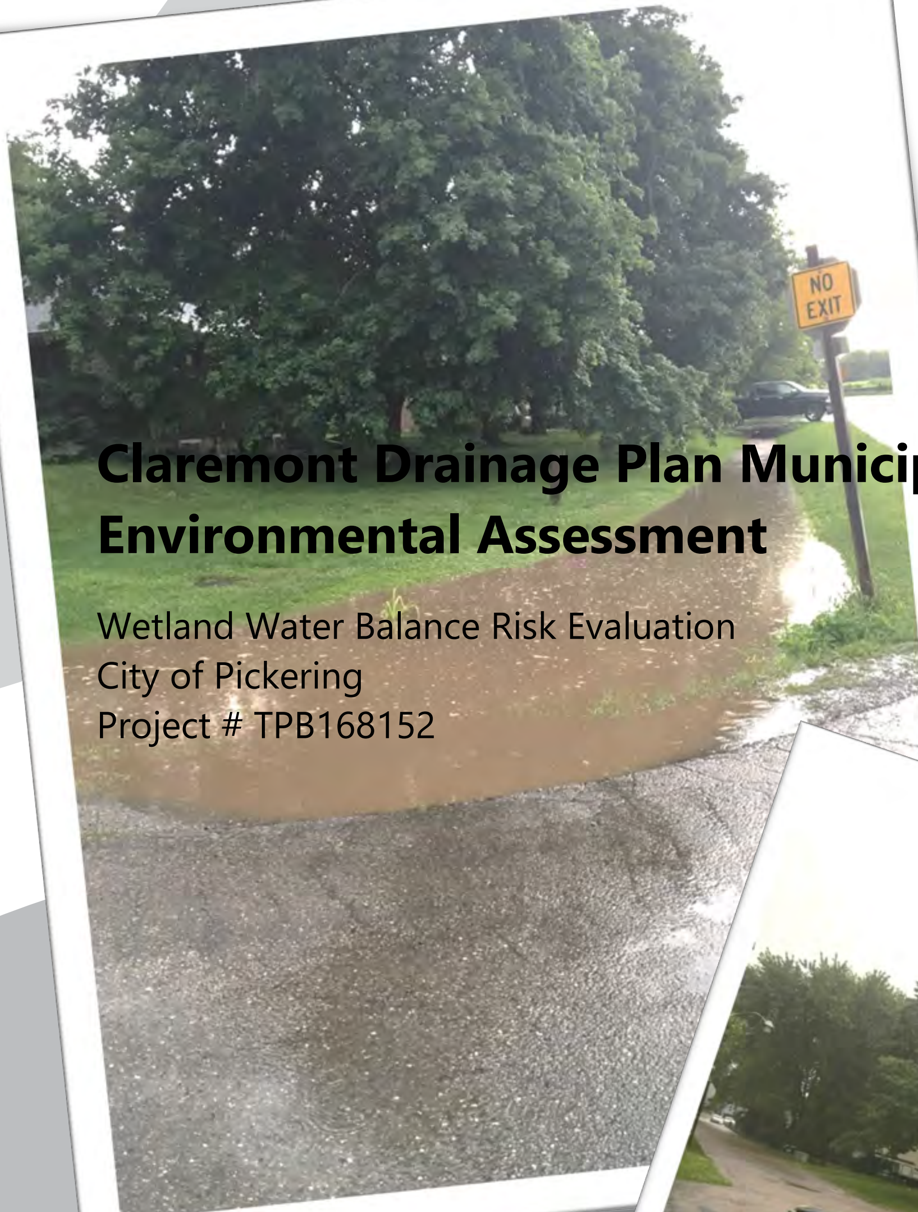
APPENDIX E

NATURAL HERITAGE SYSTEMS - WETLAND ASSESSMENT



Claremont Drainage Plan Municipal Class Environmental Assessment

Wetland Water Balance Risk Evaluation
City of Pickering
Project # TPB168152

Prepared for:

City of Pickering

Pickering Civic Complex, One the Esplanade, Pickering, Ontario L1V 6K7

April 5, 2022

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Wood Environment & Infrastructure Solutions
a Division of Wood Canada Limited

April 5, 2022

Table of Contents

1.0 Introduction ... 1
1.1 Purpose / Overview ... 1
1.2 Background ... 1
2.0 Background Information Review and Documentation ... 2
2.1 Information Sources ... 2
2.1.1 Technical Drawings and Maps ... 2
2.1.2 Topographic Survey ... 2
2.1.3 Reports ... 2
2.1.4 Modelling Data ... 4
2.1.5 Soils ... 4
2.1.6 Land Use ... 4
3.0 Study Area Investigation ... 5
4.0 Wetlands Water Balance Risk Assessment ... 6
4.1 Methods ... 6
4.1.1 Hydrological Assessment ... 6
4.1.2 Ecological Assessment ... 6
4.2 Existing Conditions ... 7
4.2.1 Ecological Land Classification and Vegetation ... 7
4.2.2 Wildlife and Wildlife Habitat ... 8
4.2.3 Aquatic Environment ... 10
4.2.4 Wetland Hydrology ... 10
4.3 Detailed Description of Activity ... 11
4.4 Consideration of Potential Impacts ... 12
4.4.1 Magnitude of Potential Hydrological Change ... 12
4.4.2 Sensitivity of the Wetland ... 13
4.4.3 Hydrological Classification ... 14
4.5 Wetland Risk ... 15
4.6 Assessment of Function ... 16
4.6.1 Hydrological ... 16
4.6.2 Ecological ... 16
4.7 Mitigation ... 16
4.7.1 Hydrological ... 16
4.7.2 Ecological ... 17
5.0 Conclusions and Recommendations ... 18
5.1 Conclusions ... 18
5.2 Recommendations ... 18
6.0 References ... 20

Table of Contents cont'

List of Tables

Table 4.1. Occurrences of Reptiles and Amphibians within the Study Area based on Desktop Review 8
Table 4.2. Species identified through NHIC within the Study Area 9
Table 4.3. Fish Species identified within the Study Area 10
Table 4.4. Drainage Outlet Characteristics 11
Table 4.5. Comparison of the Existing and Proposed Conditions Runoff Volumes at the Two Drainage Outlets for the Study Area 13

List of Appendices

Appendix A Claremont Drainage Plan Municipal Class Environmental Assessment Figures
Appendix B Ecology Figures

1.0 Introduction

1.1 Purpose / Overview

Wood Environment & Infrastructure Solutions (Wood) has been retained by the City of Pickering to assess the Hamlet of Claremont's drainage system and develop recommendations for measures to improve its performance; this is the Claremont Drainage Plan Municipal Class Environmental Assessment. The study is intended to develop a comprehensive drainage improvements plan for the Hamlet, that will address current drainage concerns and provide an implementation plan for the management of flooding in the area.

This report has been prepared to document the Wetland Water Balance Risk Evaluation as requested by TRCA and should be reviewed with the companion document, the Claremont Drainage Plan Municipal Class Environmental Assessment

1.2 Background

The Hamlet of Claremont is located in the Region of Durham in Southern Ontario, north of Lake Ontario. It is a part of the Greater Toronto Area and has a population of approximately 1,200 as of the 2016 census. The Hamlet is a largely rural community located adjacent to the West Duffins Creek valley. The community is characterized by a mixture of agricultural lands and rural estate and low-density residential land uses (ref. Figure 1, Appendix A).

Drainage throughout the Hamlet is currently serviced by a series of roadside ditches, swales, culverts and storm sewers. The area's drainage system reflects the standards prevalent during the era of construction with mixed use of roadside ditches and driveway culverts, storm sewers with curbs or gutters, and natural outlets for overland drainage.

In 2009/2010, the City retained a Consultant to undertake an analysis of the drainage system in Claremont, following some flooding incidents on Franklin Street. The study provided findings regarding the storm sewers on Franklin Street and Central Street. However, the scope of the subject analysis was determined to be too narrow to optimize and improve the overall drainage system in the central area of the Hamlet of Claremont. As a part of the study, a PCSWMM model of the drainage system was created. The model included storm sewers on William Street, Wixon Street, Franklin Street, Dow Street and Central Street. The results of the 2009/2010 analysis determined that the drainage system is largely undersized. The study recommended improvements to the drainage system, which included providing a 10-year capacity storm sewer on Central Street and 5-year capacity storm sewers elsewhere.

In 2012, the City received drainage complaints from properties located along Livingston Street and Bovingdon Place, about a poorly functioning ditch due to excessive vegetation growth. The City retained a Consultant in 2013 to complete a design for the ditch cleanout, and secure the necessary approvals from TRCA and MNRF prior to construction. During the design process, subsurface utilities mapping determined that the TransCanada pipeline is only 1.3 m below the surface of the ditch, and a minimum allowable cover of 1.2 m over the pipeline is required. Given this restriction, the maximum possible slope that could be achieved on the ditch was 0.5%. It was hence determined that this gentle slope would be too difficult to construct with precision and would promote more vegetation growth, which would prevent the ditch from functioning properly.

In recognition of the foregoing, the City of Pickering initiated this Class EA Study to more broadly and comprehensively formalize the understanding of the legacy of drainage problems facing the Hamlet, and to systematically and consultatively develop a Drainage Plan to address the Hamlet's drainage concerns.

2.0 Background Information Review and Documentation

2.1 Information Sources

Various datasets of background information have been used for this assessment which include monitoring data, Geographic Information Systems (GIS) mapping, reports and drawings and modelling data. A summary description of the information used for this assessment has been provided in the following.

2.1.1 Technical Drawings and Maps

City of Pickering provided a CAD base map for the Hamlet of Claremont, which included 1-meter interval contour data, mapping of storm water management infrastructure such as storm sewers, maintenance holes, catch basins, swales, outfalls, as well as aerial imagery for the study area. Additional data provided includes road right-of-way limits, building footprints and property parcels.

In addition to the aforementioned information, the City of Pickering and Toronto Region Conservation Authority have supplied reports, drawings and other documentation within proximity of the wetlands as per the following:

i. Livingston Street – Plan and Profile (City of Pickering, June 1977)

ii. Central Street, Regional Road 5 Plan and Profile (1986).

iii. Claremont Estates – Plan and Profile of William Street (Cosburn Patterson Wardman Ltd, March 1987)

iv. County Creek Estates – Plan and Profile for Acorn Land and Canso Drive, (John Hudspith Associates Limited – October 1991)

v. XMPL Subdivision Phase II - Plan and Profile for Acorn Lane, (David Schaeffer Engineering Ltd, October 1997)

vi. Claremont Estates – Phase II – Plan and Profile of Tom Thomson Court (David Schaeffer Engineering Ltd, April 2006)

vii. Victoria Street – Plan and Profile (City of Pickering, July 2007)

viii. Claremont Park Master Plan - Concept Plan (January 2016).

2.1.2 Topographic Survey

In order to fill gaps related to topography for areas with missing information, specifically related to surface drainage features including open channels, culverts and roadside ditches, Wood's survey crew was deployed. These data have been incorporated into the hydraulic modelling of the Hamlet of Claremont.

2.1.3 Reports

The following documents and reports considered relevant to the Class EA objectives, have been reviewed:

"Study of Road Improvements for RR No. 5", Paul Theil Associates Limited (May 1996)

The study was undertaken to examine proposed improvements to Rural Road No. 5 proposed through Claremont. The study investigated the study area's existing conditions and developed a hydrologic model using OTTHYMO89 to assess the existing drainage network. The objective of the study was to model the area and develop a strategy to improve the existing road drainage and alleviate impacts where possible.

The recommended approach was a 'Natural Drainage' approach which included conveyance by ditches or shallow swales along Central Street. The report also investigated several existing drainage issues which were pre-existing in the area.

"XMPL Phase II Subdivision' Hydrogeologic Study", Jagger Hims (March 2010)

This report was prepared in support of the application for approval of the Draft Plan of Subdivision 'XMPL Phase II'. The study was undertaken to document the availability of ground water to service the 26-lot residential development, and to assess the impacts of subsurface sewage disposal systems. The properties are located on Acorn Lane, Kodiak St, and Carpenter Ct. which is west of the subject study area. The report indicated that there were signs of a high groundwater table within all but one of the test pits. The report identified that the high-water table was between 0.45 m and 1.25 m below ground surface.

"Claremont Flooding Analysis Solutions", AECOM Canada Ltd. (July 2010)

This memorandum summarized the results of several PCSWMM hydrologic modelling assessments developed to evaluate various alternatives for mitigating drainage issues within the Hamlet. The drainage issues had been previously investigated in earlier reports commissioned in response to basement flooding in the study area. The memorandum evaluated nine (9) proposed alternatives on the basis of cost and effectiveness in flood reduction. The alternative recommended was Alternative 9, which was to provide a 10-year storm sewer on Central Street and 5-year storm sewers elsewhere.

"2012 Duffins Creek Hydrology Update", Aquafor Beech Limited (February 2013)

The purpose of the report was to update the hydrologic model of the Duffins Creek Watershed. The key objectives of the study were to capture land use changes, update Stormwater management criteria, develop flood control criteria, and assess impacts to Regional Storm flows associated with proposed future developments. The hydraulic model was initially developed in 1979 by James F. MacLaren Limited, and was periodically updated to reflect changes within the watershed.

The model was prepared using Visual OTTHYMO version 2.1, with model parameters derived from TRCA's GIS database. The watershed was divided into 56 subcatchments, where data were available stormwater management facilities were incorporated into the model. The model was calibrated using existing rainfall data and data from streamflow gauges.

The report prescribed an updated stormwater control strategy based on pre-development unit flow rates for each subcatchment. The prescribed control strategies were expected to mitigate the large flow increases which would otherwise occur without control. It would also better match existing flow rates on the West, East and downstream branches of Duffins Creek.

"City of Pickering Stormwater Design Guidelines" (As of: January 2017)

The City of Pickering has developed Stormwater Design Guidelines for developers, engineers and architects for preparing development plans in the City of Pickering. The goal of the manual is to provide technical tools and guidelines to comply with the City's stormwater management requirements and infrastructure design standards (current). Various relevant standards have been identified as per the following:

- Minor Systems shall be sized to capture and convey the 5 Year Storm.
- Major Systems shall be sized to capture and convey the Regulatory Event to a safe outlet without flooding adjacent properties and should provide a minimum of 300 mm of freeboard from the maximum water surface elevation of the major system flow path to the minimum opening of structures. The Regulatory Event is defined as the larger of the 100 year storm or the Regional Storm.

- Local Roadway's which are utilized as a major drainage system shall be designed such that flow depth resultant of the Regulatory Event is limited to the lesser of 150 mm above the roadway crown, or the right-of-way (ROW) limit.
- Culverts servicing 'rural local' roadways shall be sized to convey at least the 25 year storm, Culverts servicing 'urban local' roadways shall be sized to convey at least the 50 year storm.

2.1.4 Modelling Data

The following modelling data were provided by the City of Pickering and/or the Toronto and Region Conservation Authority:

- HEC-RAS hydraulic model for Duffins Creek (ref. TRCA Duffins Creek Floodline Mapping Study: Catchments 13, 14 and 27, October 2003). The hydraulic model does not include the drainage features contained within the study area.
- PCSWMM model developed as part of an earlier drainage study (AECOM, 2013). The model was not discretized to sufficiently account for inlet capacity constraints within the study area. The model did not extend south of Central Street.

2.1.5 Soils

Surficial soils data for the study area (as available from Agriculture Canada – Ontario Soil Survey Reports) suggest that the surficial geology within the Hamlet of Claremont is characterized as medium textured Glaciocustrine deposits (silt, sand, and minor clay). The dominant soil group for the study area was identified as 'Woburn' which corresponds to a Loam to Silt Loam NRCS soil classification.

The City of Pickering also provided a Hydrogeologic Study (Jagger Hims Ltd, March 2000), which indicated that there were signs of a high groundwater, west of the study area (now Carpenter Crescent and Kodiak Street). The study identified that the high-water table was interpreted as between 0.45 m and 1.25 m below ground surface. The soils identified for the area were reasonably consistent with those identified by the Ontario Soil Survey report (Agriculture Canada, 1956).

2.1.6 Land Use

The existing land use within the Hamlet of Claremont is primarily residential, with some institutional land use (schools, church), and parkland/agricultural areas. Figure 1 (ref. Appendix A) provides an aerial overview of the study area. Residential development in the Hamlet of Claremont is generally older, and consists of single detached residences, with larger backyard areas, which are typically well vegetated (with extensive tree coverage).

3.0 Study Area Investigation

Site investigations of the study area have been conducted as part of this study. Initial site visits of the drainage features and crossings occurred on March 27, 2017 to identify suitable locations for the installation of flow monitoring equipment to provide flow data for calibrating the PCSWMM hydrologic/ hydraulic modelling. An additional site visit was conducted on September 25, 2017 to review existing drainage features, crossings, as well as document existing conditions.

The investigations identified that there was standing water within a number of ditches, and several culverts were damaged/crushed. Standing water within ditches is generally attributable to localized grading issues. Within the Hamlet of Claremont, standing water is considered to be attributable to shallow ditch/channel grades and localized pools/depressions., as well as the presence of a high groundwater table (ref. Jagger Hims Ltd, March 2000).

4.0 Wetlands Water Balance Risk Assessment

A Wetland Water Balance Risk Assessment has been conducted as requested by TRCA based on comments received from the Toronto and Region Conservation Authority (TRCA) (ref. Mugo-Marouchko, September 28, 2021) specific to the Claremont Drainage Plan Public Information Centre (PIC) #2 slides), and the meeting with TRCA staff on October 18, 2021. A Wetland Balance Risk Assessment (following the TRCA's Wetland Water Balance Risk Evaluation, 2017) for the two (2) wetlands located downstream of the proposed drainage improvements (ref. Appendix B).

4.1 Methods

4.1.1 Hydrological Assessment

An estimation of the magnitude of hydrological change is required for the Wetland Water Balance Risk Evaluation (TRCA, November 2017). The Wetland Water Balance Risk Evaluation (TRCA, November 2017) has identified several factors will influence the magnitude of hydrological change which include the following:

- Wetland feature limits
- Extent and size of pre-development catchments
- Total development area of catchment
- Area of the wetland catchment owned by the proponent
- Percent of impervious cover planned within the proponent's holdings
- Proposed extent and size of the post-development catchment
- Anticipated magnitude and duration of water taking
- Location and extent of any locally significant recharge areas

The drainage areas contributing to the wetlands have been identified based on the drainage areas delineated within the PCSWMM modelling in support of the Claremont Drainage Plan Municipal Class Environmental Assessment (MCEA). The implementation of the preferred alternative(s) identified within the Claremont Drainage Plan MCEA would not result in a change of the catchments size or imperviousness within the contributing drainage area to the wetlands. Similarly, the implementation of the preferred alternative(s) would not require water taking or alterations to any groundwater recharge areas within the study area.

To address the drainage system performance deficiencies within the Hamlet of Claremont, a partial diversion of flow from the East Channel storm sewer outfall to the West Channel storm sewer outfall has been proposed as the preferred alternative (ref. Figure 8, Appendix A). The proposed diversion of flow is an enhancement of the existing diversion from the East Channel storm sewer outfall to the West Channel storm sewer outfall. Consequently, there is a proposed reduction of runoff volume discharged to the East Channel and downstream wetland while there is a proposed equivalent increase of runoff volume discharged to the West Channel and downstream wetland. The simulated change in runoff volume discharging from the study area has been used as a surrogate for the change in contributing drainage area.

4.1.2 Ecological Assessment

In order to further inform the assessment of potential impacts to the wetland, a desktop review of available resources was completed. Initially, high-level Ecological Land Classification (ELC) data was provided to Wood by the Toronto & Region Conservation Authority (TRCA) (ref. Figure 3, Appendix B). Ecological Land

Classification (ELC) was completed in accordance with the Ecological Land Classification for Southern Ontario (Lee et al. 1998). In addition, the Natural Heritage Information Centre (NHIC, 2022) database was reviewed for occurrences of SAR species in the area. The Ontario Reptile and Amphibian Atlas (Ontario Nature, 2020), Ontario Breeding Bird Atlas (Bird Studies Canada, 2006), and iNaturalist (2022) were also consulted for reported species observations in the area.

The TRCA Wetland Water Balance Risk Evaluation (TRCA, 2017) Appendix 3 contains a list of hydrologically sensitive vegetation communities, fauna, and flora; this Appendix was reviewed in the context of the proposed improvements relative to potential impacts to the wetland community.

4.2 Existing Conditions

4.2.1 Ecological Land Classification and Vegetation

The Study Area is situated within Ecoregion 6E, the Lake Simcoe-Rideau Ecoregion, which extends from Lake Huron in the west to the Ottawa River in the east and includes most of the Lake Ontario shore and the Ontario portion of the St. Lawrence River Valley and is the second most densely populated ecoregion in Ontario. Flora in this ecoregion is relatively diverse with hardwood forests dominated by Sugar Maple (*Acer saccharum*), American Beech (*Fagus grandifolia*), White Ash (*Fraxinus americana*), Eastern Hemlock (*Tsuga canadensis*), and numerous other species are found where substrates are well developed on upland sites. Lowlands, including rich floodplain forests, contain Green Ash (*Fraxinus pennsylvanica*), Silver Maple (*Acer saccharinum*), Red Maple (*Acer rubrum*), Eastern White Cedar (*Thuja occidentalis*), Yellow Birch (*Betula alleghaniensis*), Balsam Fir (*Abies balsamea*), and Black Ash (*Fraxinus nigra*) (Crins, 2009).

Initially, high-level ELC data was provided to Wood by the TRCA (Figure 3). No ELC community information was available for the Study Area; however, delineations for portions of the surrounding area were provided with the following vegetation communities delineated as follows:

CUM1-A Native Forb Meadow;

CUW1-A3 Native Deciduous Successional Woodland;

CUT1-E Red Osier Dogwood Deciduous Thicket;

FOM7-1 Fresh-Moist White Cedar - Sugar Maple Mixed Forest;

FOC4-1 Fresh-Moist White Cedar Coniferous Forest;

FOM6-1 Fresh-Moist Sugar Maple - Hemlock Mixed Forest; and

MAM2-2 Reed Canary Grass Mineral Meadow Marsh.

Figure 2 (ref. Appendix B) identifies the wetland within and within proximity to the Study Area and there are two (2) primary drainage outlets for the Hamlet of Claremont; the western portion of the drainage area discharges to the west wetland (Wetland 1) which is located between Canso Drive and Carpenter Court. This wetland conveys runoff from the north, near the Claremont Public School, southward beyond Acorn Lane. The second primary outlet, for the eastern portion of the drainage area, is at a wetland/channel located between Victoria Street and Livingston Street (Wetland 2). The channel commences at Central Street and is conveyed southward beyond Bovingdon Place and Old Brock Road, a third wetland (Wetland 3) also present to the west of William Street between Tom Thomson Court and Central Street; however, there are no anticipated impacts to this wetland at this stage and is not discussed further in this report.

In the data provided by TRCA, Wetland 1 has been identified as a MAM2-2 - Reed Canary Grass Mineral Meadow Marsh. This type of wetland is typified by Robust and Narrow-leaved Emergents (medium-tall wetland grasses), usually dominated in this region by Reed Canary Grass (*Phalaris arundinacea*) and/or

European Reed (*Phragmites australis australis*). Wetland 2 was not formally assessed in the provided data. Aerial imagery from Google Earth was reviewed and the vegetation structure of the section north of Bovingdon Place appears similar to that of Wetland 1, though a more narrow channel with higher surrounding cover of trees and shrubs; this has not been confirmed through field identification.

A review of NHIC did not identify any SAR plants as being previously reported present within the Study Area. This however does not rule out the possibility of SAR plants occurring within the potential impact footprint. For example, Black Ash (*F. nigra*) is a SAR wetland species which was formerly common in the province so is often not included in NHIC database searches. While it is possible this species occurs within the wetlands, it is unlikely; additionally, this species is currently subject to a Minister's Order temporarily pausing protections under the Endangered Species Act (O. Reg. 23/22, 2022).

4.2.2 Wildlife and Wildlife Habitat

Characteristic mammals of Ecoregion 6E – Lake Simcoe-Rideau Ecoregion include White-tailed Deer (*Odocoileus virginianus*), Common Raccoon (*Procyon lotor*), Striped Skunk (*Mephitis mephitis*), and Woodchuck (*Marmota monax*). Wetland habitats are used by many species of water birds and shorebirds, including Wood Duck (*Aix sponsa*), Great Blue Heron (*Ardea herodias*), and Wilson's snipe (*Gallinago delicata*). Open upland habitats are used by species such as Field Sparrow (*Spizella pusilla*), Grasshopper Sparrow (*Ammodramus savannarum*), and Eastern Meadowlark (*Sturnella magna*). Upland forests support populations of species such as Hairy Woodpecker (*Leuconotopicus villosus*), Wood Thrush (*Hylocichla mustelina*), Scarlet Tanager (*Piranga olivacea*), and Rose-breasted Grosbeak (*Pheucticus ludovicianus*). Reptiles and amphibians found in this ecosystem include American Bullfrog (*Lithobates catesbeianus*), Northern Leopard Frog (*Lithobates pipiens*), Spring Peeper (*Pseudacris crucifer*), Red-spotted Newt (*Notophthalmus viridescens viridescens*), Snapping Turtle (*Chelydra serpentina*), Eastern Gartersnake (*Thamnophis sirtalis sirtalis*), and Northern Watersnake (*Nerodia sipedon sipedon*) (Crins, 2009)

The Ontario Reptile & Amphibian Atlas and observations found on the citizen science initiation iNaturalist found several species of sensitive reptiles and amphibians in the area which may use the subject wetland for breeding, movement, and other life history activities (ref. Table 4.1). Data from the NHIC identifies five faunal species at risk within the four 1-km squares surrounding the Study Area, as shown below (ref. Table 4.2).

Table 4.1. Occurrences of Reptiles and Amphibians within the Study Area based on Desktop Review

Common Name	Species Name	Immediate / Square Presence	Sensitivity Rank	Sensitive Time Frame	Local Rarity
Blanding's Turtle	*Emydoidea blandingii*	Square	High	All Year	L1
Midland Painted Turtle	*Chrysemys picta marginata*	Square	High	All Year	L3
Snapping Turtle	*Chelydra serpentina*	Square	High	All Year	L2
American Bullfrog	*Lithobates catesbeianus*	Square	High	All Year	L2
Grey Treefrog	*Hyla versicolor*	Square	High	Late Apr – early Oct	L2
Green Frog	*Lithobates clamitans*	Immediate / Square	Medium	Late Apr – mid Sep	L4

Common Name	Species Name	Immediate / Square Presence	Sensitivity Rank	Sensitive Time Frame	Local Rarity
Northern Leopard Frog	*Lithobates pipiens*	Immediate / Square	High	Late Sep – mid Aug	L3
Pickerel Frog	*Lithobates palustris*	Square	High	Early Oct – late Aug	L2
Spring Peeper	*Pseudacris crucifer*	Square	High	Start Apr – end Sep	L2
Western Chorus Frog	*Pseudacris triseriata*	Square	High	End Mar – end Jul	L2
Wood Frog	*Lithobates sylvaticus*	Square	High	Late Mar – end Aug	L2
American Toad	*Anaxyrus americanus*	Immediate / Square	Medium	Late Apr – mid Sep	L4
Blue-spotted Salamander	*Ambystoma laterale*	Square	High	Mar - Aug	LX
Red-spotted Newt	*Notophthalmus viridescens viridescens*	Square	High	All Year	L2
Spotted Salamander	*Ambystoma maculatum*	Square	High	Mar - Oct	L1

Table 4.2. Species identified through NHIC within the Study Area

OGF ID	Common Name	Scientific Name	SARO Status	COSEWIC Status	ATLAS NAD83 IDENT
1038534	Henslow's Sparrow	*Ammodramus henslowii*	END	END	17PJ5070
1038534 1033933 1038443 1034024	Redside Dace	*Clinostomus elongatus*	END	END	17PJ5070 17PJ4969 17PJ5069 17PJ4970
1033933 1034024	Eastern Meadowlark	*Sturnella magna*	THR	THR	17PJ4969 17PJ4970
1033933	Bobolink	*Dolichonyx oryzivorus*	THR	THR	17PJ4969
1033933	Eastern Wood-pewee	*Contopus virens*	SC	SC	17PJ4969

4.2.3 Aquatic Environment

The Study Area is located within the Duffins Creek Watershed (TRCA 2018). Rural areas dominate the north of the watershed, while the southern portions are urban or urbanizing. Historically, Duffins Creek watershed was dominated by vast forests; however, agricultural practices have negatively impacted the local ecosystem. Duffins Creek's 81 kilometres of streams are in relatively good condition and are dominated by cold water aquatic communities such as sculpin, trout, and numerous other fish species.

A total of 17 fish species (ref. Table 4.3) were identified for the watercourses within the Study Area through background information review consisting of cold, cool, and warmwater species. Redside Dace, which is listed as an endangered species by both the federal and provincial governments was also identified.

Table 4.3. Fish Species identified within the Study Area

Coldwater Fish Species	Coolwater Fish Species	Warmwater Fish Species
Redside Dace (*Clinostomus elongatus*)	Brassy Minnow (*Hybognathus hankinsoni*)	Brown Bullhead (*Ameiurus nebulosus*)
Brook Trout (*Salvelinus fontinalis*)	Blacknose Dace (*Rhinichthys atratulus*)	Fathead Minnow (*Pimephales promelas*)
American Brook Lamprey (*Lethenteron appendix*)	Common Shiner (*Luxilus cornutus*)	Pumpkinseed (*Lepomis gibbosus*)
Slimy Sculpin (*Cottus cognatus*)	Creek Chub (*Semotilus atromaculatus*)	
	Longnose Dace (*Rhinichthys cataractae*)	
	Mottled Sculpin (*Cottus bairdii*)	
	Northern Redbelly Dace (*Chrosomus eos*)	
	Rainbow Darter (*Etheostoma caeruleum*)	
	Smallmouth Bass (*Micropterus dolomieu*)	
	White Sucker (*Catostomus commersonii*)	

4.2.4 Wetland Hydrology

The areas contributing to the wetlands from the Hamlet of Claremont have been identified within the supporting PCSWMM hydrologic/hydraulic model. The drainage areas have been identified based on the contributing minor system (storm sewers) and major systems (road ways, ditches, and channel) which discharge to the two (2) primary outlets (ref. Table 4.4) from the study area. The primary outlets are located at the East Channel culvert crossing of Old Brock Road and the West Channel culvert crossing at Acorn Lane. The land use of the drainage areas are primarily comprised of low-density residential properties, with agricultural external areas.

Table 4.4. Drainage Outlet Characteristics

Outlet Location	Description	Drainage Area (ha)	Total Impervious Area (ha)
East Channel	Brock Road and area south of Central Street, west of Old Brock Road. Discharge location at the Old Brock Road crossing of the East Channel.	35.78	7.86
West Channel	Lane Street to Central Street, Old Brock Road to William Street, Central Street to Acorn Lane. Discharge location at Acorn Lane crossing of the West Channel.	27.04	8.81

As indicated within Table 4.4, the total drainage area contributing to the East Channel at the Old Brock Road culvert is 35.78 ha (+/-) with an imperviousness of 22.0 % (+/-), while the drainage area contributing to the West Channel at Acorn Lane is 27.04 ha (+/-) with an imperviousness of 32.6 % (+/-). An existing 450 mm diameter diversion storm sewer conveys stormwater runoff from a control manhole, located at the storm sewer outfall to the East Channel, westward via the Central Street storm sewer system to the storm sewer outfall to the West Channel. This contributing drainage area to the existing 450 mm diameter diversion storm sewer has not been accounted for in the drainage area contributing to the West Channel (ref. Figure 3, Appendix A).

The area downstream of Old Brock Road and Acorn Lane has not been accounted for within the contributing drainage areas to the east wetland and west wetland respectively, as these areas are beyond the limits of the Claremont Drainage Plan Study Area. This is further discussed is subsequent sections.

These subcatchment characteristics will not be used to calculate the impervious cover score, as per Equation 1 within the Wetland Water Balance Risk Evaluation (TRCA, November 2017). As noted, there have been no proposed changes to the hydrologic parameterization of the drainage areas contributing to the wetlands within the study area; a proposed enhancement of the existing diversion storm sewer has been recommended and the impact of the runoff volumes from the modelled design storms has been used as a surrogate for the change in hydrology.

4.3 Detailed Description of Activity

The Claremont Drainage Plan MCEA identified preferred alternatives for the drainage system improvements for Central Street based on functional performance (i.e. their ability to address the identified drainage system deficiencies), as well as other criteria related to environmental, social, economic and constructability considerations. Drainage system improvements have also been recommended for the areas that convey runoff to the Central Street drainage system or convey flow from the Central Street drainage system; the functional performance is the primary criteria for these areas of concern. The recommended drainage improvements of increased storm sewer sizing has resulted in increased flow rates that require mitigation to meet the existing conditions peak flow rate targets at the storm sewer outfalls to the East and West Channels.

The preferred alternative for the Central Street drainage system, and for the mitigation of the increased peak flow rates due to the contributing area drainage system improvements, is to divert runoff from the

East Channel control manhole westward via a diversion storm sewer to three (3) proposed underground SWM storage tanks within the Central Street ROW at the intersection with Williams Street / Canso Drive (ref. Figure 8, Appendix A). The SWM tanks would discharge to the Canso Drive storm sewer and the West Channel outfall located behind the residential property at 4994 Canso Drive. This preferred alternative would mitigate the peak flow rates discharging to the East and West channels, while also mitigating the Central Street major and minor system performance deficiencies.

While the peak flow rates discharging to the West Channel would largely be mitigated to meet the existing conditions peak flow targets through the implementation of stormwater management quantity controls, there would be an increase in the runoff volume discharged to the West Channel while there is a proposed equivalent decrease of runoff volume discharged to the East Channel. The impacts of the proposed storm sewer system changes are noted within the subsequent sections.

4.4 Consideration of Potential Impacts

The Wetland Water Balance Risk Evaluation (TRCA, 2017) framework was used to structure an approach to assessing the sensitivity of the wetland to potential change. Both Magnitude of Hydrological Change and Sensitivity of the Wetland is considered prior to assigning a Risk level to the project.

4.4.1 Magnitude of Potential Hydrological Change

As noted, the drainage system performance deficiencies within the Hamlet of Claremont have been proposed to be addressed through the implementation of the MEA Class EA preferred alternative which includes increasing storm sewer diameters and increasing the diversion of flow from the East Channel storm sewer outfall to the West Channel storm sewer outfall. The proposed diversion of flow is an enhancement of the existing diversion from the East Channel storm sewer outfall to the West Channel storm sewer outfall. The peak flow rates have largely been maintained at the West and East Channel storm sewer outlets through the proposed diversion of the flow from the East Channel to the West Channel and with the implementation of SWM controls. Despite maintaining the peak flow rates, there is a reduction in the runoff volume conveyed to the East Channel and a corresponding increase in the runoff volume conveyed to the West Channel. As discussed within Section 4.1.1, the simulated change in runoff volume discharging from the study area has been used as a surrogate for the change in imperviousness or contributing drainage area for the Wetland Risk Assessment.

The East and West Channels discharge to the respective wetlands. The City of Pickering 12 hour AES 2-100 year design storm events have been used to estimate the runoff volume discharged at each storm sewer outlet and associated channels and downstream wetlands. Additionally, flow monitoring data has been used to estimate the base flow discharging at each storm sewer outlet and has been added to the PCSWMM model simulated flow hydrographs. The observed base flow, which preceded five (5) storm events, has been averaged for the East Channel downstream of the Central Street storm sewer outfall and the for the West Channel, downstream of the Canso Drive outfall. The average base flow at the outfall to the East Channel has been determined to be 0.06 m^3/s (+/-) while the average baseflow at the outfall to the West Channel has been determined to be 0.003 m^3/s (+/-). These values have been added to both the existing and proposed conditions flow hydrographs for the 2-100 year design storm events. The corresponding runoff volumes are provided within Table 4.5.

Table 4.5. Comparison of the Existing and Proposed Conditions Runoff Volumes at the Two Drainage Outlets for the Study Area

Scenario	Outlet	Runoff Volume (m3)					
		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Existing Conditions	West Channel at Acorn Lane	3,925	6,453	8,398	11,000	12,986	14,942
	East Channel at Old Brock Road	11,486	15,045	18,138	22,296	25,579	28,866
Proposed Conditions	West Channel at Acorn Lane	4,572	7,233	9,392	12,262	14,523	16,797
	East Channel at Old Brock Road	10,831	14,251	17,138	21,016	24,029	27,015
Difference (m3)	West Channel at Acorn Lane	+647	+781	+995	+1,262	+1,537	+1,855
	East Channel at Old Brock Road	-655	-793	-1,000	-1,280	-1,550	-1,851
Difference (%)	West Channel at Acorn Lane	+16.5	+12.1	+11.8	+11.5	+11.8	+12.4
	East Channel at Old Brock Road	-5.7	-5.3	-5.5	-5.7	-6.1	-6.4

As shown within Table 4.5, there would be an increase in the runoff volumes at the Acorn Lane culvert crossing of the West Channel for the simulated 2-100 year 12 hour AES design storm events in comparison of the existing conditions scenario and the proposed conditions scenario (i.e. preferred alternative). The greatest percentage increase would be 16.5 % (+/-) for the 2 year storm event. Consequently, there is a reduction in the runoff volume discharged at the Old Brock Road culvert crossing of the East Channel in comparison of the existing conditions scenario and the proposed conditions scenario (i.e. preferred alternative). The simulated reduction in runoff volumes would be 5.7 % for the 2 year event and up to 6.4 % for the 100 year storm event.

While base flow has been considered at the storm sewer outfalls to each channel, there is likelihood that the base flow is greater than has been estimated. The East Channel is 800 m (+/-) in length from the Central Street outfall to the culvert crossing at Old Brock Road. The West Channel is 430 m (+/-) in length from the Canso Drive outfall to the culvert crossing at Acorn Lane. Background information reviewed for the Claremont Drainage Plan MCEA indicated that there are likely high groundwater tables within the study area. As such, it is possible that the groundwater would contribute to the baseflow over the length of the East and West Channels from the outfalls to the culvert crossings and the monitored base flow at the outfalls does not account for the contributing base flow along the full lengths of the channels. Additional monitoring data beyond the culvert crossings would be required to confirm this hypothesis; this could be included as part of the detailed design for the preferred alternative.

4.4.2 Sensitivity of the Wetland

There are five (5) criteria identified in the Wetland Water Balance Risk Evaluation (TRCA 2017) that contribute to the evaluation of the sensitivity of a wetland:

4.4.2.1 Vegetation community

Different ecological communities vary in their sensitivity to hydrological change. Of the two wetlands of interest to the prescribed activities, one has been classified using ELC – as provided by TRCA. The wetland to the west of Acorn Lane (Wetland 1), which follows the stream alignment, has been classified as MAM2-2 – Reed Canary Grass Mineral Meadow Marsh. This community is considered to have **Low Sensitivity** according to the TRCA criteria.

The other wetland on the east side of Old Brock Road (Wetland 2), has not been formally assessed. If both Wetlands are of the same ELC class, then the Sensitivity ranking for the Vegetation communities would be Low, however due to the lack of formal assessment **Medium Sensitivity** is a conservative assigned ranking.

4.4.2.2 Fauna Species

Many species are adapted to particular hydrological conditions or are associated with specific vegetation within wetlands. There is considerable variation in the ability of species to withstand hydrological change within their habitats. Several sensitive fauna (reptiles, amphibians, and birds) are known to the surrounding area and may use the subject wetland for different life processes. Whereas the location of observations are not always specifically known, they are thought to be proximal or within the subject wetland. Three species have been observed directly within/adjacent to the subject wetlands – Northern Leopard Frog, Green Frog, and American Toad; the first is a species of **High Sensitivity**, and others are ranked as **Medium Sensitivity**. To this extent, given the combined sensitivities of known fauna, the Sensitivity ranking for the fauna within the wetland is **High** (presence of High sensitivity species).

4.4.2.3 Flora Species

There is a strong correlation between the hydrology of a wetland and the vegetation community present in the wetland. Some species require specific hydrological conditions while others persist in a broader range of hydrological conditions. As no formal field visit has been conducted, a species list is not available.

The overall sensitivity ranking for flora within the subject wetland is **Medium** (conservative estimate in absence of formal species list).

4.4.2.4 Significant Wildlife Habitat for Hydrologically Sensitive Species

Wetlands provide habitat for a large number of species and some of this habitat is very sensitive to hydrological change. Candidate Significant Wildlife Habitat for hydrologically sensitive species is possible based on known species occurrences and habitat characteristics for the subject wetland:

- Amphibian Breeding Habitat (Wetland)
- Amphibian Movement Corridor
- Marsh Bird Breeding Habitat

These candidate sites would require field confirmation of breeding populations of amphibians and/or marsh birds in order to confirm presence of Significant Wildlife Habitat. Significant Wildlife Habitat for high sensitivity species (amphibians) is thought to be present in the subject wetland based on observations of multiple amphibian species; as such, the sensitivity rating is **High** (presence of Significant Wildlife Habitat as defined by Significant Wildlife Habitat Criteria Schedules for Ecoregion 6E (OMNRF 2015), for high sensitivity species).

4.4.3 Hydrological Classification

Due to the lack of change in the drainage area and the imperviousness contributing to the wetlands, Equation 1 Wetland Water Balance Risk Evaluation (TRCA, November 2017) has not been used to determine the sensitivity, or level of risk, of the wetlands. Using Equation 1 to calculate the *impervious cover score* would result in a value of 0, which is not reflective of the proposed drainage improvements that have been recommended as per the preferred alternative. The simulated percentage change of the runoff volume, in addition to the average observed base flow, discharging to the wetlands has been used as a surrogate to the *impervious cover score* calculation. The Wetland Water Balance Risk Evaluation (TRCA, November 2017) criteria for water taking / discharge and the impact to recharge areas also do not apply to the for the hydrological classification as these parameters have not been proposed to be altered as per the preferred alternative. The change in runoff volume is the only hydrologic parameter that will be used to evaluate the magnitude of hydrological change.

Consistent with the magnitudes of change identified within Table 2 within the Wetland Water Balance Risk Evaluation (TRCA, November 2017) for the increase / decrease of catchment size, the following magnitudes of change have been applied for this evaluation:

- < 10 % = Low Magnitude
- 10-25 % = Medium Magnitude
- > 25 % = High Magnitude

The simulated runoff volume results for the preferred alternative (ref. Table 4.5) for the West Channel indicate that there would be an increase in the runoff volume of 16.5 % (+/-) for the City's 2 year 12 hour AES design storm event. Similarly, the runoff volumes for the 5-100 year storm events would increase by 11.5 % (+/-) to 12.4 % (+/-). These increases are in excess of 10 % magnitude of change, however, are less than 25 % magnitude of change; the magnitude of runoff volume change for the West channel due to the implementation of the preferred alternative would be considered **Medium** based on the ranges provided within Table 2 within the Wetland Water Balance Risk Evaluation (TRCA, November 2017) for the increase / decrease of catchment size.

The preferred alternative simulated runoff volume results (ref. Table 4.5) for the East Channel indicate that there would be a decrease in the runoff volume of 5.7 % (+/-) for the City's 2 year 12 hour AES design storm event; the runoff volumes for the 5-100 year storm events would also decrease by 5.3 % (+/-) to 6.4 % (+/-). These decreases are less than a 10 % magnitude of change; the magnitude of runoff volume change for the East channel due to the implementation of the preferred alternative would be considered Low based on the ranges provided in Table 2 within the Wetland Water Balance Risk Evaluation (TRCA, November 2017) for the increase / decrease of catchment size.

4.5 Wetland Risk

Subsequent to the identification of the above criteria, the overall Sensitivity of the subject weltands is identified as **High** (for the west wetland) and **Low** (for the east wetland). In order to characterize the risk to the hydrological and ecological integrity of the wetland, the Project Risk Decision Tree (TRCA, 2017) was followed. The magnitude of hydrological change (Medium and Low) and the sensitivity of the wetland (High) were considered, and the decision tree points to **High (west wetland)** and **Low (east wetland)** risk under these parameters. It is important to note, however, that the intent of this evaluation is to consider the potential impacts associated with the improvements to flow and the protection of property (flood risk/damage) and their potential effects on the wetlands. To this extent, we recognize that the flora and fauna associated with the wetland are considered to be sensitive to hydrological change, and the potential impacts are considered with this in mind.

4.6 Assessment of Function

4.6.1 Hydrological

The sensitivity of a wetland to hydrological change is influenced by the hydrogeomorphic setting of the wetland. The four (4) wetland hydrological wetland classifications defined within the Ontario Wetland Evaluation System (OMNR 2013) and referenced within the Wetland Water Balance Risk Evaluation (TRCA, November 2017), are defined as isolated, palustrine, riverine, and lacustrine. It is anticipated that the wetlands within the study area are identified as riverine wetlands due to the permanent baseflow discharging to and from the watercourse upstream and downstream of the wetlands.

The flow monitoring data obtained between April 2017 and November 2017 at the storm sewer outfalls indicates that there is a constant flow of water that is discharging to the East and West channels which discharge to the wetlands. However, flow monitoring data has not been obtained downstream of the wetlands and it has been assumed that there is a constant flow discharging from the wetlands due to the constant flow conveyed to the wetlands. Additionally, the Claremont Drainage Plan MCEA indicated that there are likely high groundwater tables within the study area as noted by City Staff and residents of the community. The groundwater would contribute to the baseflow discharging to and from the wetlands, however, has not been confirmed

The wetlands have been identified as riverine wetlands; the wetlands are classified with a low sensitivity ranking according to the criteria within Table 3 of the Wetland Water Balance Risk Evaluation (TRCA, November 2017).

4.6.2 Ecological

The vegetation community and individual floral species associated with the wetland are provisionally characterized as being low to medium sensitivity. Medium sensitivity has been selected as a conservative rank based on the lack of full field assessment, in combination with aerial imagery review. Species of these sensitivity ranking are less likely to be particularly sensitive to changes in local hydrology. Significant changes to the wetland hydrology are not anticipated as a result of the proposed works, which are anticipated to only affect surface water inputs associated with storm surge event. The catchment area of the wetlands will remain unaltered by the proposed works.

The faunal community associated with the wetland is characterized as high sensitivity. Significant changes to wetland hydrology could reasonably be expected to impact the life processes of these species. Amphibians with habitat preferences characteristic of the features available within the subject wetland are those that depend on seasonal, or ephemeral, aquatic, fish-free, habitats. These are the most sensitive species known to be associated with the subject wetland and are also associated with the three (3) Significant Wildlife Habitat types identified within or immediately adjacent to the wetland.

Avian species which may use the candidate Marsh Bird breeding Significant Wildlife Habitat are identified as sensitive to changes in hydrology, but to a lesser extent than amphibians, and are not expected to experience impacts to habitat form or function resulting from the proposed works.

4.7 Mitigation

4.7.1 Hydrological

As noted in Section 4.7.2, short-term mitigation controls will be required during the construction of the Claremont Drainage Plan MCEA preferred alternative and associated works to prevent unwanted disturbances or impacts to the wetland features.

The long-term impacts of implementing the refined drainage diversion structure as the preferred alternative results in a change in runoff volumes conveyed to the wetlands; further refinement and assessment can be undertaken at the next stages of planning and design. The refinements may include reducing the runoff volume that would be diverted from the East Channel to the West Channel, while still maintaining the appropriate level of service for the drainage systems within the Hamlet of Claremont.

4.7.2 Ecological

While long-term effects to the form and function of the wetland are not anticipated, project activities are anticipated to result in temporary disturbances as a direct result of construction activities. Unmitigated, the proposed works could result in deleterious impacts to the wetland and the species that depend on it.

Mitigation measures include spill prevention for vehicles associated with the proposed works. Hydrological alteration during the proposed works should be conducted outside the timing window associated with amphibian and marsh bird breeding to avoid impacting successful breeding through water level fluctuations.

5.0 Conclusions and Recommendations

5.1 Conclusions

Drainage from the Hamlet of Claremont is primarily conveyed to two (2) channels, identified as the East and West Channel, which convey runoff to two (2) wetlands features downstream of and within the channels. Due to drainage system capacity issues identified through the Claremont Drainage Plan MCEA, the preferred alternative has recommended to divert flow from the East Channel to the West Channel while also implementing stormwater management quantity controls. The proposed quantity controls would largely mitigate potential peak flow rate increases at the West Channel, however, there would be an increase in the runoff volume discharged at the storm sewer outfall to the West Channel based on the City of Pickering 2 -100 year AES 12 hour design storm events. Consequently, there would be a reduction in the runoff volume discharged at the storm sewer outfall to the East Channel.

The Wetland Water Balance Risk Evaluation (TRCA, November 2017) has been used to determine the hydrological impact to the two (2) wetlands; a surrogate approach has been used based on the change in runoff volume. The increase in runoff volume to the West Wetland would be greater than 10 % and less than 25 % and the magnitude of runoff volume change (hydrological change) would be Medium. The decrease in runoff volume to the East Wetland would be less than 10 % and the magnitude of runoff volume change (hydrological change) would be Low.

A desktop review of available resources has been completed to evaluate the ecological sensitivity of the wetlands:

- The data indicated that there are low sensitivity vegetation species within the west wetland, and limited data for the east wetland; conservatively, a medium sensitivity has been used for the east wetland vegetation species.
- The data was reviewed for known fauna within the wetlands; the combined sensitivities of known fauna within the wetland is High due to the presence of High sensitivity species, the Northern Leopard Frog.
- The overall sensitivity ranking for flora within the subject wetland is Medium (conservative estimate in absence of formal species list).
- Significant Wildlife Habitat for high sensitivity species (amphibians) is thought to be present in the subject wetland based on observations of multiple amphibian species; as such, the sensitivity rating is High.

The subsequent wetland hydrological sensitivity and ecological sensitivity have been reviewed in reference to the Project Risk Decision Tree (TRCA, 2017). The magnitude of hydrological change (Medium and Low) and the sensitivity of the wetland (High) were considered, and the decision tree points to High (west wetland) and Low (east wetland) risk under these parameters.

5.2 Recommendations

It is recommended that this Wetland and Water Balance Risk Evaluation be reviewed with the TRCA in order to refine the evaluation and identify any future monitoring requirements. The following preliminary recommendations have been compiled based on the findings for the Wetlands Water Balance Risk Assessment:

For the west wetland (High Risk)

1. Monitoring required as outlined in Wetland Water Balance Monitoring Protocol (TRCA, 2016). This would be conducted subsequent to completion of the Claremont Drainage Plan Class EA and prior to the detailed design of the revised drainage diversion structure on Central Street and associated works. It is worthy to note that refinement of the drainage diversion structure may reduce the risk analysis determined herein.
2. Additional emphasis placed on characterization of groundwater interaction, with hydrogeological investigations to be conducted as part of detailed design of the Class EA revised drainage diversion structure and associated works.
3. Approved continuous hydrological model is required (e.g. PCSWMM) for all applications. The PCSWMM modelling from the Class EA can be used for the purpose of assessing the revised drainage diversion structure detailed design and associated works.
4. Integrated hydrological model may be required where groundwater interaction is high. This modelling would be conducted as part of the detailed design of the revised drainage diversion structure detailed design and associated works.
5. Design mitigation plan to maintain water balance to wetland as outlined in SWM Criteria Document (TRCA, 2012; see overall objective for wetlands). This modelling would be conducted as part of the detailed design of the revised drainage diversion structure detailed design and associated works.
6. Interim mitigation plan may be required as part of the detailed design process for the revised drainage diversion structure detailed design and associated works.

For the east wetland (Low Risk)

1. Monitoring is not required based on the Low Risk categorization assigned to the wetland.
2. Non-continuous hydrological model (e.g. Thornthwaite Mather) is required with output at monthly or higher resolution; this would be required prior to completion of the detailed design process for the revised drainage diversion structure detailed design and associated works.
3. Design mitigation plan to maintain water balance to wetland as outlined in SWM Criteria Document (TRCA, 2012; see overall objective for wetlands); this would include refining the diversion control structure during the detailed design.

•

6.0 References

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Appendix A

Claremont Drainage Plan Municipal Class Environmental Assessment Figures

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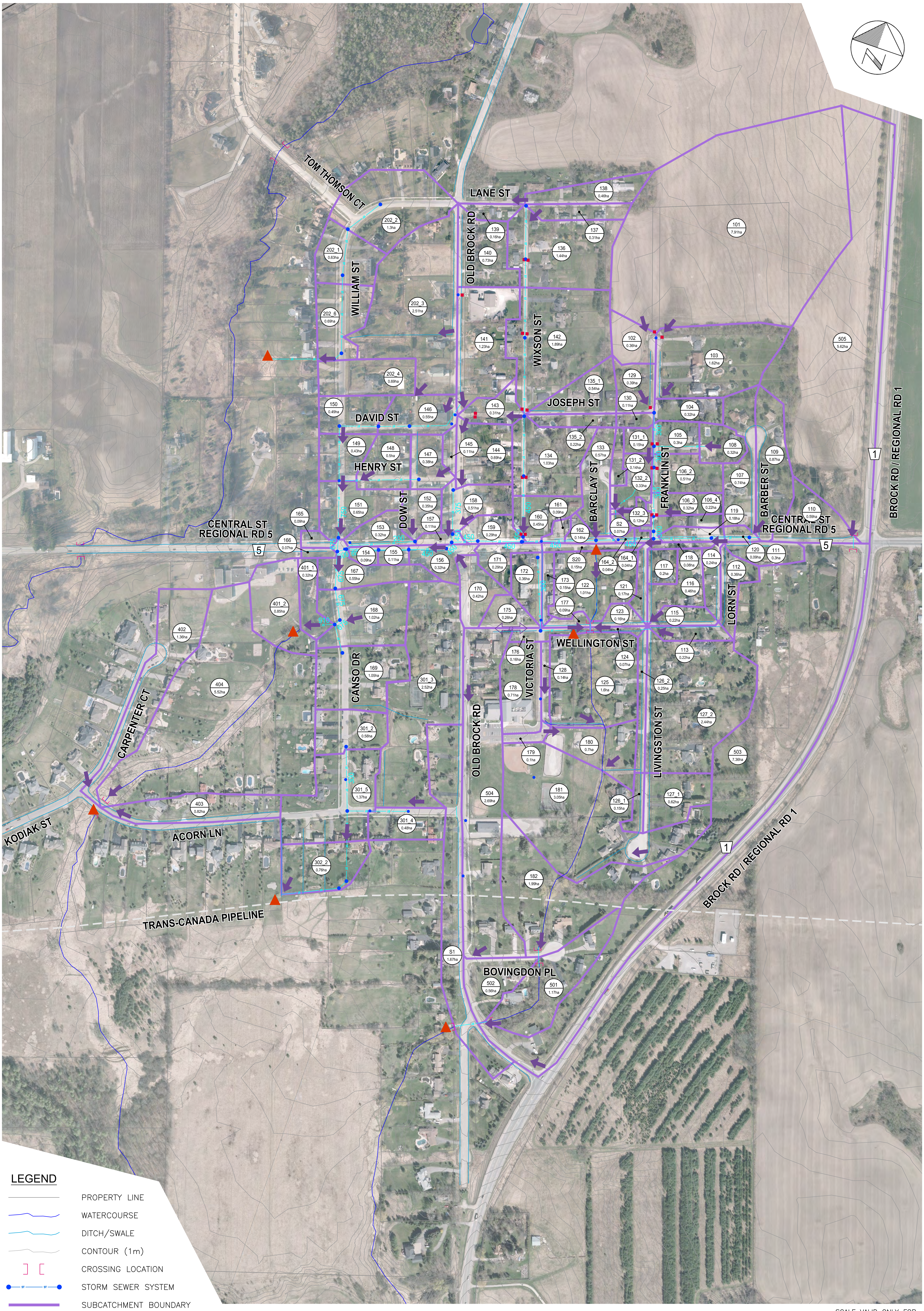
SCALE VALID ONLY FOR 24"x36" VERSION

CLAREMONT DRAINAGE PLAN CITY OF PICKERING	STUDY AREA PLAN	wood.	Scale 1:2500 (0 25 50 100) Consultant File No. TPB168152S Figure No. 1



LEGEND

- PROPERTY LINE
- WATERCOURSE
- DITCH/SWALE
- CONTOUR (1m)
- CROSSING LOCATION
- STORM SEWER SYSTEM
- SUBCATCHMENT BOUNDARY
- 150 — SUBCATCHMENT ID#
- 0.49ha — SUBCATCHMENT AREA
- MAJOR SYSTEM FLOW DIRECTION
- OUTFALL LOCATION

SCALE VALID ONLY FOR 24"x36" VERSION

CLAREMONT DRAINAGE PLAN CITY OF PICKERING	SUBCATCHMENT BOUNDARY PLAN	wood.	Scale 1:2500 (0 25 50 100) Consultant File No. TPB168152S Figure No. 3

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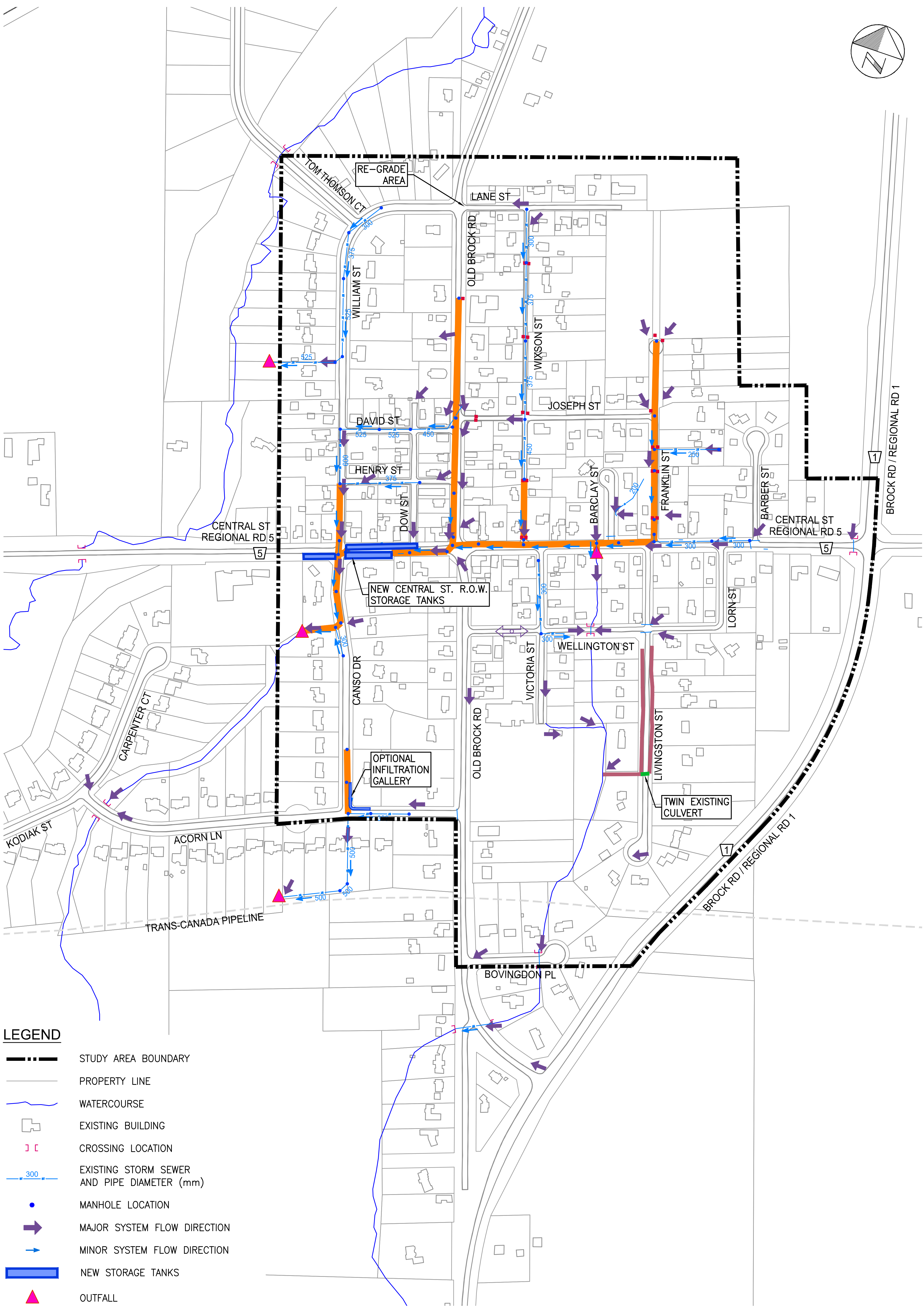

LEGEND

- STUDY AREA BOUNDARY
- PROPERTY LINE
- WATERCOURSE
- EXISTING BUILDING
- CROSSING LOCATION
- EXISTING STORM SEWER AND PIPE DIAMETER (mm)
- MANHOLE LOCATION
- MAJOR SYSTEM FLOW DIRECTION
- MINOR SYSTEM FLOW DIRECTION
- NEW STORAGE TANKS
- OUTFALL
- STORM SEWER UPGRADE
- NEW CATCHBASIN
- DITCH RE-PROFILING
- CULVERT UPGRADES

SCALE VALID ONLY FOR 24"x36" VERSION

CLAREMONT DRAINAGE PLAN CITY OF PICKERING	ALTERNATIVE 2 CENTRAL STREET RIGHT-OF-WAY	wood.	Scale 1:2500 (0 25 50 100) Consultant File No. TPB168152S Figure No. 8

Appendix B

Ecology Figures

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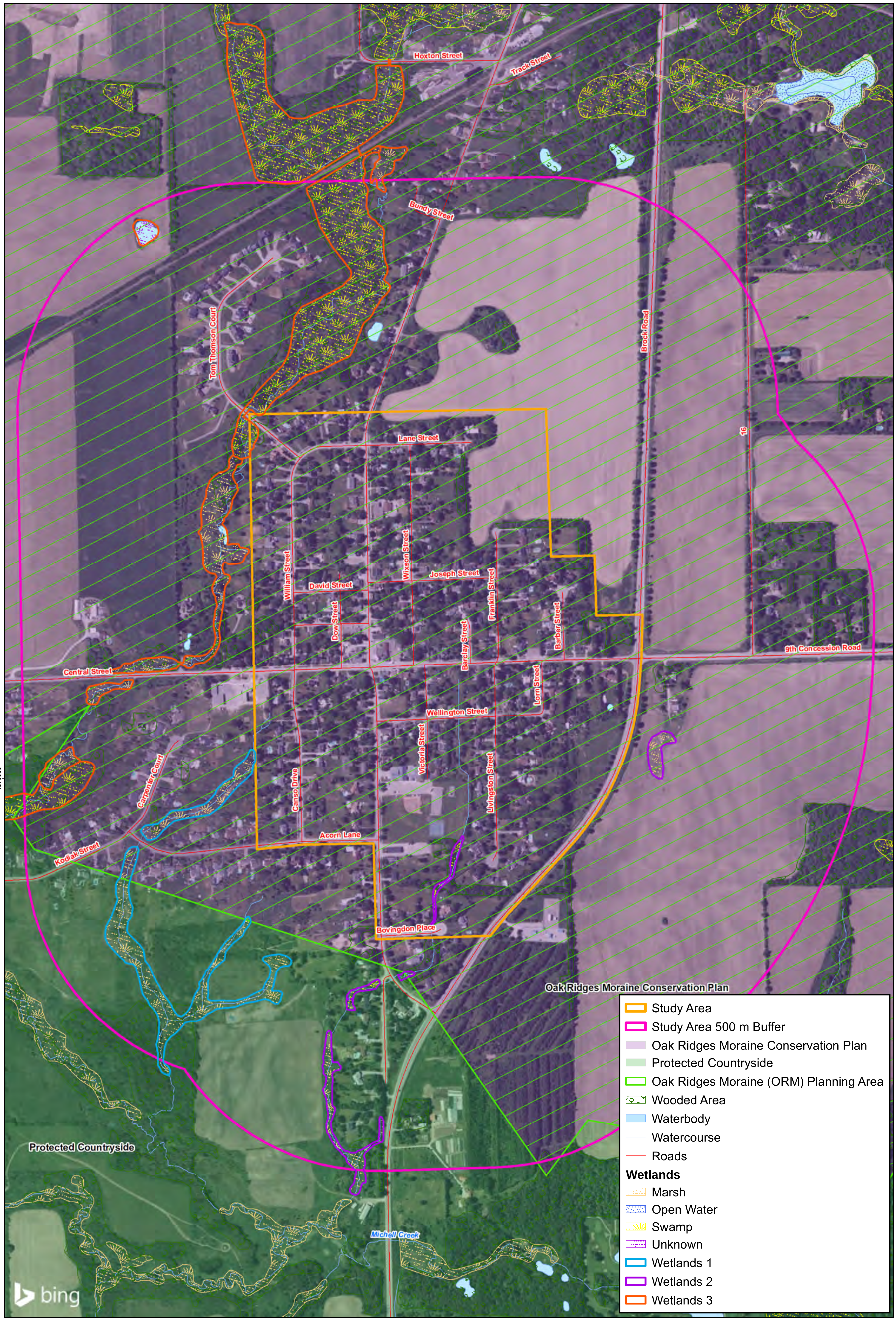

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QA/QC: KW MT MG
Sources: AB TPR, Centre for Cadastral Management, Geomatics Canada
- Contains information licensed under the Open Government licence – Alberta, Canada.
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City of Pickering

Claremont Drainage Plan Project

Wetlands Map

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Metres
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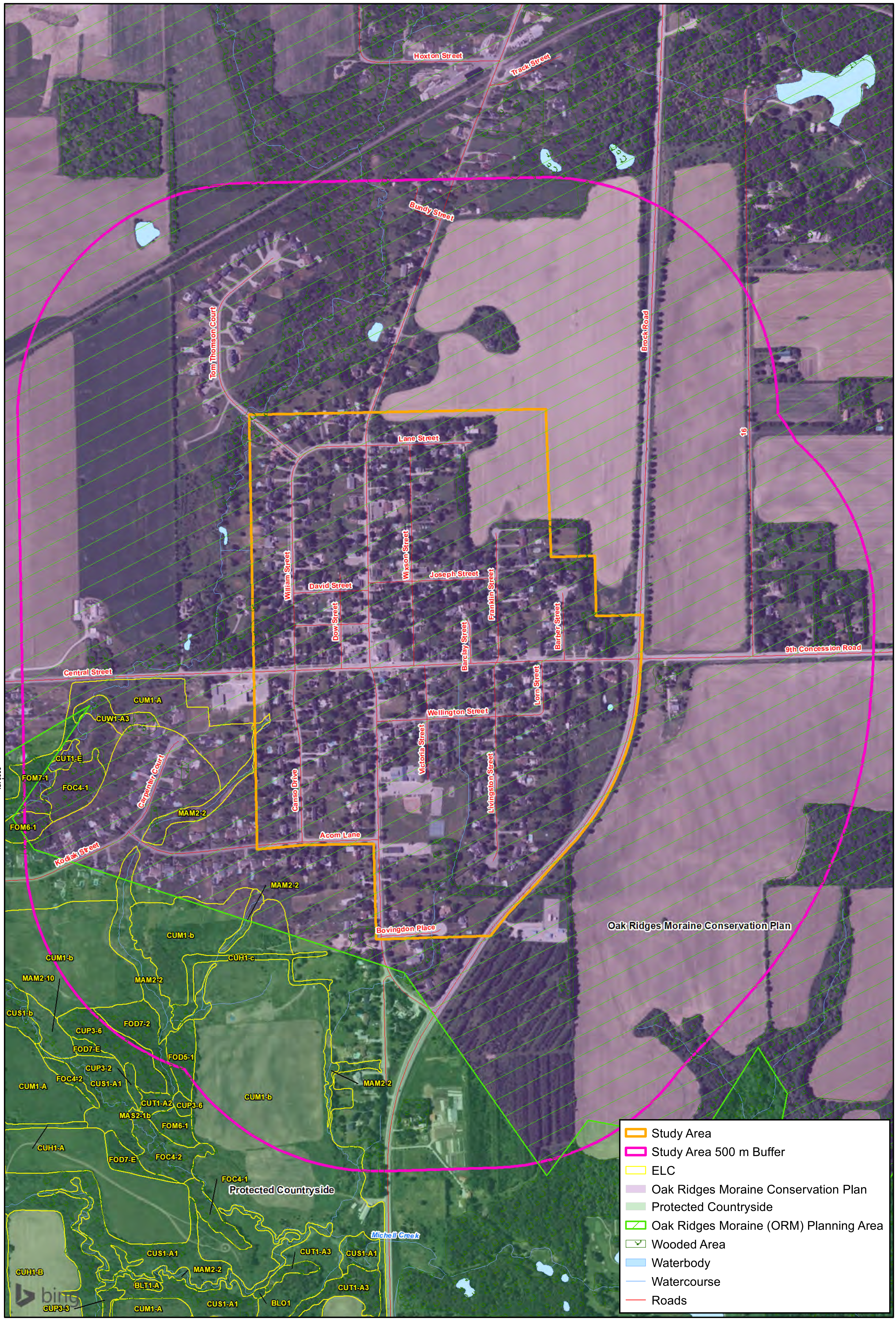
N

wood.

March 2022

Figure 2



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Sources: AB TPR, Centre for Cadastral Management, Geomatics Canada
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City of Pickering

Claremont Drainage Plan Project

Vegetation Map

100 0 100
Metres
1:7,500

N

wood.

March 2022

Figure 3

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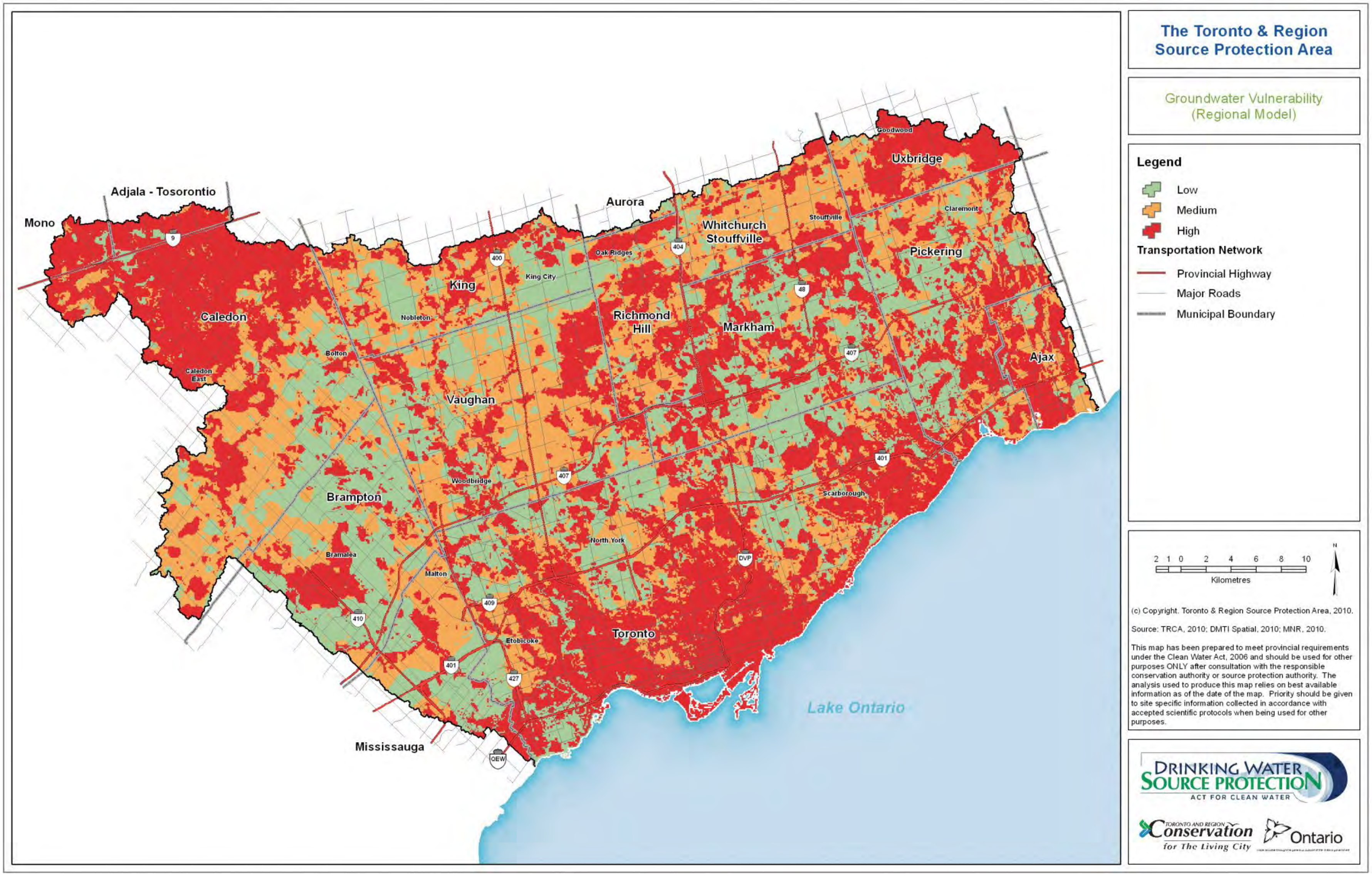

Figure 4.1: Groundwater Vulnerability (Regional Model)

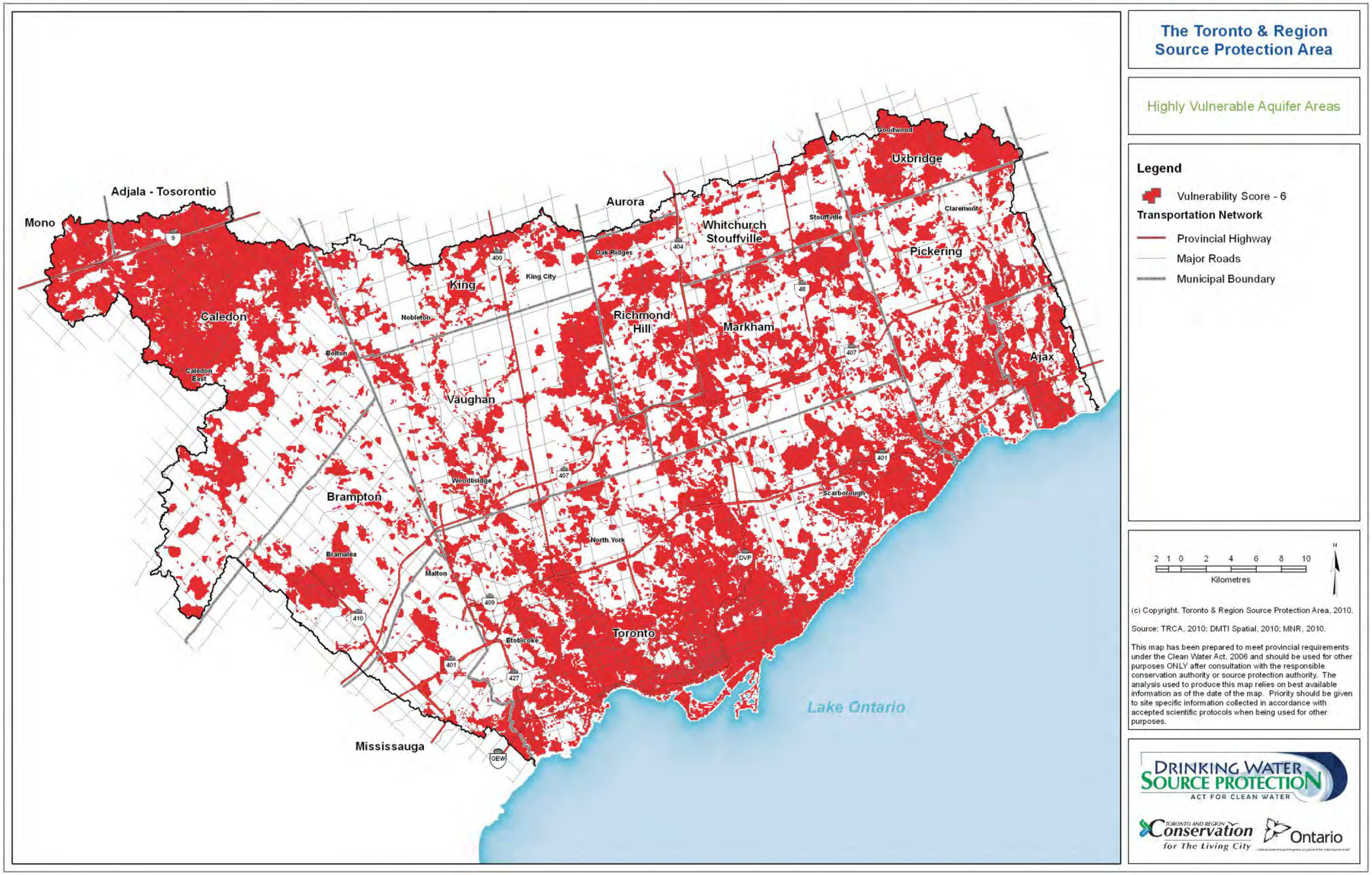

Figure 4.2: Highly Vulnerable Aquifers (HVAs)

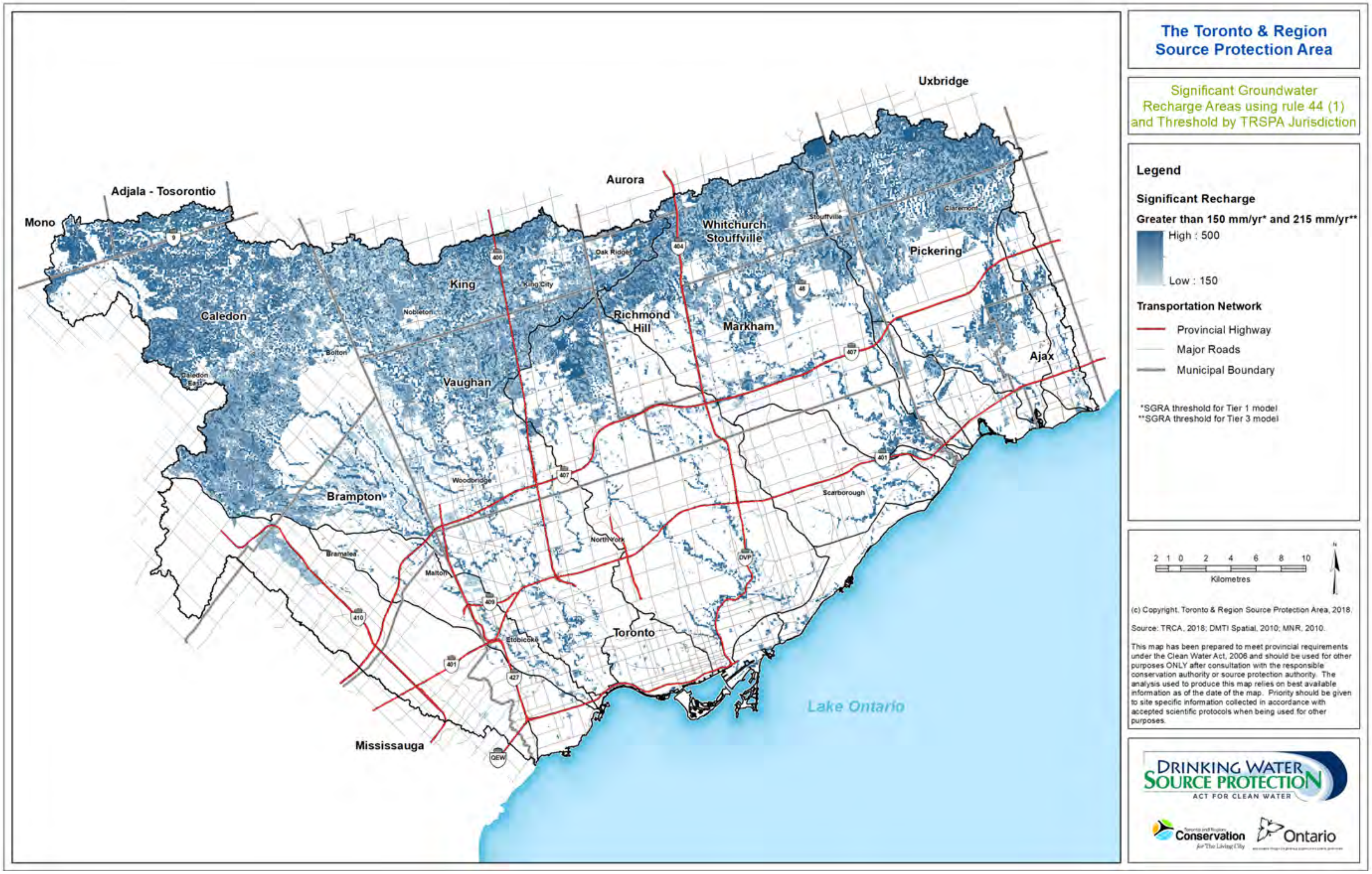

Figure 4.3: Significant Groundwater Recharge Areas using *Rule 44 (1)* and threshold by TRSPA Jurisdiction