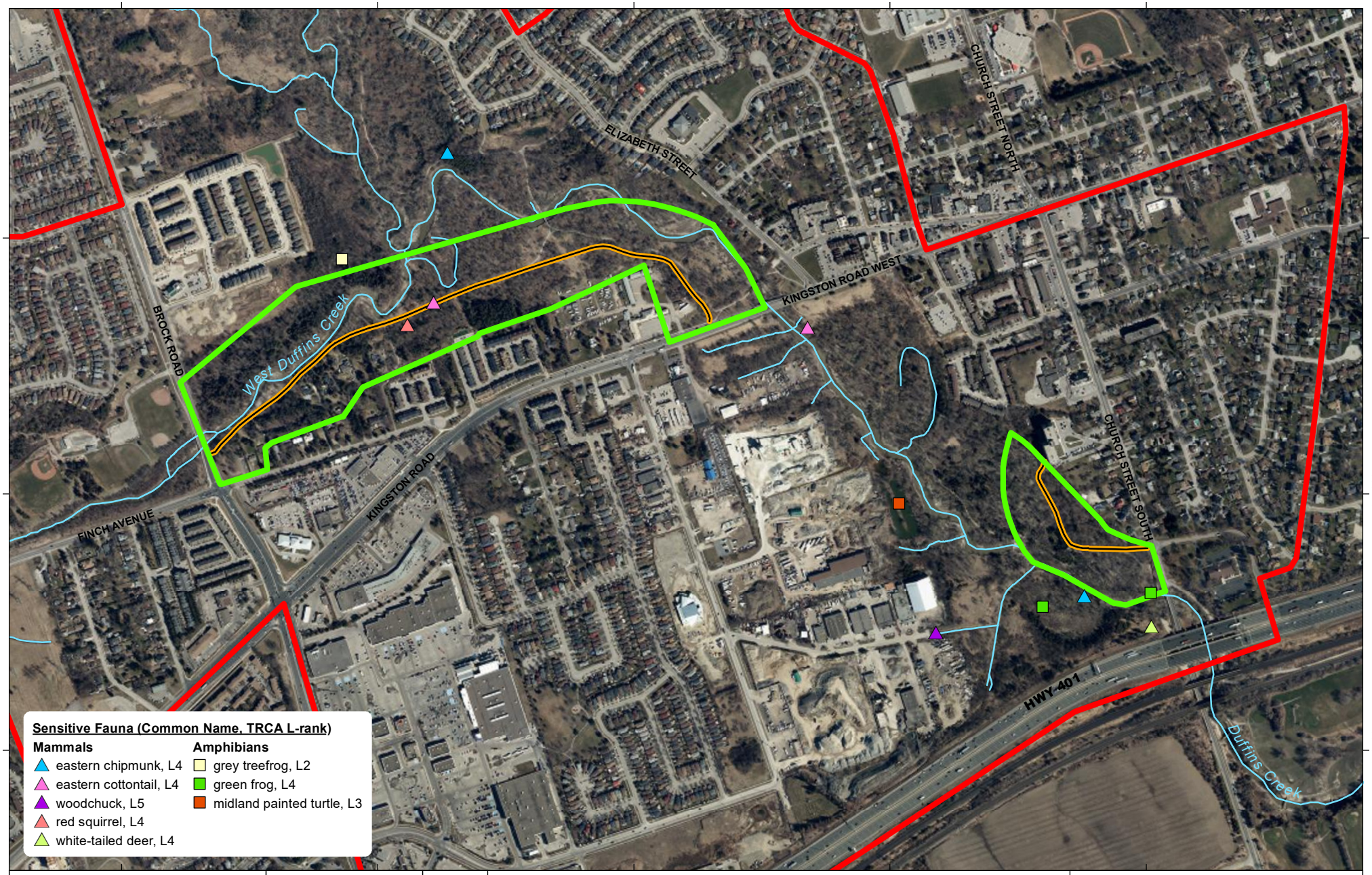

CLIENT: KGS Group

PROJECT: Pickering-Ajax Dykes EA

PREPARED BY: Palmer

0 50 100 150 200 metres

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PROJECT NO.	1903601
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LEGEND:

- Project Study Area
- Direct Study Area
- Dyke Centre Line (Approx.)
- Watercourse (TRCA)

Imagery (2018) provided by TRCA

TITLE:

Terrestrial Resources – Sensitive Fauna

Figure 7

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Appendix A

TRCA Methods Memo

Subject: Ajax Pickering Dyke EA Biological Inventory

Date: July 23, 2019

From: Sue Hayes (Senior Project Manager – Terrestrial Inventories & Monitoring)

A terrestrial biological inventory of the Ajax Pickering Dyke EA was completed in 2019.This inventory work was completed by the Environmental Monitoring and Data Management (EMDM) Group at the request of TRCA's Development and Engineering Services.

Data Collection Methodology

Vegetation community, flora species and fauna species data were collected through field surveys. Surveys were carried out at the appropriate times of year to assess breeding status in the case of amphibians and birds, and during the optimal growing period of the various plant species and communities. Vegetation communities and flora species were surveyed concurrently.

Botanical fieldwork was conducted in 2019 between the months of May through June (Table 1). Locating and identifying ephemeral flora species is a primary focus in the early spring months before the full closure of forest canopy occurs. The bulk of the vegetation community work was completed in June when characteristics of community and non-ephemeral flora species are at their peak. Vegetation community designations were based on the Ecological Land Classification (ELC) and determined to the level of vegetation type (Lee *et al.* 1998). Community boundaries were outlined on printouts of 2017 digital ortho-rectified photographs (ortho-photos) at a scale of 1:2000 and then digitized in ArcView.

Flora Species of Regional Concern (ranked L1 to L3) and Urban Concern (L4) were mapped as point data, and the approximate population size recorded for each point. A list of all other species observed was documented for the site.

Table 1. Survey dates and effort for the 2019 biological inventories.

Survey Item	Survey Dates	Survey Effort
Vegetation Communities and Flora Species	2019: May 22 and May 31, June 1, 18 and 21	22 hours
Frogs and Nocturnal Spring Birds	2019: April 4	1.5 hours
Breeding Songbirds	2019: June 4, 11, 20 and 21	4.5 hours

Breeding bird surveys were conducted on dates in June (Table 1). The April evening visit surveyed for breeding frog species of Regional Concern; they also incidentally surveyed for early-spring nocturnal bird species, including owls and American woodcock (*Scolopax minor*). Surveys in June point-mapped breeding bird territories for L1 - L4 Species of Regional and Urban Concern. Other breeding birds (L5 and exotic) were listed, but not mapped.

Breeding bird surveys were conducted at least twice during the breeding season (early and late June) to assess the breeding status of each mapped individual. Categorization of possible, probable or confirmed breeding status for birds followed the method used for Ontario Breeding Bird Atlas data collection (Cadman *et al*. 2007). All initial visits were completed by the end of the third week of June. Bird observations recorded prior to June 16 were validated through a second visit later in the season. A quality assurance process filtered out individuals likely to be migrants in transit, rather than on-site breeders.

The full data collection methods can be viewed at:

Toronto and Region Conservation Authority (TRCA). 2007d. *Terrestrial Natural Heritage Program Data Collection Methodology*. Toronto and Region Conservation Authority. Available on-line at: https://trca.ca/conservation/greenspace-management/terrestrial-natural-heritage/

Project Team

Paul Prior – Fauna Biologist

Paul has been leading fauna inventories for the TRCA for the past 19 years, primarily in the east end of the region. Before coming to the TRCA, he ran field stations for Long Point Bird Observatory on Lake Erie from 1991 to 1997. He has been watching birds for the past 47 years!

Natasha Gonsalves – Flora Biologist

Natasha has been conducting botanical inventories with TRCA for the past 12 years. She is certified in Ecological Land Classification and Wetland Evaluation in Southern Ontario. In her role as a flora biologist, she is responsible for the data collection, management, analysis, and reporting of inventory and monitoring data.

June 11, 2019

TO: Melody Brown P.Eng, (Project Manager), and Nick Lorrain (Senior Manager) Capital Projects Engineering Services, Development and Engineering Services

CC: Scott Jarvie (Assc. Director), and Rick Portiss (Senior Manager), Environmental Monitoring and Data Management Section, Toronto and Region Conservation Authority.

Internal TRCA Memo: 2019 EMDM Monitoring activities, Methodology, and Data as related to Pickering and Ajax Flood Control Dyke Restoration Environmental Assessment.

Dear Melody Brown and Nick Lorrain,

During 2019 TRCA's EMDM section was retained by TRCA's Development and Engineering Services Division to undertake aquatic habitat monitoring of a portion of the Duffin's watershed.

The following memo summarizes the monitoring activities, and methodology as related to the Pickering and Ajax Flood Control Dyke Restoration Environmental Assessment (EA). The collected data and photos of the monitoring locations are attached in the email accompanying this memo. Table 1 provides a list of data submitted to your section.

Monitoring Site Location:

There were two monitoring sites (DF-PAFCD1 and oxbow) both within the Duffin's Creek watershed located in the valley north of Bluebird Crescent just Northeast of the Finch Avenue and Brock Road intersection. Several Regional Watershed Monitoring Program (RWMP) sites and water quality monitoring locations are within close proximity to the area where 2019 monitoring occurred (***Figure 1*** and ***Figure 2***). Photo's of the monitoring locations are attached in the email accompanying this memo.

Figure 1: Monitoring site location (yellow circle) and surrounding Regional Watershed Monitoring Program (green fish dots) and water quality data (blue dots).

Figure 2: Location of riverine and oxbow aquatic habitat assessment. Orange line represent location of construction and dyke. Red box represents study area.

Monitoring Methodology:

Aquatic habitat and channel morphology monitoring occurred on June 7, 2019 at two sites (DF-PAFCD1 and Oxbow). Fish collection at the sites was deemed not necessary as there are several RWMP sites within the area from which a fish species list can be retained.

Site DF-PAFCD1: Instream habitat, including channel morphology was assessed using methods from the Ontario Stream Assessment Protocol (OSAP, Stanfield, 2013), that uses a series of standardized measurements from which habitat metrics were derived. Through the OSAP (Section 4 Module 2), sample sites were standardized to a geomorphic unit of 2 cross-overs (riffle/pool/run sequences) or a minimum of 40 m in length. Data were collected through a point-count/transect survey approach and metrics were based on a minimum of 60 points per site.

Metrics include: percent habitat type (riffles, runs, and pools), percent cover type (embedded, unembedded, and no cover), percent instream vegetation type (filamentous and non-filamentous algae, grass, moss, macrophytes, watercress, terrestrial plants), and sediment type and size. Observations of additional site features such as sediment loading, in-stream barriers, and riparian vegetation were also recorded.

A rapid geomorphological survey (RGA was performed in accordance with the protocol outlined in the *Stormwater Management Planning and Design Manual* published by the Ministry of Environment (MOE) in 2003. The RGA protocol is based on the presence or absence of specific indices within four factor groups. A sum of the present indices is used to calculate a stability index value which is used to determine the degree of evidence of channel adjustment (MOE, 2003).

Oxbow: The aquatic habitat within the oxbow was also assessed. The entire reach of the oxbow was sampled, and photo documented. It should be noted that the OSAP was designed to assess streams whereas the oxbow represents lentic environment. None the less, the OSAP classifications and methodology, where feasible, was used to gather data regarding aquatic habitat within the oxbow. GPS coordinates with notes and measurements were taken at points along the reach of the oxbow (13 points total). Most of the measurements were taken from the southern portion of the oxbow (***Figure 3***) because it will be in closest proximity to the occurring construction. Sediment type, vegetation type, and cover type were all recorded using OSAP(Module 4, Section 2). The wetted width and depth was also measured at both the right and left banks of the oxbow. Sightings of aquatic flora and fauna were also noted.

It should be noted that the oxbow receives drainage from an outlet of some sort (***Figure 4***) and drains into the Duffin's water course (***Figure 5***). Tadpoles, turtles, and aquatic macrophytes were observed with in the oxbow during the time of the field visit.

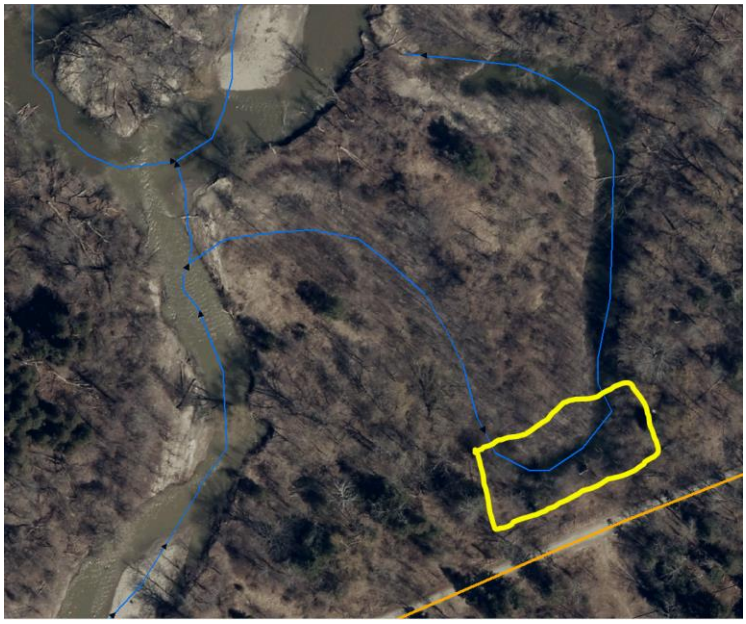


Figure 3: Southern portion of oxbow.

Figure 4: Image of oxbow and outlet into oxbow at point 6.

Figure 5: Outlet from Oxbow into Duffin's creek.

Available Data Inventory:

Table 1 summarizes the data that is available. I am sending this data along with this memo except for the water quality and benthic macroinvertebrate data. This data is available upon request should it be needed for the EA.

Site Name	Fish Community	Benthic Invertebrates	Aquatic Habitat	RGA	Channel Morphology	Water Quality	2019 Photos
DF003WM	x	x	x	x	x		
DF004WM	x	x	x	x	x		
DF005WM	x	x	x	x	x		
DF-PAFCD1			x	x	x		x
Oxbow			x		Depth and width only		x
104023						x	
104025						x	
104026						x	

Thank you for the opportunity to do monitoring on behalf of your group. We appreciate the business and look forward to future projects. Should you have any questions, comments, or concerns please don't hesitate to contact me directly.
Sincerely,

Jan Moryk M.Sc.,
Senior Project Manager, Aquatic Projects
Environmental Monitoring and Data Management, Restoration & Infrastructure Division, TRCA
289.268.3942, jan.moryk@trca.ca

References:

Ministry of the Environment (MOE). 2003. Storm water management planning and design manual. Toronto, ON: Queen's Printer for Ontario.

Stanfield, L.W., 2013. *Ontario Stream Assessment Protocol. Version 7, Fish and Wildlife Branch*. Ontario Ministry of Natural Resources. Peterborough, Ontario.

Appendix B

NHIC Mapping

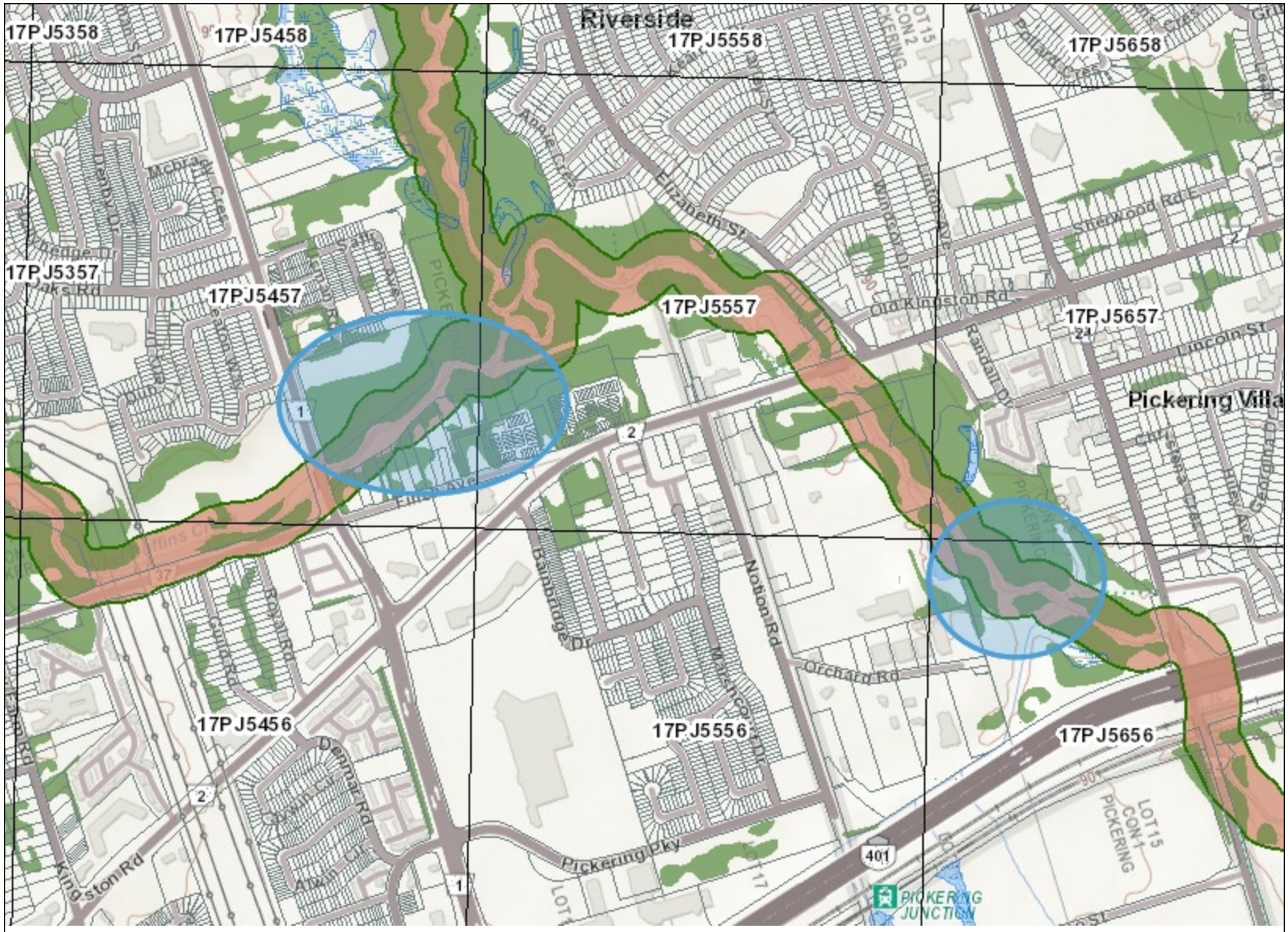
Ontario

Ministry of Natural Resources and Forestry

Make-a-Map: Natural Heritage Areas

Pickering & Ajax Dykes

Notes:



Legend

- Assessment Parcel
- Woodland
- Conservation Reserve
- Provincial Park
- Natural Heritage System
- Ecoregion

Wetland
- Provincially Significant Wetland Evaluated
- Non - Provincially Significant Wetland Evaluated
- Unevaluated Wetland

Area of Natural Heritage & Scientific Interest (ANSI)
- Provincially Significant Life Science ANSI
- Provincially Significant Earth Science ANSI

Greenbelt Plan
- Boundary
- River Valley Connections

Land Use Designations
- Protected Countryside
- Towns and Villages
- Hamlets
- Urban River Valley
- Specialty Crop Area

Niagara Escarpment Plan (NEP)
- Boundary
- Parks and Open Space System

Land Use Designations
- Escarpment Natural Area
- Escarpment Protection Area
- Escarpment Rural Area
- Mineral Resource Extraction Area
- Escarpment Recreation Area
- Urban Area
- Minor Urban Centre

Oak Ridges Moraine Conservation Plan (ORM)
- Boundary

Land Use Designations
- Natural Core Area
- Natural Linkage Area
- Countryside Area
- Rural Settlement
- Palgrave Estates Residential Community
- Settlement Area

0.7 0 0.33 0.7 Kilometers

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Natural Resources and Forestry(OMNRF) shall not be liable in any way for the use of, or reliance upon, this map or any information on this map.

Appendix C

NHIC Natural Heritage Data

Appendix C
Ontario Ministry of Natural Resources and Forestry - Natural Heritage Areas Make-a-map Results
Accessed July 31, 2019

OGF ID	Element Type	Common Name	Scientific Name	SRank	SARO Status	COSEWIC Status	Last Obs Date	EO ID	Grid
1038381	SPECIES	Redside Dace	*Clinostomus elongatus*	S2	END	END	Jul-96	7502	17PJ5457
1038381	SPECIES	Butternut	*Juglans cinerea*	S2?	END	END	2005-08-18	95282	17PJ5457
1038381	SPECIES	Snapping Turtle	*Chelydra serpentina*	S3	SC	SC	2003-07-25	95690	17PJ5457
1038381	SPECIES	Bank Swallow	*Riparia riparia*	S4B	THR	THR	2005-07-01	115407	17PJ5457
1038391	SPECIES	Redside Dace	*Clinostomus elongatus*	S2	END	END	Jul-96	7502	17PJ5557
1038391	SPECIES	Redside Dace	*Clinostomus elongatus*	S2	END	END	1983-07-31	7703	17PJ5557
1038391	NATURAL AREA	MAJOR-SPINK AREA						10406	17PJ5557
1038391	SPECIES	Red Mulberry	*Morus rubra*	S2	END	END	1894-08-01	11350	17PJ5557
1038391	SPECIES	Butternut	*Juglans cinerea*	S2?	END	END	2005-05-12	95326	17PJ5557
1038391	SPECIES	Bank Swallow	*Riparia riparia*	S4B	THR	THR	2005-07-01	115407	17PJ5557
1038400	NATURAL AREA	Lower Duffins Creek Wetland Complex						3762	17PJ5656
1038400	SPECIES	Redside Dace	*Clinostomus elongatus*	S2	END	END	1983-07-31	7703	17PJ5656
1038400	SPECIES	Red Mulberry	*Morus rubra*	S2	END	END	1894-08-01	11350	17PJ5656
1038400	SPECIES	Butternut	*Juglans cinerea*	S2?	END	END	2005-05-12	95326	17PJ5656
1038400	SPECIES	American Eel	*Anguilla rostrata*	S1?	END	THR		115358	17PJ5656
1038400	SPECIES	Bank Swallow	*Riparia riparia*	S4B	THR	THR	2005-07-01	115407	17PJ5656
1038400	SPECIES	American Eel	*Anguilla rostrata*	S1?	END	THR		180516	17PJ5656
1038401	SPECIES	Red Mulberry	*Morus rubra*	S2	END	END	1894-08-01	11350	17PJ5657
1038401	SPECIES	Bank Swallow	*Riparia riparia*	S4B	THR	THR	2005-07-01	115407	17PJ5657
1038390	NATURAL AREA	Lower Duffins Creek Wetland Complex						3762	17PJ5556
1038390	SPECIES	Red Mulberry	*Morus rubra*	S2	END	END	1894-08-01	11350	17PJ5556
1038390	SPECIES	Bank Swallow	*Riparia riparia*	S4B	THR	THR	2005-07-01	115407	17PJ5556

Appendix D

Fish Data

Appendix D - Fish Species near Ajax Pickering Dykes

	Main Duffins Creek	West Duffins Creek						Ganatsekiagon Creek						Urfe Creek						Lower Main Duffins				
	ACRESS-SS	DF003WM						DF004WM						DF005WM						DF001WM				
	2015	2003	2006	2009	2012	2015	2018	2003	2006	2009	2012	2015	2018	2003	2006	2009	2012	2015	2018	2003	2006	2009	2012	2015
Atlantic Salmon	X											X							X					
Blacknose Dace	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X			X
Bluntnose Minnow														X	X	X				X	X	X	X	X
Brassy Minnow														X										
Brook Stickleback	X																							
Brown Trout						X				X	X											X		
Chinook Salmon			X	X						X	X													
Common Shiner	X	X	X	X			X						X	X	X	X	X	X	X	X	X	X	X	
Creek Chub	X	X		X	X	X	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Fathead Minnow	X									X				X		X					X	X	X	
Golden Shiner																						X		
Hornyhead Chub																				X				
Johnny Darter	X	X	X	X		X	X		X	X		X	X	X	X	X	X	X	X	X	X	X	X	X
Logperch																					X			X
Largemouth Bass															X									
Longnose Dace	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X		X		X	X	
Mottled Sculpin								X	X	X	X	X	X		X	X								
Northern Redbelly Dace																		X						
Pumpkinseed		X		X										X	X	X		X		X		X		X
Rainbow Darter	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X
Rainbow Trout	X		X	X	X	X		X	X	X	X	X	X		X	X	X	X	X			X	X	X
Rock Bass																				X	X	X	X	X
Round Goby																						X	X	X
Sand Shiner																				X	X			
Sea Lamprey														X	X				X					
Smallmouth Bass		X																		X				
Spotfin Shiner																				X	X	X	X	
Spottail Shiner																					X			
Stonecat	X	X		X	X																X		X	
White Sucker		X	X	X	X	X	X		X				X	X	X	X	X		X	X	X	X	X	

Appendix E

Butternut Data

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

Select Office Address from Drop Down.

Memorandum

Date: September 24, 2019

File #: 1903601

To: Faud Curi – KGS Group

From: Austin Adams – Palmer

cc: Dan McParland – Palmer

Re: Butternut Trees in relation to Ajax/Pickering Dykes Maintenance Project

---

Butternut (*Juglans cinerea*) is listed as an *Endangered* species on the Species at Risk in Ontario List, and as such, it is protected under the *Endangered Species Act* (ESA) from being killed, harmed, or removed (Government of Ontario, 2007). Butternut trees suffer from a highly transmissible fungal disease called butternut canker (*Ophiognomonia clavigignenti-juglandacearum*). The ESA sets three categories of trees that set different levels of protection, which depend on the degree of canker infection and the potential of the tree to help with protection/recovery efforts in Ontario. For activities that may affect Butternut, Section 23.7 of Ontario Regulation 242/08 sets out the requirements to seek an authorization under the ESA (e.g., a permit).

Three Butternut trees were identified near the proposed repair/maintenance activities for the Ajax/Pickering Dykes Maintenance Project (**Figure 1**). Other Butternut have been identified in the general area, but are not considered to be near the proposed maintenance activities (e.g. beyond the 25 metre (m) habitat buffer) and are not considered to be affected by the Project.

This memo provides a summary of the current status of the three Butternut, as assessed by a Butternut Health Assessor (BHA) on August 12, 2019.

1. Pickering Dyke

A Category 1 tree was observed on the north bank of West Duffins Creek (**Figure 1 – Tree #1**). Category 1 trees are considered too infected to help preserve or protect the genes of the species in Ontario (Ministry of Natural Resources and Forestry, 2014). After an ESA Registry (and Ministry review period), this Category can be harmed or removed without further actions under the ESA.

The Pickering Dyke is located on the south bank of West Duffins Creek, and outside the 25 m habitat buffer for this tree. The Project is not expected to affect this tree or its 25 m habitat buffer, which will be confirmed once the Project preferred alternative has been determined.

2. Ajax Dyke

Two Butternuts have been identified near the Ajax Dyke (**Figure 1**); Trees #2 and #3.

Tree #2 has been assessed as a Category 2 tree. Category 2 trees demonstrate some resistance to the infection and may be able to help the protection or recovery of the species in Ontario. However, up to 10 Category 2 trees can be removed/harmed in an area, following registry. As a condition, the ESA requires that a compensation planting and monitoring plan be implemented for removal/harm of each impacted tree. The amount of trees required in compensation varies if harming vs. removing.

However, Tree #2 is some distance from the Ajax Dyke and might simply be avoided using project planning. Should the proposed disturbances be beyond the 25 m habitat buffer of this tree, activity registry may not be required.

Tree #3 is a Category 1 tree, located on the Dyke itself. As such, this tree will almost certainly require removal for maintenance activities; however, after ESA registry, this Category of tree can be harmed or removed without further action under the ESA.

A hybrid Butternut was also observed on the dyke, confirmed as such by its leaf scar, leaf form and nut shape (**Figure 1**). Hybrid Butternut are not protected by the ESA.

3. Next Steps

The areas required for dyke repair and maintenance is currently being evaluated for the Project Environmental Assessment (EA); the location of the Category 2 tree has been noted and will be avoided to the degree possible. A Butternut Health Assessment will be completed once the locations and extent of required disturbances for dyke repair and maintenance is determined. A compensation planting and monitoring plan will be developed if the Project cannot avoid the 25 m habitat buffer of the Category 2 tree.

Should other Butternut be observed in the Project area, with disturbances within their 25 m habitat buffer radius, they would also be required to be assessed by a BHA.

4. Conclusion

I hope that this letter provides a summary of the Butternut that may be impacted by the Project activities. Should you require any elaboration, please contact me at austin@pecg.ca or 647-461-2372.

Prepared By:

Austin Adams, M.Sc., EP
Senior Ecologist, Butternut Health Assessor #571

PALMER ENVIRONMENTAL CONSULTING GROUP INC.

References

Government of Ontario. (2007). Endangered Species Act, 2007, S.O. 2007, c. 6. Retrieved from https://www.ontario.ca/laws/statute/07e06

Ministry of Natural Resources and Forestry. (2014). *Butternut Assessment Guidelines - Assessment of Butternut Tree Health for the Purposes of the Endangered Species Act, 2007: Version 2.* Ministry of Natural Resources and Forestry.

CLIENT:	KGS Group
PROJECT:	Pickering-Ajax Dykes EA
PREPARED BY:	PALMER ENVIRONMENTAL CONSULTING GROUP INC.

0 100 200 300 metres

N

PROJECT NO.	1903601
REVISION:	1-2
DATE:	Aug 19, 2019
SCALE:	1:12000
DRAWN:	BE
DATUM:	NAD 1983
CHECKED:	AA
PROJECTION:	UTM zone 17

LEGEND:

- Study Area
- Direct Study Area
- Dyke Centre Line (Approx.)
- Watercourse (TRCA)
- Butternut (PECG)
- Hybrid Walnut Species (PECG)
- 25 m Habitat Buffer

Imagery (2018) provided by TRCA

TITLE:

Terrestrial Resources – Butternut Locations

Figure 1

Document Path: C:\Egnyte\Shared\Projects\Active\19036 - KGS Group\1903601 - Pickering-Ajax Dykes EA\Mapping\Figures\5_ArcGIS\Ecology\1903601_5-1-1_Terrestrial Sensitive Flora.mxd

Photograph Log

Palmer

Client Name:	Project No.	Site Location:
Toronto and Region Conservation Authority	1903601	Pickering/Ajax Dykes Reconstruction Area

Photo #:	Date.
1	8/12/2019
Direction Photo Taken	n/a

Description

Butternut 1 canopy.

Photo #:	Date.
2	8/12/2019
Direction Photo Taken	n/a

Description

Butternut 1 trunk with epicormic shoots and cankers.

Photograph Log

Palmer

Client Name:	Project No.	Site Location:
Toronto and Region Conservation Authority	1903601	Pickering/Ajax Dykes Reconstruction Area

Photo #:	Date.
3	8/12/2019
Direction Photo Taken	n/a

Description

Butternut 1 cankers.

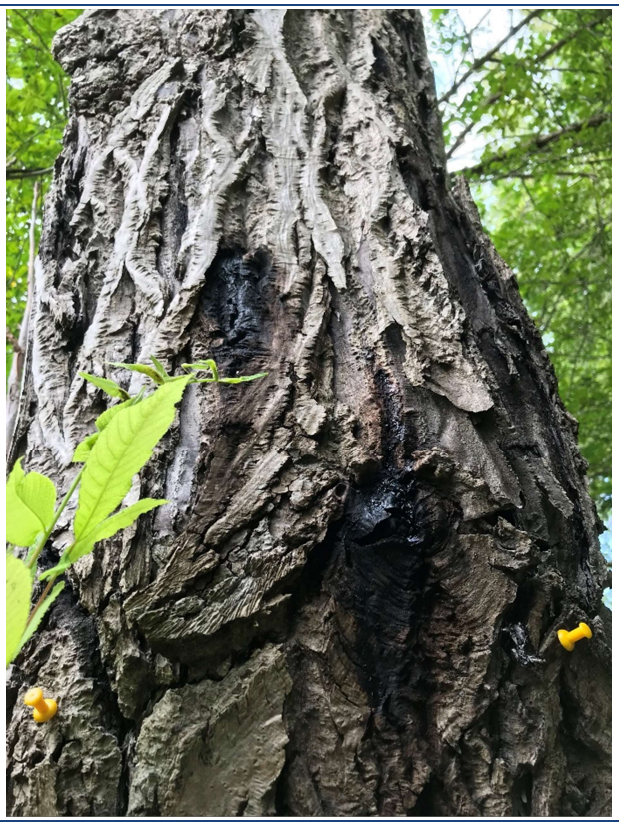


Photo #:	Date.
4	8/12/2019
Direction Photo Taken	n/a

Description

Butternut 2 canopy.

Photograph Log

Palmer

Client Name:	Project No.	Site Location:
Toronto and Region Conservation Authority	1903601	Pickering/Ajax Dykes Reconstruction Area

Photo #:	Date.
5	8/12/2019
Direction Photo Taken	n/a

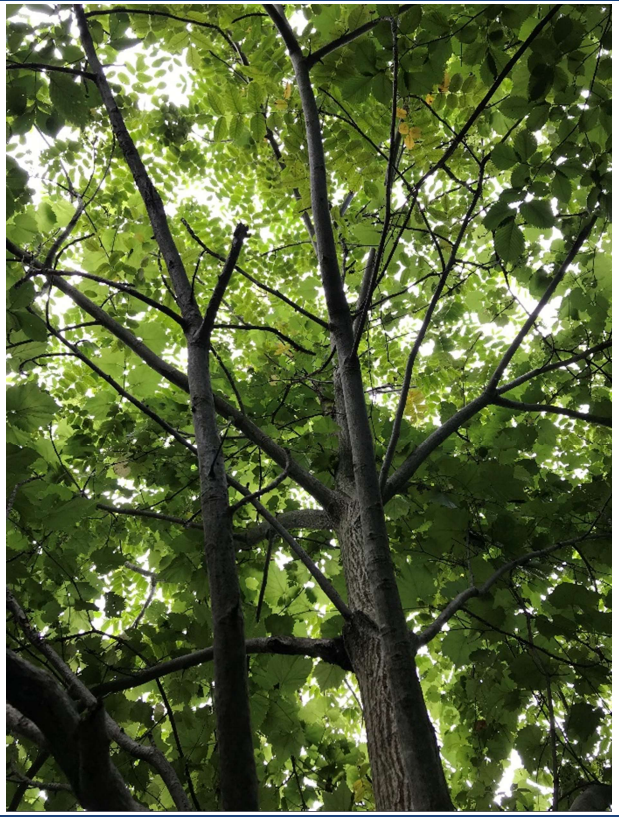
Description

Butternut 2 – oozing canker at base.

Photo #:	Date.
6	8/12/2019
Direction Photo Taken	n/a

Description

Butternut 3 canopy.



Photograph Log

Palmer

Client Name:	Project No.	Site Location:
Toronto and Region Conservation Authority	1903601	Pickering/Ajax Dykes Reconstruction Area

Photo #:	Date.
7	8/12/2019
Direction Photo Taken	n/a

Description

Butternut 3 cankers.

Photo #:	Date.
8	9/21/2018
Direction Photo Taken	S

Description

Hybrid – evidenced by notch in leaf scar. Other evidence included pith colour, offset leaflets and lack of canker.

BHA Tree Analysis (version: December 2013)

This table is to be completed by a designated Butternut Health Assessor (BHA).

BHA Report #	PECG03	Assessment Date(s)	12-Aug-19	Total # Butternut Trees in BHA Report	3
BHA ID #	571	BHA Name	Austin Adams		
Landowner / Client Name			Toronto & Region Conservation Authority (TRCA)		
Property Location					

input field data										automatic calculations from field data						Categories: 1: non-retainable, 2: retainable, 3: archivable				
			# bole cankers				# root flare (RF) cankers													
Tree #	Live Crown %	Tree dbh (cm)	sooty (S) (will be assigned 2.5 cm per canker)		open (O) (will be assigned 5 cm per canker)				<40 m from cankered tree? (Y or N)	Circ. (cm) = Pi x dbh	total bole canker width (sooty x 2.5 + open x 5)	total RF canker width (sooty x 2.5 + open x 5)	bole canker % of circ.	RF canker % of circ.	total bole & root canker % of 2xCirc	LC% >/= 50 & BC% = 0	LC% >70 & BRC % <20	LC% >70 & BC % <20	Preliminary tree call	FINAL TREE CALL a Cat 2, dbh>20cm <40m from a Cat 1
			S <2 m	S >2 m	O <2 m	O >2 m	RF S	RF O		Circ (cm)	BC (cm)	RC (cm)	BC%	RC%	BRC%					
1	20	44	7	8	7	3	2	0	n	138.2	87.5	5.0	**63.3**	**3.6**	**33.5**	1	1	1	**1**	**1**
2	80	32	4	0	0	0	5	0	n	100.5	10.0	12.5	**10.0**	**12.4**	**11.2**	1	2	2	**2**	**2**
3	80	16	14	6	1	1	5	1		50.24	60.0	17.5	**119.4**	**34.8**	**77.1**	1	1	1	**1**	**1**