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TOWN OF CALEDON
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**Innis Lake Local Subwatershed Study -
Part A Existing Conditions**

**Innis Lake Secondary Plan Area
Landowners
C/O Mattamy (Innis Lake) Limited
6696 Financial Drive
Mississauga ON L5N 7J6**



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Table of Contents

Part A – Characterization of Existing Conditions and Baseline Inventory	1
1.0 Introduction.....	1
1.1 Background and Purpose	1
1.2 Scope of Work.....	4
2.0 Planning Context	4
2.1 Federal Species at Risk Act, 2002.....	4
2.2 Federal Fisheries Act, 1985.....	5
2.3 Federal Migratory Birds Convention Act, 1994.....	5
2.4 Provincial Planning Statement, 2024	6
2.5 Species Conservation Act, 2025.....	7
2.6 Region of Peel Official Plan, 2022	8
2.7 Settlement Area Boundary Expansion (SABE), 2022.....	9
2.7.1 Environmental Screening Report.....	9
2.7.2 Scoped Subwatershed Study	10
2.8 Future Caledon Official Plan, 2025	15
2.9 Conservation Authority	17
2.9.1 Conservation Authorities Act, 1990	17
2.9.2 Ontario Regulation 41/24	17
2.9.3 TRCA Living City Policies.....	18
2.9.4 Source Water Protection	18
3.0 Ecological Conditions	20
3.1 Background Records Review and Agency Consultation	20
3.1.1 Terrestrial Habitat.....	21
3.1.2 Aquatic Habitat.....	21
3.2 Field Methodology	25
3.2.1 Vegetation Communities and Species.....	25
3.2.2 Avifauna.....	30
3.2.3 Amphibian Breeding Call Surveys	32
3.2.4 Reptiles.....	33
3.2.5 Bats.....	34
3.2.6 Aquatic Habitat Assessment.....	38
3.2.7 Headwater Drainage Feature Assessments	38
3.2.8 Incidental Wildlife Observations	41
3.2.9 Anthropogenic Features	41
3.3 Existing Ecological Conditions	41
3.3.1 Vegetation Communities and Species.....	41
3.3.2 Avifauna.....	48
3.3.3 Amphibian Breeding Call Surveys	48
3.3.4 Reptiles.....	49
3.3.5 Bats.....	49
3.3.6 Wetlands.....	51
3.3.7 Aquatic Habitat.....	54
3.3.8 Watercourse Constraint Ranking.....	57

3.3.9	Headwater Drainage Features	61
3.3.10	Reach-based Classification	62
3.3.11	Incidental Wildlife Observations	70
3.4	Preliminary Feature-Based Water Balance Risk Assessment	70
4.0	Hydrogeology	72
4.1	Physiography and Topography	72
4.2	Geology	72
4.3	Hydraulic Conductivity	73
4.4	Local Groundwater Use	73
4.5	Groundwater Conditions	74
4.6	Groundwater Quality	75
4.7	Site-Wide Existing Conditions Water Balance	75
5.0	Geotechnical	76
5.1	Background Conditions	76
5.2	Slope Stability Toe Erosion Assessment and Long-Term Stable Slope Summary	76
6.0	Hydrology and Hydraulics	77
6.1	Hydrologic Study Area	77
6.1.1	Existing Drainage	77
6.2	Desktop Assessment and Background Review	81
6.2.1	Reports	81
6.2.2	Hydrology	82
6.2.3	Hydraulics	82
6.3	Updated Hydrologic and Hydraulic Models	83
6.3.1	Existing Hydrologics	83
6.3.2	Existing Hydraulics	84
6.4	Stormwater Management Criteria	84
6.5	Flood Vulnerable Areas	86
7.0	Baseline Surface Water Monitoring	86
7.1	Water Quantity	86
7.1.1	Methodology	86
7.1.2	Results	87
7.2	Water Quality	88
7.2.1	Methodology	88
7.2.2	Laboratory Results	89
7.2.3	In-Situ Results	90
8.0	Fluvial Geomorphology	99
8.1	Reach Delineation	99
8.2	Reach Observations	100
8.3	Rapid Assessments	104
8.4	Erosion Hazard Delineation	107
8.4.1	Meander Belt Width Assessment – Unconfined Reaches	108
8.4.2	Toe Erosion Allowance Recommendation for Phase 1 Lands	113
9.0	Constraints	114

10.0 References117

Tables

Table 1. ESR Natural Feature Constraint Ranking10

Table 2. Preliminary NHS Feature Types12

Table 3. NHS Targets for SABE Area13

Table 4. FCOP - Minimum Setbacks from Natural Features15

Table 5. TRCA Minimum Buffer Requirements18

Table 6: Fish Species Historically Observed in the West Humber River22

Table 7: Excerpt from Table 1 Criteria and Thresholds for Identification of Core Areas, Natural Areas and Corridors (NAC) and Potential Natural Areas and Corridors (PNAC) Woodlands (RPOP, 2022)29

Table 8: Summary of Breeding Bird Survey Weather Conditions31

Table 9: Amphibian Breeding Call Survey Weather Conditions32

Table 10: Turtle Basking Survey Weather Conditions33

Table 11: Exit Survey Weather Conditions35

Table 12: HDF Recommended Timing and Field Investigation Dates39

Table 13. Amphibian Breeding Call Survey Results49

Table 14: Recorded Bat Calls50

Table 15: Subject Properties - Watercourse Constraint Ranking58

Table 16: Headwater Drainage Feature Reach Classifications63

Table 17: Summary of Incidental Wildlife Observations by Burnside Staff on the Subject Properties70

Table 18: Preliminary Feature-Based Water Balance Risk Evaluations71

Table 19: Existing Conditions Water Balance Summary76

Table 20: Catchment Drainage Area Updates78

Table 21: Existing Catchment Total Peak Flows (m³/2)79

Table 22: Updated Catchment Area Total Peak Flows- Uncontrolled (m³/s)79

Table 23: Existing Drainage Area vs. Updated Existing Drainage Area Flow Comparison80

Table 24: Pre-Development Hydrologic Parameters83

Table 25: Stormwater Runoff Criteria84

Table 26: Unit Target Release Rates by Catchment85

Table 27: Minimum and Maximum Water Levels at Each Monitoring Location87

Table 28: 2025 Wet and Dry Event Sampling Conditions89

Table 29: Total Suspended Solids Measurements During Sampling Events91

Table 30: Turbidity Measurements During Sampling Events92

Table 31: Average and Maximum Water Temperature Per Sampling Locations93

Table 32: Dissolved Oxygen (mg/L) Measurements During Sampling Events97

Table 33: Dissolved Oxygen (%) Measurements During Sampling Events97

Table 34: Conductivity Measurements During Water Quality Sampling Events98

Table 35: General Reach Characteristics101

Table 36: Summary of Rapid Assessment Results105

Table 37: Summary of Maximum Meander Amplitudes and Meander Belt Widths based on Imagery from 1974, 1999 and 2018109

Table 38- Summary of Meander Belt Widths for Existing Conditions110
 Table 39: Toe Erosion Allowance Guide Adapted from MNR (2002) 113

Figures

Figure 1: Study Area..... 3
 Figure 2: SABE SWS Watercourse and HDF's 14
 Figure 3: Watercourses24
 Figure 4A: Wildlife Survey Locations27
 Figure 4B: SAR Bat Maternity Roost Assessment.....37
 Figure 5: Headwater Drainage Features.....40
 Figure 6: Ecological Land Classification Phase 142
 Figure 7 Ecological Land Classification Phase 243
 Figure 8: Woodland Evaluation.....47
 Figure 9 Wetlands53
 Figure 10: 2025 Thermal Classification of Tributary A East Branch at WH195
 Figure 11: 2025 Thermal Classification of Tributary A at WH3.....95
 Figure 12: 2025 Thermal Classification of Tributary B at WH6 and WH996
 Figure 13: Constraints 115
 Figure 14: Outermost Constraints.....116

Appendices

- Appendix A Terms of Reference
- Appendix B Natural Heritage Assessment
- Appendix C Hydrogeological Assessment
- Appendix D Preliminary Feature based Water Balance Risk Assessment
- Appendix E Geotechnical Report
- Appendix F Civil Engineering Report
- Appendix G Surface Water Monitoring Results
- Appendix H Fluvial Geomorphological Assessment

(Note: Appendices A to H have been provided as separate files)

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Part A – Characterization of Existing Conditions and Baseline Inventory

1.0 Introduction

1.1 Background and Purpose

R.J. Burnside & Associates Limited (Burnside), David Schaeffer Engineering Limited (DSEL), GEO Morphix Ltd., and DS Consultants Ltd. have been retained by the Innis Lake Secondary Plan Area Landowners c/o Mattamy (Innis Lake) Limited, to prepare a Local Subwatershed Study (LSS) in support of the Innis Lake Secondary Plan. The entire Secondary Plan Area (herein referred to as the “study area”) is generally bounded by Innis Lake Road to the west, Centreville Creek Road to the east, Mayfield Road to the south, and Healey Road to the north. The study area has been divided into two phases. Phase 1 encompasses approximately the southern half of the study area while Phase 2 encompasses the northern half. The study area is located at the southern boundary of the Town of Caledon (“Town”), within the Regional Municipality of Peel (“Region”), and falls under the jurisdiction of Toronto and Region Conservation Authority (TRCA) and the Ministry of Environment, Conservation, and Parks (MECP) Halton-Peel District.

Permission to Enter (PTE) was granted for the parcels at 12351 Innis Lake Road and 12250 Centreville Creek Road (herein referred to as the “subject properties”). At the time of this report there are non-participating landowners in Phase 1 and throughout the entirety of Phase 2. Applications for PTE were made for additional parcels within the study area, but to date have not been granted. Detailed field studies therefore took place on the subject properties, and a desktop background review was completed for the remainder of the study area. Notwithstanding, the consulting team has made efforts to ensure field studies are comprehensive and representative of broader conditions within Phase 1. Figure 1 illustrates the overall study area boundaries and location of the subject properties.

The entire study area is approximately 408.9 ha in size and includes a mix of naturalized areas, commercial lands and residential properties. The subject properties where field studies took place are approximately 100 ha in size and are bisected by a wooded valley that runs north to south (see Figure 1). Either side of the central valley, in the Phase 1 study area, is comprised of a mosaic of rural properties, active agriculture, cultural meadows and various forested and marsh communities. The Phase 2 study area is also comprised of a mosaic of rural properties, active agriculture, cultural meadows, and various forest and wetland communities. Should additional site access be granted for portions of the study area beyond the subject properties, further natural heritage, hydrogeological, geomorphological, and engineering assessments will be completed, as appropriate. Expanded site access would also support further refinement of the

Natural Heritage System (NHS), beyond the refinements already completed for the subject properties.

The boundary of the study area is consistent with the Innis Lake Secondary Plan Area depicted on Figure G1 of the Future Caledon Official Plan (2025) (FCOP). The boundaries of the study area represent only a portion of the West Humber River subwatershed. Tributaries of the West Humber River flow into the study area from the west, north and east. Flows are maintained to downstream reaches of the West Humber River through four crossings on Mayfield Road. In defining boundaries for this LSS, the consulting team has considered adjacent areas that are external to the proposed Secondary Plan. The baseline hydrology for the Secondary Plan Area was established by using the validated Visual OTTHYMO (VO) model of the Humber River Watershed that is provided by TRCA. The study area is contained by catchments 36.07, 36.08, 36.09, 36.10, and 36.11 of the West Humber River Watershed. The delineation of these catchments with respect to the Secondary Plan Area can be found in Figure 4 of DSEL's Functional Servicing Report (FSR) dated May 2026. The hydrologic modelling also accounts for external drainage from upstream tributary areas that will drain through the study area to ensure an accurate accounting of existing conditions flows. A HEC-RAS hydraulic model was also provided by TRCA that is used to establish the baseline conditions floodline. Both models are refined based on the latest LiDAR and topographic information to support the existing conditions assessment.

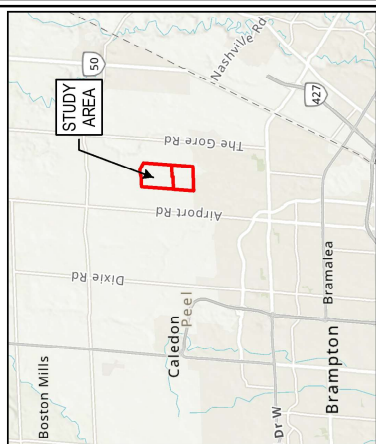
In future submissions, the proposed land use plan will be incorporated to prepare a post-development conditions hydrology and hydraulic model. Recommendations for stormwater management (SWM) ponds and culvert crossings will be provided to mitigate impacts to peak flows and the regulatory floodlines at key downstream nodes. Management and monitoring recommendations will also be provided to support the land use plan. Future submissions will consider the watercourses and lands within the West Humber River subwatershed located outside the study area to ensure they are not adversely impacted and will also address connectivity of the NHS beyond the Study Area boundaries.

The study components are organized into three parts, according to the Town's Terms of Reference: Local Subwatershed Studies (LSS TOR).

- Part A - Characterization of Existing Conditions and Baseline Inventory
- Part B - Analysis, Impact Assessment, Mitigations and Recommendations
- Part C - Implementation, Monitoring and Adaptive Management

This report includes all required items to characterize existing conditions of the study area and understand the baseline conditions. Additionally, all study component parts also follow requirements set out in the Region of Peel Official Plan (2022) and the FCOP (2025).

Subject Properties
Phase 1 Study Area
Phase 2 Study Area



Sources:
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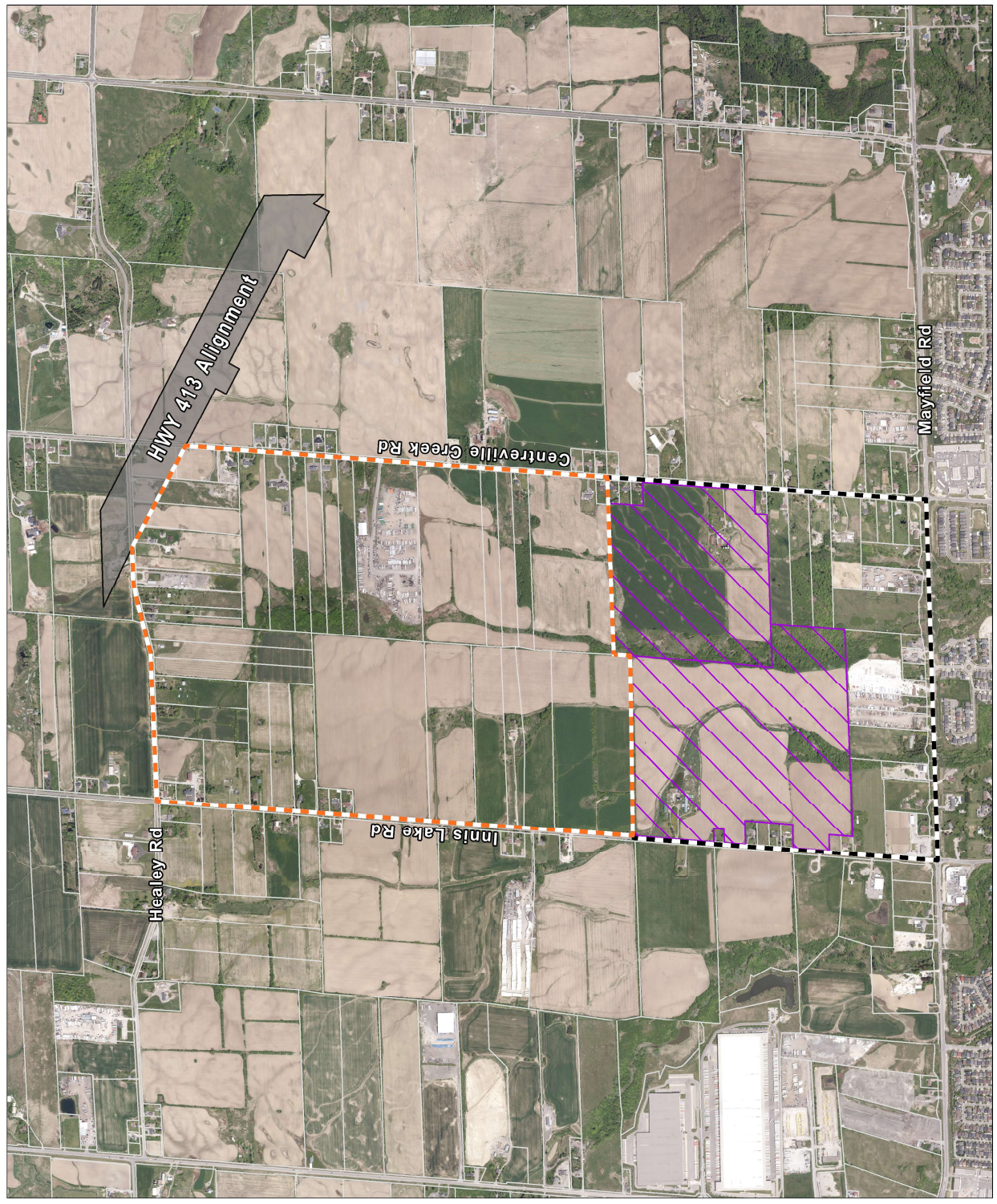
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 Coord. System: NAD 1983 CSRS UTM Zone 17N
 Projection: Transverse Mercator
 Central Meridian: 81°00'00"W
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MATTAMY HOMES

Figure Title
**INNIS LAKE SECONDARY PLAN -
SUBWATERSHED STUDY**
STUDY AREA

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1.2 Scope of Work

Part A - Characterization of Existing Conditions and Baseline Inventory was prepared in accordance with Burnside's TOR for the LSS (second submission) dated May 1, 2026 (see Appendix A of this report) and includes a summary of applicable provincial policies and guidelines. As such, Part A of the LSS includes:

- A review of applicable environmental policies and regulations affecting the study area, including the Secondary Area Boundary Expansion (SABE) study.
- A review of existing secondary source data to identify any known natural features.
- Pre-submission consultation with various agencies to identify additional features and to confirm field study methodologies.
- A summary of detailed field assessments that were conducted on the subject properties.
- A description of the proposed development, including conceptual servicing and SWM measures.

2.0 Planning Context

2.1 Federal Species at Risk Act, 2002

The *Species at Risk Act, 2002* (SARA), provides protection for Species at Risk (SAR) and their habitat. Schedule 1 of SARA is considered the official list of wildlife species at risk that receive legal protection under the Act and includes species that have been assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Extirpated, Endangered, Threatened, or Special Concern (Government of Canada, 2017).

To ensure the protection of SAR, Section 32(1) and (2) of the SARA states:

(1) No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species, or a threatened species

(2) No person shall possess, collect, buy, sell or trade an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species, or any part or derivative of such an individual

And Section 33 of the SARA states:

No person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered or threatened species, or that is listed as an extirpated species if a recovery

strategy has recommended reintroduction of the species into the wild in Canada

SARA prohibitions pertaining to private lands include:

- Aquatic species listed on Schedule 1 as Endangered, Threatened or Extirpated.
- Migratory birds listed in the MBCA and also listed on Schedule 1 as Endangered, Threatened or Extirpated.
- May apply through an order to other species listed on Schedule 1 (i.e., not an aquatic or migratory bird species) as Endangered, Threatened or Extirpated, if provincial/territorial legislation or voluntary measures do not adequately protect the species and its habitat.

Although Environment and Climate Change Canada (ECCC) are the overall administrator of SARA, responsibility for implementation of the Act is shared by ECCC and the Canadian Wildlife Service, Parks Canada and Fisheries and Oceans Canada (DFO). On private lands, ECCC oversees matters related to migratory birds, while DFO oversees matters related to aquatic species. SARA prohibitions can be applied by an order, as described above, or through federal legislation (including SARA).

2.2 Federal Fisheries Act, 1985

The federal *Fisheries Act* prohibits causing the “death of fish by means other than fishing”, and the “harmful alteration, disruption or destruction (HADD) of fish habitat”. If construction activities have the potential to cause the death of fish, or HADD of fish habitat, then the project must be submitted to DFO as a Request for Review. The proponent responsible for the activities is required to obtain an *Authorization* from DFO as per Paragraph 34.4(2) and 35(2)(b) of the *Fisheries Act*.

2.3 Federal Migratory Birds Convention Act, 1994

The *Migratory Birds Convention Act, 1994* (MBCA) and the Migratory Bird Regulations (MBR) are federal legislative requirements that are binding on members of the public and all levels of government, including federal and provincial governments. The legislation protects certain species, controls the harvest of others and prohibits commercial sales of all species.

The MBCA and MBR provide protection to migratory bird nests when they are considered to have a high conservation value for migratory birds.

The nests of all migratory bird species are protected when they contain a live bird or a viable egg. The nests of 18 species (listed in Schedule 1 of the regulations), whose nests are reused by migratory birds, continue to have year-round nest protection, unless they have been shown to be abandoned. To be considered abandoned:

- Minister must be notified via an online registration system (Notice: Abandoned Nest Registry - Canada.ca) that the nest does not contain a live bird or viable egg.
- Nest is to remain unused by migratory birds during the designated wait time for that species.
- Of the 18 species, three are known to commonly breed in Southern Ontario: Great Blue Heron, Green Heron, and Pileated Woodpecker.

Permits are available under limited circumstances and mostly relate to egg or nest destruction or relocation “*for the purpose of reducing the danger that they are causing or are likely to cause to human health or public safety or the damage they are causing or are likely to cause to agricultural, environmental or other interests*”.

ECCC and the Canadian Wildlife Service have compiled nesting calendars that show the variation in nesting intensity, by habitat type and nesting zone, within broad geographical areas distributed across Canada. While this does not mean nesting birds will not nest outside of these periods, the calendars can be used to greatly reduce the risk of encountering a nest. ECCC advises avoidance as the best approach.

2.4 Provincial Planning Statement, 2024

The Provincial Planning Statement (PPS; MMAH, 2024) provides general policies on land use patterns, resources, and public health and safety that guide development across Ontario. All planning decisions are required to be consistent with the applicable provisions of the PPS.

Eight types of natural heritage features are identified in Section 4.1, policies 4.1.4 and 4.1.5 of the PPS, where development and site alteration are not permitted unless it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions. The Natural Heritage Reference Manual (NHRM) (MNR, 2010) provides criteria for identifying provincially significant features; these are listed below:

1. Significant Wetlands in Ecoregions 5E, 6E, and 7E.
2. Significant Coastal Wetlands.
3. Significant Wetlands in the Canadian Shield, north of Ecoregions 5E, 6E, and 7E.
4. Significant Woodlands in Ecoregions 6E and 7E (excluding islands in Lake Huron and the St. Mary's River).
5. Significant Valleylands in Ecoregions 6E and 7E (excluding islands in Lake Huron and St. Mary's River).
6. Significant Wildlife Habitat (SWH).

7. Significant Areas of Natural and Scientific Interest (ANSIs).
8. Coastal wetlands in Ecoregions 5E, 6E, and 7E that are not subject to policy 2.1.4(b).

Section 4.1, policies 4.1.6, 4.1.7 and 4.1.8 of the PPS identifies three additional development and site alteration prohibitions and exemptions, as follows:

1. Fish habitat, except in accordance with provincial and federal requirements.
2. Habitat of Endangered and Threatened species, except in accordance with provincial and federal requirements.
3. On adjacent lands to the natural heritage features and areas identified in policies 4.1.4, 4.1.5, and 4.1.6, unless the ecological function of the adjacent lands has been evaluated and it has been demonstrated that there will be no negative impacts on the natural features or their ecological functions.

2.5 Species Conservation Act, 2025

The *Species Conservation Act, 2025* (SCA) is Ontario's provincial statute governing the identification, protection, and management of SAR. It replaces the former *Endangered Species Act, 2007* (ESA) and reflects a shift towards integrating biodiversity conservation with economic and land use considerations. The SCA has two main objectives:

- To identify SAR using scientific, community, and Indigenous knowledge.
- To protect and conserve species while considering social and economic factors, including sustainable development.

O. Reg. 60/26 - Protected Species in Ontario (PSO) List provides a full list of species that are protected under the SCA. This list includes species classified as Extirpated, Endangered or Threatened listed by the Committee on the Status of Species at Risk in Ontario (COSSARO), with the exception of aquatic species and migratory birds which are protected under the federal SARA.

O. Reg. 61/26 - Excepted Activities provides a list of activities that do not require a permit or registration. The following are activities listed under O. Reg. 61/26 that relate to the development industry:

- Protecting a person or animal from an imminent risk to health and safety.
- Trapping, incidental killing, harming, capturing or taking etc.
- Black Ash or Butternut that are identified as unhealthy (as determined by a professional).

O. Reg. 74/26 - Permit Activities provides a list of activities that require a permit. These activities include killing, harming, capturing, or taking a species as the primary purpose of the activity and is not an incidental result of a broader activity. These activities also include possessing, transporting, collecting, buying, or selling species. It is unlikely that activities associated with development will fall within this regulation.

O.Reg. 75/26 - Registrable Activities provides a list and required actions when registering an activity through the Species Conservation Registry. Registration of an activity will require the creation of a Conservation Plan, Mitigation Measures, Conservation Measures, Training, Monitoring, and Annual Reporting.

2.6 Region of Peel Official Plan, 2022

In 2022, the Region of Peel adopted its most recent Official Plan consolidation (herein, RPOP). On July 1, 2024, under the *Planning Act*, the Region was designated an upper-tier municipality and specific planning responsibilities were removed. The Town of Caledon is the land use planning authority for this project, however policies from the RPOP are still applicable.

As per Schedule E1 in the RPOP, the majority of the study area is within the 2051 New Urban Area, with a small portion in the northeast corner at Healey Road and Centreville Creek Road, as part of the Rural System. Schedule C1 and C2 display that portions of the study area, coincidental with tributaries of the West Humber River, are part of the Greenlands System and Core Greenlands System, respectively. Schedule A1 identifies the watercourses in the study area as being part of the water resources system. Schedule A2 identifies highly vulnerable aquifers present within the southwestern portion of the study area.

Section 2.6 of the RPOP states that local municipalities are to further refine, interpret, and identify or designate the Water Resource System features and areas in their Official Plan. Low-impact development and green infrastructure is to be used to mitigate and adapt to climate change impacts, mitigate the impacts of development on natural heritage features, support efficient and sustainable uses of watercourse resources and to manage stormwater. The RPOP directs the local municipalities to establish policies and programs to protect, improve and restore water resources.

Section 2.14 of the RPOP describes the policies to protect, restore and enhance the Greenland's System as an approach to managing growth and development. The policy framework builds on provincial policies and plans contained in the PPS, amongst others. The Greenland's and Water Resources Systems are interrelated and policies of the RPOP protect, improve or restore sensitive surface and groundwater features, and should maintain linkages and hydrological functions amongst features and areas.

2.7 Settlement Area Boundary Expansion (SABE), 2022

The SABE study was completed by the Region of Peel to inform the RPOP. The SABE study identified the Natural Environmental System (NES) within the New Community Areas.

To support the SABE, Wood Environment and Infrastructure Solution Canada Ltd. (Wood) completed two documents: an Environmental Screening Report (ESR) (2020) and a Scoped Subwatershed Study (SWS) (2022). The SWS has three components: Part A - Characterization, Part B – Impact Assessment and Part C - Implementation Plan. The Innis Lake LSS falls within the SABE study area. As such, information and guidelines from the SABE are used to inform the Innis Lake LSS.

2.7.1 Environmental Screening Report

The ESR categorizes Natural Features as High, Moderate or Low constraint.

High Constraint Features (HCF) are natural environmental features and areas with existing designations or significance that afford them protection under provincial or municipal policies or plans. Development is generally prohibited in High Constraint Features.

Moderate Constraint Features (MCF) are natural environment features and areas that may, though future assessment, represent constraints to development or are indicators of potentially significant functions. This included non-provincial NHS outside of features designated as High Constraint. Examples include linkages and corridors which may constrain development, but their location etc. require refinement through further study. MCFs may become High Constraint or be assessed as posing little or no constraint. This is to be determined through appropriate levels of assessment and study.

Low Constraint Features (LCF) include mapped environmental areas that do not represent constraints to development but may influence some aspects of land use planning decisions or may require additional studies, enhancement management requirements that could increase development complexity, management needs, or affect planning and/or development processes.

The ESR identifies the entirety of the study area as being in the Focus Study Area (FSA) which indicates further study is required. Within the study area, High Constraint Features are present.

Table 1 below details various features and their constraint ranking from the ESR.

Table 1. ESR Natural Feature Constraint Ranking

Constraint	Feature / Area Type
High	<ul style="list-style-type: none"> • Provincially Significant Wetland (PSW) • Permanent / Intermittent Watercourses • Natural Hazards • Provincial NHS • Significant Woodland (Core Woodlands in Peel) • ANSI • Environmentally Sensitive Areas • Significant Valleylands • Other Valleylands
Moderate	<ul style="list-style-type: none"> • Evaluated-Other and Unevaluated Wetlands • Other Woodlands • Other Drainage Features • Seepage Areas & Springs • Municipal and Conservation Authority NHS
Low	<ul style="list-style-type: none"> • Ecologically Significant Groundwater Recharge Areas (ESGRA) • Significant Groundwater Recharge Areas (SGRA) • Highly Vulnerable Aquifers • Wellhead Protection Areas (WHPA) • Flood Vulnerable Areas

2.7.2 Scoped Subwatershed Study

Part A of the Scoped SWS (2022) for the SABE discusses a watercourse ranking system. Watercourses are ranked as High, Medium, and Low based on their physical and biological characteristics. Figure 2 displays the mapping of High, Medium and Low Constraint watercourses from the Scoped SWS. Descriptions of each can be found below.

High constraint watercourses have properties that are regulated by Conservation Authorities and are usually high-quality systems that should not be relocated and replicated. They must remain open and protected, with exceptions made for rehabilitation on a case-by-case basis. They are permanently wetted with flowing or standing water and a fish community is present and natural habitat is available. They may also be habitat for SAR.

Medium constraint watercourses also have properties that are generally regulated by Conservation Authorities but are highly impacted and may be realigned using natural channel design techniques. They have smaller contributing drainage areas (50 to 200 ha) and are not typically found within defined valley corridors. They may have

well-defined morphology (i.e., defined bed, banks, evidence of erosion / sedimentation and sorted substrate). They provide seasonally wetted habitat for fish and may provide seasonal migration routes as well. Potential permanent fish habitat in the form of pools, wetlands and other features may be present. Medium constraint watercourses are associated with potential groundwater discharge from the TRCA Expanded Groundwater model. They are found within terrestrial features that are of low or moderate ecological quality. The adjacent terrestrial features are not provincially, regionally or locally significant and do not provide critical habitat for wildlife. This includes unevaluated wetlands.

Low constraint watercourses are ephemeral and are typically poorly defined, lack function or quality as defined for High and Medium constraint watercourses. Part A Scoped SWS (2022) for the SABE states that they resemble headwater drainage features (HDF) and could not be assessed through desktop or windshield assessments and further study is required.

Part A Report of the SWS did not assign management recommendations to HDFs. The SWS also relied on desktop data and windshield assessments to determine constraint rankings of watercourses. The Innis Lake LSS obtained on-site field data in order to inform the constraint rankings of watercourses.

Appendix E of Part A of the SWS identifies a variety of Low, Medium and High Constraint watercourses, as well as HDFs, within the study area. Section 3.3.8 of this report provides the watercourse rankings for features in the subject properties.

2.7.2.1 Preliminary NHS

The Scoped SWS (2022) for the SABE identified the Preliminary NHS as being comprising of either Key Features, Supporting Features or Other Features. Key features were recommended to be protected as part of a connected NHS through the SWS. Supporting features are features and areas that are not, based on available information, assessed to be Key Features. Further assessment is required to determine if they meet Key feature criteria. Others require further assessment determine if they meet Key Feature criteria and to evaluate their functions, integrations and contribution to the NHS to determine how they are to be managed. Other features are not Key or Supporting but may include small and/or isolated features or areas requiring further assessment (i.e., are they Key or Supporting). Table 2 below identifies features that comprise Key, Supporting, and Other features.

The Part B SWS further identified Corridors / Linkages and Enhancement Areas as required to form a robust and connected NHS, however they were not identified in the Part A SWS. Corridors / Linkage build upon NHS features to create a connected and integrated NHS. Enhancement Areas improve the form and/or function of the NHS by infilling, extending or adding to features and areas that comprise the NHS.

Table 2. Preliminary NHS Feature Types

Feature Type	Features Included
Key Feature	<ul style="list-style-type: none"> • Woodlands, Wetlands and Valleylands • Environmentally Sensitive / Significant Aras • SWH • Fish Habitat • Habitat of SAR • Provincial and Regionally Significant ANSIs • HDF classified as Conservation or Protection • Key Natural Heritage Features as defined in the Greenbelt Plan and the Growth Plan within applicable areas of the Focus Study Area • Sand Barrens, Savannahs and Grasslands (as defined by Provincial Plans and ELC classification)
Supporting Feature	<ul style="list-style-type: none"> • Woodlands, Wetlands and valleylands • Regionally significant Earth Science ANSIs • HDF classified as Mitigation • Successional Habitats • Open Aquatic Habitats
Other Feature	<ul style="list-style-type: none"> • Woodlands • Wetlands • Successional Habitat • Open Aquatic Habitats

As the NHS in the Scoped SWS (2022) for the SABE was primarily determined through desktop analysis and windshield assessment, the NHS will be further refined or confirmed through detailed location study. This can include feature category (i.e., Key, Supporting, Other) determination, refined boundary delineation, implementation of linkages, enhancement and mitigation measures these can all be informed by site specific studies (i.e., fieldwork). The Scoped SWS defines the framework and targets to be implemented in the NHS and guidance to support future work and guidance to support subsequent phases of work.

The Innis Lake LSS will refine the NHS within the study area through site-specific studies. The data from these studies will be used to determine the significance of the various features to determine the NHS that will be implemented in the study area in the future Part B Analysis and Impact Assessment report. Mitigation measures and the enhancement and/or protection of features will be discussed in the Part B report as well. Monitoring and management of various features will be discussed in the future Part C report.

2.7.2.2 Targets for NHS

The SWS provides target for the NHS within the SABE area (2022). These targets are included in Table 3 below. The future Part B Analysis and Impact Assessment Report will review the NHS as determined in the Part A report against the criteria in Table 3.

Table 3. NHS Targets for SABE Area

Feature Type	Target for the NHS
Natural Cover	<ul style="list-style-type: none"> • No net loss of natural cover.
Wetland	<ul style="list-style-type: none"> • No net loss of natural cover. • Increase total wetland cover through NHS enhancements.
Woodland	<ul style="list-style-type: none"> • No net loss of existing natural cover. • Increase total woodland cover through NHS enhancement with a focus on creation of table land features.
Valley / Stream Corridor	<ul style="list-style-type: none"> • No net loss of ecological and hydrological functions. • Increase natural cover within these corridors through enhancements.
Successional / Open Habitat	<ul style="list-style-type: none"> • Maintain important existing successional/open habitat contiguous to other features and areas of the NHS. • Increase representation and quality of open country habitats across the landscape through NHS enhancement opportunities. • Strive to create at least one habitat area with a minimum size threshold of 5 ha.
Aquatic	<ul style="list-style-type: none"> • Achieve 75% naturally vegetated watercourse length through protection, enhancement or restoration.
Sand Barrens, Savannahs, Grasslands	<ul style="list-style-type: none"> • Protect these where they occur.
NHS Enhancement	<ul style="list-style-type: none"> • Identify and distribute enhancement opportunities across the NHS to support a robust and sustainable system. • Increase natural cover by 30%.

2.8 Future Caledon Official Plan, 2025

On October 22, 2025, the Minister of Municipal Affairs and Housing (MMAH) approved the FCOP with modifications. The study area is located within the G1 Planning Area as per figure F3 of the FCOP.

Schedule B1: Town Structure of the FCOP illustrates that the majority of the study area is comprised of Urban Area with Urban Corridors and Natural Environment System. A small section in the northeast corner of the study area is part of the Highway 413 Focused Analysis Area and NWGTA Transmission Corridor Narrowed Area of Interest.

Schedule B2: Growth Management depicts the entirety of the study area as classified as New Urban Area 2051.

Schedule B4 depicts the study area as mainly comprised of New Community Area, outside of the Highway 413 Focused Analysis Area and NWGTA Transmission Corridor Narrowed Area of Interest.

Schedule D1 depicts Natural Features and Areas, Supporting Features and Areas and Permanent and Intermittent Streams throughout the study area.

Schedule D2b depicts Natural Features and areas with a 30 m buffer, potential Linkage Areas, Potential Enhancement Areas, Supporting Features and Areas.

Schedule D3 depicts these Natural Features are comprised of Valley and Stream Corridors, Significant and Other Woodlands, and Other Wetlands. In Section 13.10 of the FCOP it is stated that the Preliminary Natural Environment System from Schedule D2b is from the Scoped SWS (2022). The buffers summarized in Table 4 below, potential enhancement areas, and linkages are not designations, but are intended to inform more detailed studies which will then designate and provide protection to certain areas.

Schedule D4a depicts highly Vulnerable Aquifers are present in the southwestern portion of the study area. As per Schedule D4b there are no Significant Groundwater Recharge Areas within the study area.

Section 13.9 of the FCOP states the minimum buffers required for components of the Natural Environment. These are presented below in Table 4.

Table 4: FCOP - Minimum Setbacks from Natural Features

Component of Natural Environment System	Minimum Buffer
Life Science ANSI, Significant Valleyland; SWH; Woodlands meeting one or more of the criteria for a Natural Areas and Corridors woodland in Table 1 of the RPOP.	15 m

Component of Natural Environment System	Minimum Buffer
Significant Woodland	20 m
Other woodlands	10 m
Wetlands	30 m

As per Section 13.10.1 of the FCOP, a local subwatershed study, or equivalent, is to be completed to the satisfaction of the Town in accordance with a TOR approved by the Town for each Secondary Plan Area or new development area in the New Community Areas. The study is to be completed to review, confirm and refine the Preliminary Natural Environment System as displayed on Schedules D2a and D2b. The final buffer width within New Community areas are to be determined through an Environmental Impact Study (EIS) to be prepared and submitted at the development stage.

Section 13.3.1 of the FCOP states that the Natural Features and Areas in the plan corresponds to the Greenlands System as identified and protected in the RPOP.

Development and site alteration within Natural Features and areas is not permitted, aside from activities such as forest, fish and wildlife management, or passive recreation. Section 13.3.4 stated that for activities within Natural Areas and Features that development and site alteration will only be permitted if it has been demonstrated to the satisfaction of the Town that there will be no negative impacts on the natural feature or their ecological function, and that:

- There must be no reasonable alternative location outside of the Natural Features and Areas designation and use, development or site alteration is directed away from the Natural Features and Areas designation to the greatest extent possible.
- If avoidance is not possible, the impact to the feature is minimized.
- An impact to the feature or its function is mitigated through restoration enhancement to the greatest extent possible.
- Where ecosystem compensation is determined to be appropriate and feasible, including for essential infrastructure, it may be considered in accordance with Town ecosystem compensation guidelines and application Conservation Authority requirements.

Section 13.4 and Schedule D2b of the FCOP also details Supporting Features and Areas. Permitted uses in Supporting Features and Areas mimic those permitted in Natural Features and Areas. The Supporting Features and Areas include the following:

- Evaluated non-PSWs.
- Unevaluated wetlands.
- Woodlands meeting one or more of the criteria for a Natural Areas and Corridors woodland in Table 1 of the RPOP.

- Cultural woodlands and cultural savannahs within the Urban System meeting one or more of the criteria for a Natural Areas and Corridors woodland in Table 1 of the RPOP.
- Any other woodland greater than 0.5 ha that does not meet the criteria for a Natural Areas or Corridors woodland in Table 1 of the RPOP.
- Fish habitat and habitat for aquatic SAR.
- Habitat of Endangered or Threatened species.
- Regionally or Provincially significant Life Science ANSI.
- Regionally significant Earth Science ANSI.
- The Escarpment Protection Area designation of the NEP.
- Any other valley and stream corridor that have not been designated as meeting one or more of the criteria for Core Area valley and stream corridors in Table 2 of the RPOP.
- Sensitive head water areas and sensitive groundwater discharge areas;
- Enhancement areas and linkages.
- Vegetation protection zone (VPZ) identified in Provincial plans and buffers outside of Provincial plan areas.
- Alvars.

2.9 Conservation Authority

2.9.1 Conservation Authorities Act, 1990

Part VI of the *Conservation Authorities Act, 1990* (CA Act) sets out the Regulatory Powers of conservation authorities. Specifically, the CA Act prohibits, in the absence of a permit “activities to straighten, change, divert or interfere in any way with the existing channel of a river, creek, stream or watercourse or to change or interfere in any way with a wetland.” Development activities are also prohibited in hazardous lands, wetlands, river or stream valleys and shorelines in the absence of a permit.

2.9.2 Ontario Regulation 41/24

To implement, in part, the provisions of Part VI of the CA Act, O. Reg. 41/24 applies to all Conservation Authorities in the province, including TRCA. The principal mandate of TRCA is to prevent the loss of life and property due to flooding and erosion and to conserve and enhance natural resources. O. Reg. 41/24 is a key tool in fulfilling this mandate because it prevents or restricts development activity in areas where the control of flooding, erosion, dynamic beaches, unstable soil or bedrock may be affected by development. Further development activity is prohibited if an activity is likely to create conditions or circumstances that, in the event of a natural hazard, might jeopardize the health or safety of persons, or result in damage or destruction of property.

TRCA will assess any future permit applications to determine if the proposed works will affect regulated features, in accordance with their programs and policies.

TRCA regulates several areas throughout the study area as per the Regulation Mapping (2026). In the study area the regulated areas largely coincide with tributaries of the West Humber River.

2.9.3 TRCA Living City Policies

The TRCA *Living City Policies* (2014) guides the implementation of the TRCA legislated roles and responsibilities in planning and permitting infrastructure and developments. The *Living City Policies* document includes policies for determining the Natural System and provides recommendations of setback widths to protect natural features. See Table 5 for required minimum setbacks.

Table 5: TRCA Minimum Buffer Requirements

Component of Natural System	Minimum Buffer
Valley or Stream Corridors	10 m from the greatest of the long-term stable top of slope/bank, stable top of slope, regulatory floodplain, meander belt width, and any contiguous natural features or areas.
Woodlands	10 m from dripline or any contiguous natural features or areas.
Wetland	30 m from PSW. 10 m from all other wetlands.

It is important to note that the *Living City Policies* have not been updated since the implementation of Bill 23 which changed the mandate and responsibilities of Conservation Authorities across the province. Sections of the *Living City Policies* unrelated to natural hazards and flooding are no longer valid, as these items no longer fall under Conservation Authority jurisdiction. As it relates to this project, communication with Nick Cascone (Senior Planner) on August 8, 2025, confirmed that TRCA generally requires a setback of 10 m from all wetlands, however setbacks prescribed by provincial plan or official plan are now responsibility of the municipality and therefore override the general TRCA setback.

2.9.4 Source Water Protection

The TRCA has a *Source Water Protection Plan* policy that encompasses the Toronto and Region Source Protection Area, approved in 2025. The *Source Water Protection Plan* identified four types of vulnerable areas where certain land uses or activities have the potential to negatively affect drinking water supplies (quantity or quality): Wellhead Protection Areas (WHPAs), Highly Vulnerable Aquifers (HVAs), Significant Groundwater Recharge Areas (SGRAs) and Intake Protection Zones (IPZs). Mapping of the Source

Water Protection areas is available through the Source Water Protection Information Atlas and review of this mapping in relation to the study area is discussed below.

2.9.4.1 Wellhead Protection Areas

WHPAs are zones around municipal water supply wells where land uses must be carefully planned and restricted to protect the quality and quantity of the water supply. Upon review, the study area is not located within a WHPA for quality or quantity.

2.9.4.2 Highly Vulnerable Aquifers

Source Protection Studies within the Region of Peel have identified areas of HVAs, referring to the susceptibility of an aquifer to contamination based on the nature of the subsurface materials and depth to the water table.

Upon reviewing the MECP Source Protection Information Atlas, some areas in the western half of the study area were identified as HVAs. This is interpreted to be associated with the occurrence of lenses and layers of coarse-grained materials within the Halton Till. Some land use restrictions may apply to areas mapped as HVAs, which pose a risk of contaminating the underlying aquifers. Residential lands uses are not considered 'high risk' in terms of potential aquifer contamination.

2.9.4.3 Significant Groundwater Recharge Areas

SGRAs are defined as areas where rates of groundwater recharge are relatively high and are important for recharging aquifers. According to mapping provided by the Source Water Protection program, no SGRAs are present within the study area. However, the TRCA has delineated areas known as Ecologically Significant Groundwater Recharge Areas (ESGRAs), which are areas of land where groundwater recharge occurs that may support groundwater-dependant ecosystems such as coldwater streams and wetlands. Upon review of available mapping, some areas in the southern portion of the study area are considered ESGRAs. This is interpreted to be associated with the more coarse-grained surficial soils in this area and proximity to wetlands and watercourses.

2.9.4.4 Intake Protection Zones

IPZs are defined as vulnerable areas of land surrounding municipal surface water intake pipes. There are no IPZs mapped in the vicinity of the study area.

3.0 Ecological Conditions

3.1 Background Records Review and Agency Consultation

A comprehensive desktop assessment was completed to compile and review existing natural heritage information available for the study area.

Information reviewed included, but was not limited, to the following sources:

- Aerial photographic imaging and 1:10,000 Ontario Base Mapping (OBM).
- Fisheries and Oceans Canada (DFO) Aquatic SAR mapping (2026).
- MNR Make a Map: Natural heritage Areas to identify natural heritage features and Natural Heritage Information Centre (NHIC) data of rare wildlife species on, and in the vicinity of, the study area: 1x1 km² Squares: 17NJ9952, 17NJ9951, 17NJ9950, 17PJ0052, 17PJ0051, 17PJ0050, and 17PJ0152.
- MNR Aquatic Resource Area (ARA) summary data (2019).
- MNR Online GeoHub Search (Nesting Sites, White-tailed Deer Wintering Areas).
- Ontario Hydrology Network (OHN) mapping.
- The Ontario Breeding Bird Atlas (OBBA) 2001-2005 – 10x10 km² Square 17PJ05.
- Ontario Reptile and Amphibian Atlas (ORAA) – 10x10 km² Square 17PJ05.
- iNaturalist records.
- eBird records.
- TRCA Regulated Areas and features mapping and Ecological Land Classification (ELC) mapping (2023).
- The Living Cities Policies, TRCA (2014).
- FCOP (March 2024).
- RPOP (June 2024).

The following is a summary of agency correspondence and replies to date:

- A TOR and information data request was sent to TRCA via email to Andrea Teralla and the Town via email to Gurnkanwal Boparai and Yves Scholten, on July 11, 2025.
- Comments on the TOR were provided by TRCA staff in their letter dated January 14, 2026.
- Comments on the TOR were provided by the Region staff in their letter dated February 12, 2026.
- A meeting with the Town's Water Resources staff and multiple discipline representatives was held on February 24, 2026, to discuss the TOR.
- A meeting with the Town and TRCA relating to Natural Heritage took place on March 13, 2026. Following the meeting, comments on the TOR were provided by the Town's Natural Heritage staff on March 27, 2026.
- An updated TOR was submitted to the Town, and subsequently the TRCA, on May 1, 2026. It was agreed that this second TOR submission would not be reviewed but was required for record-keeping purposes.

3.1.1 Terrestrial Habitat

3.1.1.1 Wildlife

The following is a summary of potential wildlife habitat identified in the study area based on a review of background aerial imagery, databases, and reports:

- Turtle overwintering and nesting habitat.
- Amphibian breeding habitat.
- Breeding bird habitat (e.g., anthropogenic structures, grassland, wetland, forest).
- Raptor nesting habitat.
- Bat maternity roosting habitat.
- Wildlife linkages and corridors.
- SWH.
- SAR and Species of Conservation Concern (SCC).

SAR and SWH screening tables are provided in Appendix B.

3.1.1.2 Vegetation Communities and Species

The following is a summary of potential vegetation communities identified in the study area based on a review of background aerial imagery, databases, reports, and data collected during the due diligence phase:

- Wetland communities (meadow marsh, graminoid meadow, shallow aquatic, swamp).
- Cultural habitats (constructed pond, hedgerow, meadow, woodland, thicket).
- Coniferous plantation.
- Deciduous forest.
- Open pasture and row crops.
- Natural Features and Areas (Town of Caledon)
- Significant Woodlands (Town of Caledon)
- Greenlands System and Core Areas of the Greenlands System (Region of Peel)
- Locally rare flora.
- SAR and SCC.

Vegetation communities on the subject properties were site confirmed during field investigations in 2025 and are discussed in Section 3.3.1.1.

3.1.2 Aquatic Habitat

According to GEO Watershed Boundaries mapping, the study area is located within the West Humber River quaternary watershed. MNR ARA mapping (2019) identifies three branches of tributaries of West Humber River draining generally from north to south across the study area. TRCA Regulated Areas and features mapping (2023) identifies

three regulated watercourses on the subject properties. All tributaries on the subject properties are identified by the MNR Aquatic Resource Area mapping (2019) as having a warmwater thermal regime.

A summary of documented fish species in the West Humber River tributaries is outlined in Table 6 below.

As per the TRCA Living City Policies, valley and stream corridors are defined by the greatest of the long-term stable top of slope, Regulatory flood plain, meander belt and any contiguous natural features plus an applicable buffer. As per policy 8.4.8 in the Living City Policies, 10 m setback shall be applied to these physical properties as the minimum setback for development. As per the FCOP, 15 m shall be applied to valleys if they are deemed to be significant.

Table 6: Fish Species Historically Observed in the West Humber River

Species Name	Scientific Name	Thermal Regime
Blacknose Dace	<i>Rhinichthys atratulus</i>	Cool
Bluntnose Minnow	<i>Pimephales notatus</i>	Warm
Brook Stickleback	<i>Culaea inconstans</i>	Cool
Brown Bullhead	<i>Ameiurus nebulosus</i>	Warm
Common Shiner	<i>Luxilus cornutus</i>	Cool
Creek Chub	<i>Semotilus atromaculatus</i>	Cool
Fantail Darter	<i>Etheostoma flabellare</i>	Cool
Northern Pearl Dace	<i>Margariscus nachtriebi</i>	Cool
Rainbow Darter	<i>Etheostoma caeruleum</i>	Cool
Redside Dace	<i>Clinostomus elongatus</i>	Cool
Rock Bass	<i>Ambloplites rupestris</i>	Cool
White Sucker	<i>Catostomus commersonii</i>	Cool

3.1.2.1 Aquatic Species at Risk

The DFO SAR mapping does not identify any aquatic SAR habitat on the subject properties. No regulated Redside Dace habitat is present. However, Redside Dace are listed in the historically observed fish community within the study area tributaries by MNR ARA mapping (2019), although this mapping is non-specific regarding the date and location of species observance. Approximately 3.1 km east, these tributaries form a confluence with the West Humber River - mapped critical habitat for Redside Dace. NHIC square 17NJ9950 indicates an occurrence of Redside Dace, relating to Salt Creek in the adjacent lands. Salt Creek confluences with the tributaries of the study area more than 5 km downstream and none of the study area tributaries correspond with Redside Dace occurrence, as per the remaining NHIC squares (i.e., 17NJ9952,

17NJ9951, 17PJ0052, 17PJ0051, 17PJ0050, and 17PJ0152). Figure 3 shows a map of the aquatic background conditions.

3.1.2.2 Headwater Drainage Feature Background and Management

During the background review, ephemeral drainage features were identified on aerial photos as potential HDFs that convey water into the downstream habitat of West Humber River tributaries. Further study of mapped 1st and 2nd order watercourses was recommended through the HDF assessment and classification framework to provide additional information on the function and form of previously unknown features. The annual flow regime and hydrological contributions of these HDFs would also be assessed during the LSS field investigations to determine potential impacts of development to downstream habitat. The assessment, classification and management recommendations following the HDF Guidelines (TRCA & CVC, 2014) are described in Sections 3.2.7 and 3.3.9.

3.2 Field Methodology

Field investigations were completed to assist in refining the NHS throughout the subject properties. Field studies were completed in accordance with the submitted TOR (2025 updated 2026) on the subject properties, which included documentation of any confirmed or candidate SAR and / or SAR habitat and are included in the detailed SAR Screening Table in Appendix B. The Town and TRCA provided comments on the TOR and adjustments were made to the field studies accordingly. Field methodologies and findings are detailed below, while survey stations are displayed on Figure 4A.

3.2.1 Vegetation Communities and Species

Per the updated TOR, detailed surveys to characterize vegetation communities and species was conducted by Burnside for the entirety of the subject properties, plus 50 m into the adjacent lands where visible from the property boundary. A 50 m check onto adjacent lands was conducted to ensure no SAR trees were present that may require a protection zone that impacts the subject properties. All species herein are described according to nomenclature and S-ranks provided by the NHIC, current to March 30, 2025. Where nomenclature differs between databases or rarity lists, the Database of Vascular Plants of Canada (VASCAN) (Canadensys, 2021) was used as a reference for synonyms of plant names to current taxonomic standards.

3.2.1.1 Ecological Land Classification and Botanical Inventory

Surveys for ELC and flora inventory were undertaken on May 9 and August 27, 2025, for the subject properties. Previously reported vegetation communities and species mapped by TRCA were verified and modified, as required, to describe current conditions on the subject properties. Vegetation communities were assessed and described using the ELC System for Southern Ontario (Lee et al., 1998), utilizing updated Second Approximation 2008 codes (Lee, 2008). All plant species observed on the subject properties, and immediately adjacent, have been analyzed for species rarity based on:

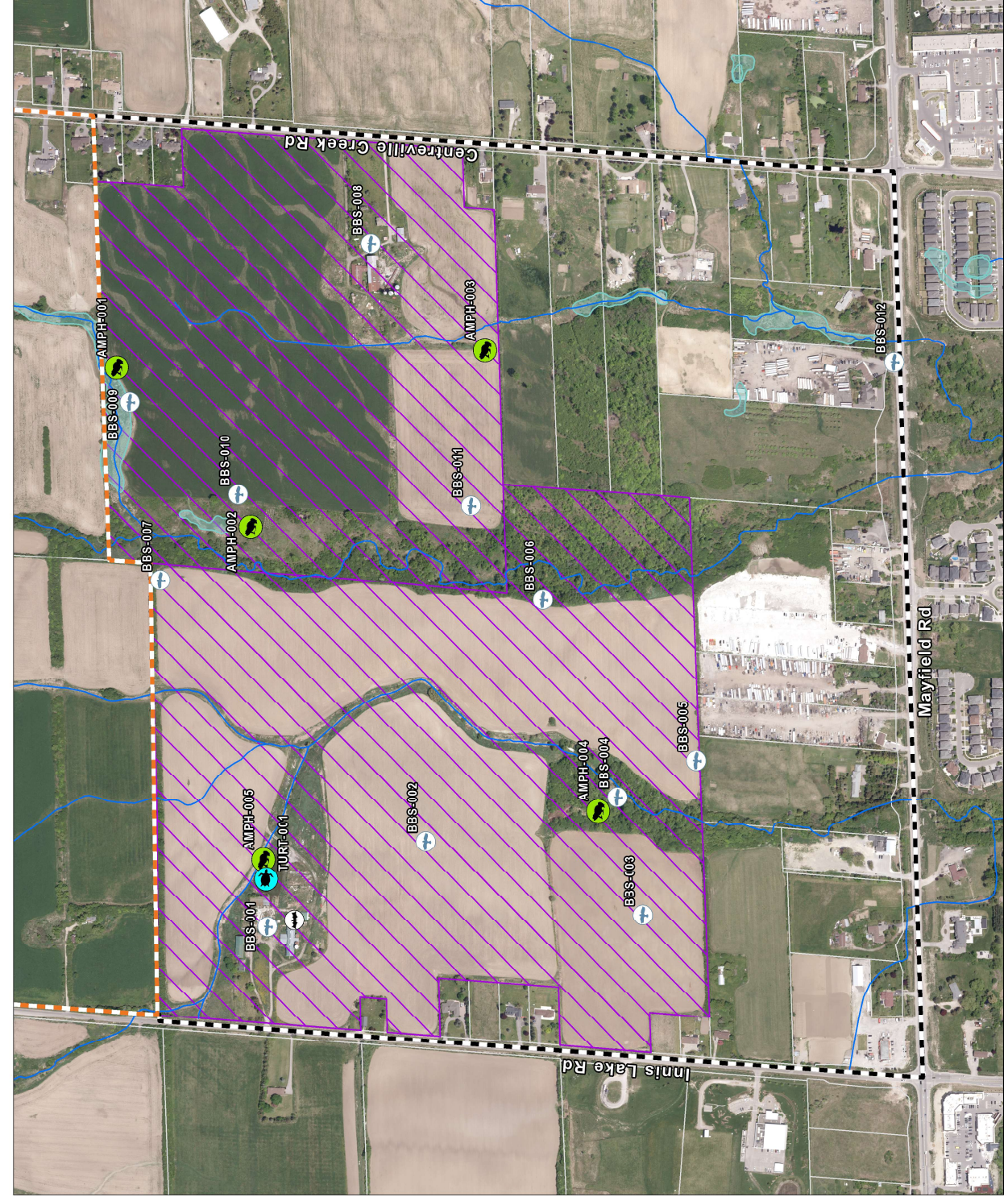
- Species status as listed on the PSO list (updated August 14, 2025), under the *Species Conservation Act* (2025).
- Species status as determined by COSEWIC and listed under SARA Schedule 1
- Species S-rank, as provided by the NHIC species lists (updated March 30, 2025).
- Rarity for Peel Region (Varga et al., 2000).
- Rarity for Peel (Riley et al., 1989).
- Toronto Region Conservation Rank (2023).










During the completion of ELC, a detailed search was conducted for Butternut (*Juglans cinerea*) and Black Ash (*Fraxinus nigra*) as both are listed as SAR in Ontario. Sweeping transects of each treed vegetation community were completed and any

observations received a GPS coordinate and photos. Further discussion on SAR plant species is found in Section 3.3.1.2.

For the remainder of the study area where PTE was not granted, TRCA ELC data was available for some areas and has been utilized where the community designation matches recent aerial photography. Where TRCA ELC data was unavailable, Burnside has mapped communities via desktop assessment using recent aerial photography. Recommendations have been made where additional detailed assessments/ fieldwork is needed for community confirmation and detailed botanical inventory.

Comments provided by the Town on the TOR indicate that a third visit during the fall season (September to October) is required. Information pertaining to the fall ELC and botanical inventory will be included in the second submission of this report.



-  Amphibian Survey Station
-  Turtle Basking Survey Station
-  Bat Exit Survey Stations (Multiple Stations)
-  Breeding Bird Survey Station
-  Watercourse (MNR)
-  Wetland (MNR)
-  Subject Properties
-  Phase 1 Study Area
-  Phase 2 Study Area

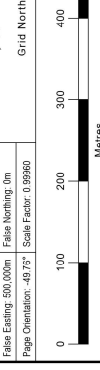
Sources:

1. Ministry of Natural Resources, © King's Printer for Ontario
2. Natural Resources Canada © Her Majesty the King in Right of Canada
3. Town of Callaghan

Disclaimer:

R.J. Burnside & Associates Limited and the above mentioned sources and agencies are not responsible for the accuracy of the information represented on this map. It is recommended that users confirm the accuracy of the information represented. This map is the product of a Geographic Information System (GIS). As such, the data represented on this map may be subject to updates and future reproductions may not be identical.

Datum: North American 1983 CSRS
 Coord. System: NAD 1983 CSRS UTM Zone 17N
 Projection: Transverse Mercator
 Central Meridian: 81°10'00"W
 False Easting: 500,000m False Northing: 0m
 Page Orientation: 49.7° Scale Factor: 0.99960



Client

MATTAMY HOMES

Figure Title

**INNIS LAKE SECONDARY PLAN -
SUBWATERSHED STUDY**

WILDLIFE SURVEY LOCATIONS

Drawn	Checked	Date	Figure No.
HN	MM	2026/05/06	4A
Scale	Project No.		
H 1:6,000	300559383		

3.2.1.2 Woodland Evaluation

The study area supports several woodland areas that vary in size and community type. Schedule D3 of the FCOP depicts areas of Significant Woodland within the study area, therefore an assessment of significance were completed using detailed criteria from the RPOP, updated aerial photography and data collected in the field. Significant species and community criteria were evaluated through field data collected while the remaining criteria were investigated via desktop. The woodland evaluation analysis can be found in Section 3.3.1.3.

According to the FCOP (2025), the definition of a woodland is an “ecosystem compromised of treed areas, woodlots, forested areas and the immediate biotic and abiotic environmental conditions on which they depend. Woodlands include woodlots, cultural woodlands, cultural savannahs, plantations and forested areas and may also contain remnants of old growth forests.” To be defined as significant the woodland must “meet one or more of the criteria for Natural Area and corridor woodland in Table 1 of the RPOP” or “be 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 the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past management history.”

Table 1 referenced from the RPOP categorizes woodlands into three categories: Core Area, Natural Areas and Corridors, and Potential Natural Areas and Corridors. Each category includes criteria and thresholds relating to size, age, linkage, proximity, surface water quality and significant species and communities. As FCOP’s definition of a Significant Woodland relates to meeting one or more criteria for a Natural Area and Corridor woodland, criteria are summarized in Table 7 on the next page.

Table 7: Excerpt from Table 1 Criteria and Thresholds for Identification of Core Areas, Natural Areas and Corridors (NAC) and Potential Natural Areas and Corridors (PNAC) Woodlands (RPOP, 2022)

Region of Peel Category	Size	Age	Linkage	Proximity	Surface Water Quality	Significant Species and Communities
Natural Areas and Corridors Supports integrity of the system.	Rural System: Any woodland => 4 ha up to 16 ha. Urban System: Any woodland =/ > 2 ha up to 4 ha.	Any woodland => 0.5 ha and less than 4 ha and containing at least 0.5 ha of woodland in native trees older than 100 years and having late successional characteristic (excludes plantations)	Any woodland => 0.5 ha supporting a significant linkage function, as determined through a natural heritage study approved by the Region or local municipality.	Any woodland => 0.5 ha within 100 m of another significant feature supporting significant ecological relationship between the features.	Any woodland => 0.5 ha within 30 m of a watercourse, surface water features or any wetland that is or can be identified as a wetland in accordance with OWES.	Any woodland => 0.5 ha up to 4 ha that supports any of the following: i. Any G1, G2, G3, S1, S2 or S3 plant or animal species, or community as designated by NHIC. ii. Any species designated by COSEWIC or COSSARO as Threatened, Endangered or of Special Concern. iii. The following forest communities: FOC 1-2, FOM 2-1, FOM 2-2, FOM 6-1, FOD 1-1, FOD 1-2, FOD 1-4, FOD 2-2, FOD 2-3 or FOD 6-2.

1) The rankings G1, G2, G3, S1, S2 and S3 refer to the conservation status of species assigned by the MNR Natural Heritage Information Centre (NHIC). G or Global ranks (GRANKS) are assigned by a consensus of the network of Conservation Data Centres, including the NHIC, scientific experts and The Nature Conservancy to designate a rarity rank based on the range-wide status of a species. S or Sub-national ranks (SRANKS) are assigned by the NHIC for species and vegetation communities in Ontario.

The rankings specific to Table 1 are as follows:
G1 – extremely rare G2 – very rare G3 – rare to uncommon
S1 – critically imperiled S2 – imperiled S3 – vulnerable

2) The following acronyms are described by the Ecological Land Classification for Southern Ontario: First Approximation and its Application (Lee et al., 1998)

- FOD 1-1 – Dry-Fresh Red Oak Deciduous Forest
- FOD 1-2 – Dry-Fresh White Oak Deciduous Forest
- FOD 1-4 – Dry-Fresh Mixed Oak Deciduous Forest
- FOD 2-2 – Dry-Fresh Oak-Hickory Deciduous Forest
- FOD 2-3 – Dry-Fresh Hickory Deciduous Forest
- FOD 6-2 – Fresh Sugar Maple-Black Maple Deciduous Forest
- FOM 2-1 – Dry-Fresh White Pine-Oak Mixed Forest
- FOM 2-2 – Dry-Fresh White Pine-Sugar maple Mixed Forest
- FOM 6-1 – Moist-Fresh Hemlock-Sugar Maple Mixed Forest
- FOC 1-2 – Dry-Fresh White Pine-Red Pine Coniferous Forest

3) COSEWIC – Committee on the Status of Endangered Wildlife in Canada
COSSARO – Committee on the Status of Species at Risk in Ontario

3.2.1.3 Wetland and Woodland Boundary Delineation

It is anticipated that Burnside and Town staff will stake the woodland limits within the subject properties in summer 2026. It is also anticipated that Burnside and TRCA staff will stake the wetland boundaries in summer 2026. Both boundaries will be surveyed in the field by a licensed Ontario Land Surveyor within 24 hours of the staking exercise. These surveyed boundary lines will act as the final and approved boundaries to be used on all plans moving forward.

3.2.2 Avifauna

3.2.2.1 Breeding Bird Surveys

Eastern Meadowlark (*Sturnella magna*) and Bobolink (*Dolichonyx oryzivorus*) are species listed as Threatened under Schedule 1 of SARA and receive protections under the MBCA, 1994. These species were identified as having potential to be in the study area based on a background database review and the presence of grassland / cultural meadow habitat in the study area. Both species have similar habitat requirements and were surveyed concurrently.

Standard breeding bird surveys were completed by Burnside staff on the subject properties in combination with targeted surveys for Eastern Meadowlark and Bobolink. Surveys were conducted according to the Ontario Breeding Bird Atlas (OBBA) Instructions for General Atlasing and Appendices (April 2021) and MNR's Survey Protocol for Eastern Meadowlark in Ontario (August 2013), tailored to the needs of this project. The methodology for both types of surveys is summarized below with weather data summarized in Table 8.

- Surveys were conducted between May 21 and July 3, which is the recommended date range for surveying Eastern Meadowlark and Bobolink (MNR, August 2013).
- Surveys for Eastern Meadowlark and Bobolink were conducted three times and were evenly spaced throughout the survey period. Surveys were completed on May 27, June 6 and June 17.
- Surveys were completed at eleven point-count locations per survey period.
- Surveys were conducted under the following weather conditions: counts were not completed if it was raining, if there was thick fog, or if winds were greater than 19 km per hour (i.e., >3 on the Beaufort Scale).
- Targeted Eastern Meadowlark and Bobolink point count locations were chosen based on good visibility of the surrounding fields/open areas. Per the protocol, the surveyor completed ten minutes of passive observation and recorded all species observed or heard.
- All birds recorded, including level of breeding evidence, are summarized in Appendix B.

Field data was collected using a mobile data collection app (Fulcrum) on an iOS device. Results are shown in Table 8 on the next page.

Table 8: Summary of Breeding Bird Survey Weather Conditions

Survey Date	Observers	Time of Day (Start/End) (24 hours)	Weather Conditions
			(Air Temp °C/Beaufort Sky Code ¹ /Wind Scale ²)
May 27, 2025	Elly Hind-Smith Noa McLeish	06:00 – 09:35	Start: 9°C; End: 17°C Sky: 1 Wind: 1
June 6, 2025	Elly Hind-Smith Noa McLeish	06:00 – 09:29	Start: 12°C; End: 22°C Sky: 1 Wind: 3
June 17, 2025	Elly Hind-Smith Noa McLeish	06:00 – 08:12	Start: 15°C; End: 20°C Sky: 1 Wind: 1

¹NAAMP/ Beaufort Sky Codes

- 0 = clear (no cloud cover)
- 1 = partly cloudy (scattered or broken) or variable
- 2 = cloudy or overcast
- 3 = sandstorm, dust storm or blowing snow
- 4 = fog, smoke, thick dust, or haze
- 5 = drizzle or light rain
- 6 = rain
- 7 = snow or snow/rain mix
- 8 = showers
- 9 = thunderstorms

²Beaufort Wind Scale

- 0 = calm, smoke rises vertically (0-2 km/hr)
- 1 = Light air movement, smoke drifts (3-5)
- 2 = Slight breeze, wind felt on face; leaves rustle (6-11)
- 3 = Gentle breeze, leaves & twigs in constant motion (12-19)
- 4 = Moderate breeze, small branches moving, raises dust & loose paper (20-30)
- 5 = Fresh breeze, small trees begin to sway (31-39)
- 6 = Strong breeze, large branches in motion (40-50)

3.2.2.2 Structure Surveys (Birds)

Barn Swallow (*Hirundo rustica*) and Chimney Swift (*Chaetura pelagica*) are listed as Threatened under Schedule 1 of SARA and receive protections under the MBCA, 1994. Both species are known to nest in anthropogenic structures (i.e., barns, sheds, uncapped brick chimneys). Structure surveys were completed to identify potential habitat for Barn Swallow and Chimney Swift.

If a chimney is determined to be capped or lined, it is considered unsuitable habitat for Chimney Swift, and no further investigations are required. If a chimney is uncapped or not lined, or if it cannot be determined whether it is capped or lined, further surveys would be required. This may include either a more thorough inspection of the base of the chimney inside the structure, if access is possible, or additional presence/absence survey(s) to confirm evidence of Chimney Swift activity (i.e., roosting/nesting).

All structures across the subject properties were surveyed for Barn Swallow and Chimney Swift potential during breeding bird surveys. Results can be found in Section 3.3.2.2 below.

3.2.3 Amphibian Breeding Call Surveys

Burnside staff conducted amphibian breeding call surveys, following the *Marsh Monitoring Program Participant's Handbook for Surveying Amphibians* (BSC, 2009), during the 2025 season. Surveys were conducted between April and early July by qualified ecologists, to detect potential early, mid, and late-season amphibian breeding activity in Central Ontario. The purpose of the breeding amphibian surveys was to identify wildlife habitat, as well as any potential SWH on the subject properties. Results can be found in Section 4.11 below.

Five survey stations were chosen to provide information on potential amphibian breeding sites within representative wetland communities, located throughout the subject properties: AMPH-001, AMPH-002, AMPH-003, AMPH-004, and AMPH-005.

The Marsh Monitoring Program guidelines state that three call surveys should be completed a minimum of 15 days apart when nighttime air temperatures are greater than 5°C, 10°C and 17°C, respectively and when wind strength is less than 19 km/h (<3 on the Beaufort Scale). Weather conditions during the surveys are outlined in Table 9.

Amphibian calls are used to identify species presence and are quantified by assigning a Call Level Code and an Abundance Count. The call code levels used to identify frog activity include:

- Call Level 1 - when calls are not simultaneous and calling individuals can be counted.
- Call Level 2 - when some calls are simultaneous but individual calls are distinguishable, and the number of individuals
- Call Level 3 - when calls are simultaneous and overlapping in a full chorus.

Table 9: Amphibian Breeding Call Survey Weather Conditions

Survey Date	Observers	Time of Day (Start/End) (24 hours)	Weather Conditions
			(Air Temp °C/Beaufort Sky Code ¹ /Wind Scale ²)
April 14, 2025	Erica Mekli Ariana Burgener	20:32 – 21:38	Start: 13°C; End: 13°C Sky: 1 Wind: 1
May 14, 2025	Erica Mekli Andrew Borelli	20:48 – 22:33	Start: 18°C; End: 18°C Sky: 2 Wind: 3

Survey Date	Observers	Time of Day (Start/End) (24 hours)	Weather Conditions
			(Air Temp °C/Beaufort Sky Code ¹ /Wind Scale ²)
July 3, 2025	Lorraine Adderley Andrew Borrelli	21:35 – 22:53	Start: 18°C; End: 18°C Sky: 1 Wind: 1

¹NAAMP/ Beaufort Sky Codes

- 0 = clear (no cloud cover)
- 1 = partly cloudy (scattered or broken) or variable
- 2 = cloudy or overcast
- 3 = sandstorm, dust storm or blowing snow
- 4 = fog, smoke, thick dust, or haze
- 5 = drizzle or light rain
- 6 = rain
- 7 = snow or snow/rain mix
- 8 = showers
- 9 = thunderstorms

²Beaufort Wind Scale

- 0 = calm, smoke rises vertically (0-2km/hr)
- 1 = Light air movement, smoke drifts (3-5)
- 2 = Slight breeze, wind felt on face; leaves rustle (6-11)
- 3= Gentle breeze, leaves & twigs in constant motion (12-19)
- 4= Moderate breeze, small branches moving, raises dust & loose paper (20-30);
- 5= Fresh breeze, small trees begin to sway (31-39)
- 6= Strong breeze, large branches in motion (40-50)

3.2.4 Reptiles

3.2.4.1 Turtle Basking Surveys

Visual encounter surveys for turtles were conducted in the spring, based on MNR’s Survey Protocol for Blanding’s Turtle in Ontario (2015), tailored to the needs of this project. While Blanding’s Turtle is not expected for this area, this protocol provides a comprehensive method for surveying generally for turtle overwintering / basking habitat for species expected in this location (i.e., Midland Painted Turtle (*Chrysemys picta marginata*) and Snapping Turtle (*Chelydra serpentina*)).

As per the protocol, a minimum of five surveys were conducted at the open water pond on the subject properties. Surveys were spread over five weeks (i.e., after ice melt) between April and June between 08:00 and 17:00 on clear, sunny days with air temperatures above 5°C, or on cloudy or overcast days with air temperatures above 15°C. The surveyor used high quality binoculars to ensure that vegetation was surveyed appropriately. Survey site conditions are summarized below in Table 10.

Table 10: Turtle Basking Survey Weather Conditions

Survey Date	Observers	Time of Day (Start/End) (24 hours)	Weather Conditions
			(Air Temp °C/Beaufort Sky Code ¹ /Wind Scale ²)
April 4, 2025	Erica Mekli Christian Jordan	11:17 – 12:10	Start: 6°C; End: 6°C Sky: 0 Wind: 3
April 17, 2025	Erica Mekli Sarah Yoshida	11:30 – 12:15	Start: 7°C; End: 8°C Sky: 0 Wind: 2

Survey Date	Observers	Time of Day (Start/End) (24 hours)	Weather Conditions
			(Air Temp °C/Beaufort Sky Code ¹ /Wind Scale ²)
April 21, 2025	Elly Hind-Smith Matthew Moote	10:00 – 11:00	Start: 14°C; End: 15°C Sky: 0 Wind: 2
April 24, 2025	Erica Mekli Willow Weiler	11:30 – 12:00	Start: 12°C; End: 12°C Sky: 0 Wind: 1
May 20, 2025	Erica Mekli	11:30 – 12:00	Start: 14°C; End: 14°C Sky: 1 Wind: 1

¹NAAMP/ Beaufort Sky Codes

- 0 = clear (no cloud cover)
- 1 = partly cloudy (scattered or broken) or variable
- 2 = cloudy or overcast
- 3 = sandstorm, dust storm or blowing snow
- 4 = fog, smoke, thick dust, or haze
- 5 = drizzle or light rain
- 6 = rain
- 7 = snow or snow/rain mix
- 8 = showers
- 9 = thunderstorms

²Beaufort Wind Scale

- 0 = calm, smoke rises vertically (0-2km/hr)
- 1 = Light air movement, smoke drifts (3-5)
- 2 = Slight breeze, wind felt on face; leaves rustle (6-11)
- 3= Gentle breeze, leaves & twigs in constant motion (12-19)
- 4= Moderate breeze, small branches moving, raises dust & loose paper (20-30);
- 5= Fresh breeze, small trees begin to sway (31-39)
- 6= Strong breeze, large branches in motion (40-50)

3.2.5 Bats

As per MECP’s *Species at Risk Bats Survey Note (2022)*, potential woodland SAR bat habitat should be assessed according to the protocol *Treed Habitats – Maternity Roost Surveys (MECP, 2022)*. The protocol calls for snag surveys followed by acoustic monitoring surveys. Buildings and Anthropogenic Structures can also provide maternity roost habitat and should be surveyed according to *Use of Buildings by Species at Risk Bats Survey Methodology (2018)*.

Other possible maternity roosting habitat includes rock features for Eastern Small-footed Myotis (*Myotis leibii*) and general foliage for Eastern Red Bat (*Lasiurus borealis*) and Hoary Bat (*Lasiurus cinereus*). Published protocols for how to assess these habitat types do not currently exist.

3.2.5.1 Snag Surveys

As the extent of impacts to trees on the subject properties is not yet known, snag surveys were not completed at this stage of the study. When the scope and location of the tree removals are determined, targeted surveys will take place.

3.2.5.2 Structure Surveys (Bats)

Structures on the western parcel of the subject properties were surveyed on June 27, 2024. Structures on the eastern parcel of the subject properties have not been surveyed as extent of potential impacts to the structures has not yet been determined. Structure surveys on the eastern parcel of subject properties will be carried out in the future and discussed under separate cover.

Structures were surveyed to identify if the structures had features that may be accessed by roosting bats, such as entry and exit points (holes, cracks, broken windows etc.). Investigations identified eight structures present on the subject properties. Of these, five had potential habitat for SAR Bats (STR-001, STR-002, STR-003, STR-005 and STR-008) and exit surveys were completed (see Figure 4B).

3.2.5.3 Exit Surveys

Burnside staff completed two acoustic exit surveys on July 4 and July 9, 2024. Both surveys followed the methodology described in the MECP's *Use of Buildings by Species at Risk Bats Survey Methodology* (July 2018). The structures were surveyed from the start of sunset to one hour after the first emergence, up to a maximum of 90 minutes. Surveys took place during favourable weather conditions (i.e., nights above 15°C, during periods of low wind and no rain).

Six stations were established to survey the eight structures (see Figure 4B):

- Station 1 and 3 observed the Large Cattle Barn (STR-001)
- Station 2 observed the Large Cattle Barn (STR-001) and the Silo (STR-002)
- Station 4 observed the House (STR-008)
- Station 5 observed the Feed Barn (STR-005).
- Station 6 and 7 observed the Large Barn (STR-003)

Surveyors were positioned within viewing distance of potential exit points on the structures. If bats were observed exiting a structure, the number of bats were recorded. The purpose of the acoustic surveys is to identify the species of bat present, while the purpose of the visual observations is to identify how the bats are using the subject properties (i.e., roosting or foraging). Survey conditions are summarized in Table 11, below. Results of the exit survey can be found in Section 3.3.5.1.

Table 11: Exit Survey Weather Conditions

Survey Date	Observers	Time of Day (Start/End) (24 hours)	Weather Conditions
			(Air Temp °C/Beaufort Sky Code ¹ /Wind Scale ²)
July 4, 2024	Matthew Moote, Ariana Burgener,	21:00 – 22:30	Start: 24°C; End: 23°C Sky: 1

Survey Date	Observers	Time of Day (Start/End) (24 hours)	Weather Conditions
			(Air Temp °C/Beaufort Sky Code ¹ /Wind Scale ²)
	Christian Jordan, Kaelyn Weir, Elly Hind-Smith, and Mackenzie Dawson		Wind: 2
July 9, 2024	Matthew Moote, Ariana Burgener, Andy Borrelli, Mackenzie Dawson, Kaelyn Weir, and Elly Hind-Smith	21:00 – 22:30	Start: 25°C; End: 22°C Sky: 2 Wind: 2

¹NAAMP/ Beaufort Sky Codes

- 0 = clear (no cloud cover)
- 1 = partly cloudy (scattered or broken) or variable
- 2 = cloudy or overcast
- 3 = sandstorm, dust storm or blowing snow
- 4 = fog, smoke, thick dust, or haze
- 5 = drizzle or light rain
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- 3= Gentle breeze, leaves & twigs in constant motion (12-19)
- 4= Moderate breeze, small branches moving, raises dust & loose paper (20-30);
- 5= Fresh breeze, small trees begin to sway (31-39)
- 6= Strong breeze, large branches in motion (40-50)

3.2.6 Aquatic Habitat Assessment

A general aquatic habitat assessment was completed on August 25, 2025. The entirety of the watercourses within participating subject properties were walked and general observations regarding fish habitat, including riparian habitat, erosion, sediment composition, barriers to fish movement, were made.

Reaches for the eastern tributary through the subject properties are identified as follows from downstream (south) to upstream (north): TWHR-6, TWHR-7, TWHR-7a and TWHR-8. Reaches for the western tributary through the subject properties are identified as follows from downstream (south) to upstream (north): TWHRA-6, TWHRA-5 and TWHRA-6a. Please refer to Figure 3 for the locations of these reaches.

3.2.7 Headwater Drainage Feature Assessments

HDF are small zero-order and first-order intermittent and ephemeral streams, swales and connected headwater wetlands (TRCA & CVC, 2014). HDFs can have many hydrological and ecological functions which help to maintain watershed health, such as water quality, flow attenuation, season habitat for fish, insects and amphibians, sediment influences and allochthonous input from organic material. In many cases, these features may qualify as “watercourses” under the *O.Reg. 41/24*, which are described as “a defined channel, having a bed and banks or sides, in which a flow of water regularly or continuously occurs”. Land use activities associated with urbanization and agriculture may result in impacts on HDFs that reduce their ability to perform their natural functions, negatively affecting a watershed. Individually, their importance is often overlooked due to their small size and intermittent flow regimes, particularly in the summer when monitoring of streams typically occurs.

In 2014, TRCA and CVC finalized and adopted the Evaluation, Classification, and Management of Headwater Drainage Features (HDF Guidelines). This document, in conjunction with supporting modules from the Ontario Stream Assessment Protocol (OSAP, 2017), outlines a process for assessing and classifying natural drainage features. This procedure identifies the contribution of these drainage systems on the watershed and enables the development of mitigation and management procedures if disruption is proposed, or impacts are anticipated.

Field investigations were conducted based on procedures outlined in the TRCA (2014) guidance document, as well as supporting OSAP Section 4: Module 10 (S4:M10) and Section 4: Module 11 (OSAP, 2017). Accessibility to sites within the subject properties enabled a reach-based approach primarily utilizing S4:M11. A background review of existing hydrolayer mapping, ArchHydro data, LIDAR and satellite imagery were used to identify potential HDF features from desktop. Each potential HDF location was investigated during the initial site visit on April 4, 2025, with the subsequent monitoring visits completed at sites based on observations from previous visits.

Innis Lake Local Subwatershed Study - Part A Existing Conditions
May 2026

The evaluation methods outlined in the HDF Guidelines utilize flow conditions, riparian vegetation, fish and fish habitat and terrestrial assessments as components in the determination of HDF classification. The HDF assessment protocol implemented was primarily based on the “Standard Survey Type”, with exception to seasonal fish sampling, given the readily documented fish assemblage in the downstream Humber River tributaries and the absence of flow during post-spring freshet surveys. Additional investigations were also conducted in support of this LSS to supplement amphibian species and vegetation composition data that inform the HDF classification process.

Since HDF’s can vary significantly on a seasonal basis, multiple site visits are needed to correctly assess their hydrology and riparian conditions. HDFs were evaluated through a series of three site visits in 2025, which were timed to coincide with late winter/early spring, late spring, and summer conditions, as outlined in the HDF Guide (TRCA & CVC, 2014). Table 12 provides a summary of field investigation dates and recommended sampling periods.

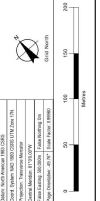
Table 12: HDF Recommended Timing and Field Investigation Dates

Site Visit	Guidelines Assessment Period	Field Investigation Date
1	Spring Freshet (Late March to early-April)	April 4, 2025,
2	Late April to May	April 30, 2025, and May 9, 2025
3	July to August	August 8, 2025
4	HDF Field Review with TRCA and Caledon (discussed under separate cover by GEO Morphix)	April 7, 2026

Following field investigations, findings of the HDF evaluations were then translated into a classification of the HDF, with respect to the hydrology and the riparian vegetation conditions of the features. See Figure 5 and Section 4.16 below for a detailed description of the features and assessment results and a detailed description of the feature. Appendix B contains a photo page of the feature from the April 4, 2025, HDF assessment.

- ▲ Farm Crossing
- Reach Break
- Management Recommendation
- Conservation
- Maintain/Restore Terminal Leakage
- Migration
- No Management Required
- Watercourse (MNR)
- Phase 1 Study Area
- Phase 2 Study Area

Source:
 1. Aerial Photo
 2. Survey of Existing Features
 3. City of Ottawa
 4. Survey of Existing Features
 5. City of Ottawa
 6. Survey of Existing Features
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BURNSIDE

MATTAMY HOMES

INNIS LAKE SECONDARY PLAN - SUBWATER DRAINAGE STUDY HEADWATER DRAINAGE FEATURES

Project No. 202005008
 Date: 11/2/2020
 Scale: 1:5000



3.2.8 Incidental Wildlife Observations

General wildlife surveys were conducted concurrently with all field investigations. All observations and signs of species were recorded (e.g., tracks/trails, scat, burrows, dens, browse, vocalizations). The results are summarized in Section 3.3.11.

3.2.9 Anthropogenic Features

Aside from structures that may be habitat for SAR birds and bats (as discussed above), anthropogenic features may be present on the subject properties that could provide suitable habitat for other wildlife, such as snakes. Additional searches for man-made features (e.g., rock piles or rock fences extending into the ground) were conducted during all site investigations and inspected for evidence of wildlife use.

3.3 Existing Ecological Conditions

3.3.1 Vegetation Communities and Species

3.3.1.1 Ecological Land Classification

ELC was completed based on the spring and summer vegetation surveys. Details for where the ELC was completed on the subject properties can be found in Figure 6. ELC details for lands in the study area outside of the subject properties can be found on Figure 7. The detailed vegetation community breakdown for the study area can be found in Appendix B.

The subject properties included a mix of cultural and anthropogenically impacted communities such as rural properties, open agriculture, hedgerows, thickets, woodlands and meadow, as well as natural communities including deciduous forests and marshes. No vegetation communities within the subject properties are locally significant, however significance of communities within the study area, but outside the subject properties, will be determined through future field studies.

For the portion of the study area that is not part of the subject properties, a combination of existing TRCA ELC data and orthoimagery was used to determine high level vegetation communities. It is recommended that additional ELC surveys be completed on properties that do not currently provide PTE to confirm and update the high-level vegetation community designation provided.

3.3.1.2 Botanical Inventory

A detailed list of plants identified on the subject properties can be found in Appendix B. The following summarizes the flora observed on the subject properties over two seasons:

- 107 plant taxa were observed. Of those, 101 were identified to species, or subspecies level.
- Of those, 48 (48%) were native and 53 (52%) were non-native to Ontario.
- No rare species (S-Rank between S1-S3) were found. All other native species are considered 'apparently secure' (uncommon but not rare (S4) or 'secure' (common, widespread and abundant) (S5) in Ontario.
- One species considered a "species of regional conservation concern" (L2) by TRCA Flora Score Ranks (2023) was identified:
 - White Oak (*Quercus alba*)
- Four additional species were observed by Burnside that are considered uncommon or rare in Peel Region by The Distribution and Status of the Vascular Plants of the Greater Toronto Area (Varga et al., 2000):
 - Creeping Yellowcress (*Rorippa sylvestris*) (Uncommon)
 - Common Bedstraw (*Galium Aparine*) (Rare)
 - Peach-leaved Willow (*Salix amygdaloides*) (Rare)
 - Old Field Aster (*Symphyotrichum pilosum*) (Rare)
- No SAR plants were observed during field investigations.

3.3.1.3 Woodland Evaluation

Multiple woodlands or varying sizes and community types are present within the study area. As per Schedule D3 of the FCOP, there are three main areas of Significant Woodland within the study area. Two are within the subject properties and one is within Phase 2 of the study area where PTE was not granted. A fourth Significant Woodland was determined through Burnside's evaluation and is located immediately north of the subject properties on the eastern side of the study area. These Significant Woodlands are mapped on Figure 8 and described below.

The TRCA Living City Policies (2014) state that Significant Woodlands should receive a 10 m buffer, however the FCOP (2025) states all Significant Woodlands require a 20 m buffer to avoid negative impact to the community. As woodlands fall under the jurisdiction of the municipality, the 20 m buffer has been applied.

Significant Woodland 1 (SW1)

SW1 is located in the south-west corner of the study area and encompasses a portion of watercourse reach TWHRB-7 and two meadow marsh polygons. SW1 is a

Fresh-Moist Lowland Deciduous Forest (FODM7) that is heavily influenced by invasive species, including Manitoba Maple (*Acer negundo*) and Common Buckthorn (*Rhamnus cathartica*). Although this woodland is not comprised of high quality tree and shrub species, it does meet criteria from RPOP's Table 1 including:

- Size: = >2 ha
- Surface Water Quality: woodland is directly adjacent to a tributary of the West Humber River (TWHRB-7) and two wetland communities.

The 20 m buffer, as required in the FCOP (2025), along the majority of SW1 is disturbed agricultural field and does not currently provide a function of protection to the woodland. A dripline survey, as approved by the Town of Caledon, is required in 2026.

Significant Woodland 2 (SW2)

SW2 is located centrally in the southern portion of the study area. Although this woodland is not comprised of high-quality tree and shrub species, it does meet criteria from RPOP's Table 1 including:

- Size- >2 ha
- Linkage: woodland overlaps with a potential linkage corridor mapped on Schedule D2b of the FCOP.
- Surface Water Quality: woodland is directly adjacent to a tributary of the West Humber River (TWHRA-6) and is within 30 m of a MNR mapped marsh.

The 20 m buffer, as required in the FCOP (2025), along the western edge of SW2 is currently disturbed agricultural field and does not currently provide a function of protection to the woodland. The eastern edge of SW2 includes existing natural features including cultural meadows, wetland communities and thicket. A dripline survey, as approved by the Town of Caledon, is required in 2026.

Significant Woodland 3 (SW3)

SW3 is located east of SW2, just north of the subject properties' boundary. It is outside of the participating subject properties and was not evaluated by Burnside staff. No TRCA ELC data was available for this area, and the woodland was determined through aerial photography interpretation. A portion of the woodland follows a stretch of watercourse reach TWHRA-6a and is adjacent to a MNR mapped wetland. This woodland meets the following criteria from RPOP's Table 1:

- Size: =>2 ha
- Linkage: woodland overlaps with a potential linkage corridor mapped on Schedule D2b of the FCOP.
- Surface Water Quality: woodland is directly adjacent to a tributary of the West Humber River (TWHRA-6a) and is within 30 m of a MNR mapped marsh.

The 20 m buffer, as required in the Future Caledon OP (2025), along the majority of SW3 is currently disturbed agricultural field and does not currently provide a function of protection to the woodland. The remaining buffer, along the eastern edge, includes a MNR mapped wetland. A dripline survey, as approved by the Town of Caledon, is required in 2026.

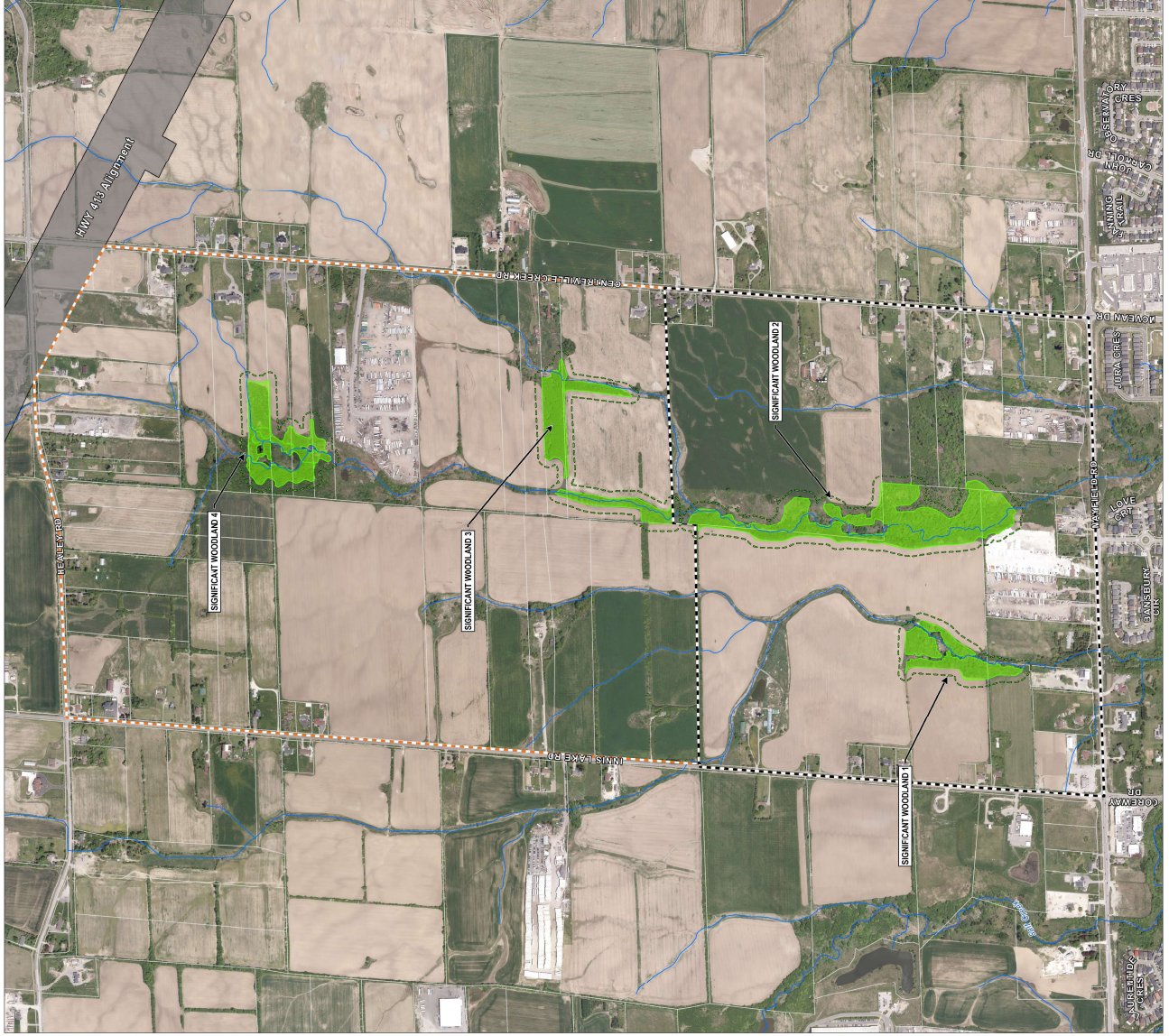
Significant Woodland 4 (SW4)

SW4 is located centrally in the northern portion of the study area. It is outside of the subject properties and was not evaluated by Burnside staff. Publicly available TRCA ELC community data was utilized to map the extent of the significant woodland. This woodland meets the following criteria from RPOP's Table 1:

- **Size:** woodland is >4 ha in area and would fall under the category of Core Area.
- **Proximity:** woodland is directly adjacent to multiple wetland communities that are candidate SWH (Amphibian Breeding Habitat- Wetland). Further field studies required to determine SWH.
- **Surface Water Quality:** woodland is directly adjacent to a tributary of the West Humber River (no reach code) and is within 30 m of a MNR mapped marsh.

The 20 m buffer, as required in the FCOP (2025), around SW4 includes both disturbed agricultural fields that do not currently provide a function of protection and natural communities (i.e. wetland, cultural meadow, and cultural thicket). A dripline survey, as approved by the Town of Caledon, is required in 2026.

The assessment of significance in this report is subject to refinement and confirmation at later stages of the development process when additional PTE is given.



- Watershed (MW)
- Significant Woodland
- 20m Significant Woodland Buffer
- Phase 1 Study Area
- Phase 2 Study Area

Notes:

1. Map of Significant Woodlands in the Watershed of the City of Burnsville, Minnesota.
2. Map of Significant Woodlands in the Watershed of the City of Burnsville, Minnesota.
3. Map of Significant Woodlands in the Watershed of the City of Burnsville, Minnesota.
4. Map of Significant Woodlands in the Watershed of the City of Burnsville, Minnesota.
5. Map of Significant Woodlands in the Watershed of the City of Burnsville, Minnesota.
6. Map of Significant Woodlands in the Watershed of the City of Burnsville, Minnesota.
7. Map of Significant Woodlands in the Watershed of the City of Burnsville, Minnesota.
8. Map of Significant Woodlands in the Watershed of the City of Burnsville, Minnesota.

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**INNIS LAKE SECONDARY PLAN -
 SUBWATERSHED STUDY
 WOODLAND EVALUATION**
 Project No. 2023050508
 Date: 05/20/2023
 Page: 8
 Scale: 1" = 500'

3.3.2 Avifauna

3.3.2.1 Breeding Birds

Forty-four resident bird species, exhibiting some level of breeding evidence (possible, probable, or confirmed), were observed on the subject properties during targeted breeding bird surveys in 2025 (see Appendix B).

Four species were observed on the subject properties during the breeding bird window, but no breeding evidence (i.e., suitable breeding habitat or breeding behavior) was recorded; Common Merganser (*Mergus merganser*), Great Blue Heron (*Ardea herodias*), Ring-billed Gull (*Larus delawarensis*) and Trumpeter Swan (*Cygnus buccinator*).

According to MNR's Significant Wildlife Habitat Technical Guide (MNR, 2000), "area-sensitive" species are defined as species that require large areas of suitable habitat for long term population survival. Fragmentation of essential habitats can result in overall declines in populations. Three "area-sensitive" bird species, as defined by MNR, were observed exhibiting breeding evidence on the subject properties during the breeding bird surveys: American Redstart (*Setophaga ruticilla*), Bobolink, and Savannah Sparrow (*Passerculus sandwichensis*).

Three bird species, that are listed on Schedule 1 of SARA, were observed exhibiting breeding evidence on the subject properties during breeding bird surveys: Barn Swallow (Threatened), Bobolink (Threatened), and Eastern Wood-pewee (*Contopus virens*) (Special Concern). SAR and SWH Screening Tables for the subject properties are included in Appendix B.

3.3.2.2 Structure Surveys

Survey investigations identified 11 total structures on the subject properties. There are seven structures on the west side and four structures on the east side. All structures were surveyed for Barn Swallow and Chimney Swift habitat during breeding bird surveys. Habitat for Barn Swallow was confirmed in one of the structures on the west side. None of the structures had potential for Chimney Swift. The significance of Barn Swallow habitat is discussed further in Part B Analysis, Impact Assessment, Mitigations and Recommendations Report.

3.3.3 Amphibian Breeding Call Surveys

Five anuran species were identified on the subject properties during targeted amphibian breeding call surveys (Table 13): Green Frog (*Lithobates clamitans*), American Toad (*Anaxyrus americanus*), Northern Leopard Frog (*Lithobates pipiens*), Gray Treefrog (*Hyla versicolor*), and Western Chorus Frog – Great Lakes

– St. Lawrence / Canadian Sheild Population (*Pseudacris maculata*) (THR). Green Frog, American Toad, and Gray Treefrog are ranked as S5 (Secure) in Ontario and considered common and widespread in the province. Western Chorus Frog – Great Lakes St. Lawrence Population is ranked as S4 (Apparently Secure) in Ontario.

Table 13. Amphibian Breeding Call Survey Results

Survey Date	Station ID	Species Observed	No. of Individuals
April 14, 2025	2	Western Chorus Frog	Full Chorus
	3	Western Chorus Frog	Full Chorus
May 14, 2025	1	Gray Treefrog	1
	2	Gray Treefrog	1
	3	Gray Treefrog	3
	4	Gray Treefrog	13
	5	Green Frog	1
		Northern Leopard Frog	1
		American Toad	4
July 3, 2025	5	Green Frog	4

3.3.4 Reptiles

3.3.4.1 Turtle Basking Surveys

No turtles were observed on the subject properties during basking surveys or other field investigations.

3.3.5 Bats

3.3.5.1 Exit Surveys

Acoustic surveys were conducted to assess the presence of SAR bats that may be utilizing candidate habitat in structures on the west side of the subject properties (12351 Innis Lake Road parcel). Recordings from the Echo Meter Touch 2 Pro Bat Call Detectors were verified using the more accurate Wildlife Acoustics Kaleidoscope Pro vv. 4.3.2. software. Table 14 shows which bat species were detected by the Echo Meter heterodynes, how many events were recorded, and the level of confidence in the accuracy of the species identification, as verified by Kaleidoscope Pro software.

Table 14: Recorded Bat Calls

Station Information		Number of Recorded Events ¹									
Date	Station	Big Brown Bat	Eastern Red Bat	Hoary Bat	Silver-haired Bat	Eastern Small-footed Myotis	Little Brown Myotis	Northern Myotis	Tri-colored Bat		
July 4, 2024	1	1	0	10	5	1	0	0	0		
	2	6	0	16	2	0	0	0	1		
	3	9	0	12	2	0	1	0	0		
	4	13	1	12	0	1	0	0	0		
	5	5	0	27	2	0	0	0	0		
July 9, 2024	1	7	1	14	5	0	0	0	0		
	2	16	0	5	0	1	0	0	0		
	3	16	0	22	9	0	1	0	0		
	4	62	0	16	4	0	0	0	0		
	5	13	1	18	4	0	0	0	0		
Total Recorded Events		148	3	152	33		2				1
Total Verified Events		142	3	152	11	3	0	0	0	0	0

¹Cells shaded green indicated a high probability that the species is present (p < 0.05).

Cells shaded red indicated a high probability of a false positive.

311 total bat calls were recorded and verified on the 12351 Innis Lake Road parcel of subject properties on both nights of surveys. The SAR bats that utilize structures as roosting habitat and were recorded during surveys were Eastern Small-footed Myotis, Little Brown Myotis (*Myotis lucifugus*), and Silver-haired Bat (*Lasionycteris noctivagans*). Of all the verified bat calls, only 13 calls were from these species. Burnside ecologists reviewed the characteristics of these calls such as time of night, amplitude, and number of pulses and were able to confidently determine that these were “fly-by calls” and do not indicate that SAR bats are using any of the identified structures as roosting habitat. Furthermore, the timestamps of each of these calls were cross-referenced with the notes taken from observation sheets. None of these bats were observed to be exiting or entering the structures at the time that the calls were recorded.

A higher number of calls from Hoary Bat was recorded during both nights of surveys and a potential exit from STR-001 was observed. However, COSEWIC’s assessment and status report of Hoary Bat found that Hoary Bats strictly roost in foliage and do not use structures for roosting habitat. Due to the presence of abundant insects in the barn, the Hoary Bats observed were foraging in the structure and it is not considered SAR habitat.

3.3.6 Wetlands

As identified on Figure 9, there are multiple wetland communities within the study area. Wetlands have been mapped by both MNR and TRCA and were field verified within the subject properties. All the wetland communities are unevaluated and are not designated as PSW, according to the Ontario Wetland Evaluation System (OWES).

Within the subject properties there are two MNR marsh communities and two meadow marsh communities verified by Burnside. The two MNR marsh communities are located within the riparian area of the central tributary and are contributing directly to the watercourse. The most northern of the MNR wetlands within the subject properties was determined to have a ‘high sensitivity’ during the feature-based water balance assessment, and the MNR wetland just south was determined to have a ‘medium sensitivity’ during the feature-based water balance assessment. The two wetlands in the south-western portion of the subject properties are also located within the riparian area of the western tributary (TWHRB-7) and are contributing directly to the watercourse. The “y-shaped” wetland was determined to have a ‘high sensitivity’ during the feature-based water balance assessment, and the wetland that is crossing the southern subject property boundary was determined to have a ‘medium sensitivity’ during the feature-based water balance assessment. These sensitivities are based on criteria set out in the TRCA Wetland Water Balance Risk Evaluation document (2017). The remainder of the study area includes five MNR marsh communities, one MNR open water community, multiple TRCA or desktop assessed wetlands, and four open water communities assessed through desktop. These wetland communities range in sensitivity from low to

Innis Lake Local Subwatershed Study - Part A Existing Conditions
May 2026

high and will require field studies to verify the sensitivity criteria and to verify botanical inventory and size.

It is anticipated that staking with TRCA will be scheduled for summer 2026 for all wetlands that have PTE. All wetlands will receive a 30 m setback, as per policies set out in the FCOP.

3.3.7 Aquatic Habitat

3.3.7.1 Western Tributary (TWHR-8 to TWHR-6)

The entirety of the western tributary was either dry or had minimal (>0.05 m deep) standing water during the August aquatic habitat assessment. Flowing water, while not measured, was observed in the tributary during the April HDF assessment. Reaches TWHR-8, TWHR-7 and TWHR-7A flow through agricultural lands, whereas reach TWRH-6 flows through forested lands.

A fishery community inventory was not conducted in 2025 as flowing water was not present during the appropriate sampling window. Sampling in the spring, when flowing water was present, is generally avoided to protect fish during sensitive life cycle window (spawning, rearing etc.). Fish were observed coincidentally during the April HDF assessment in the eastern tributary.

TWHR-8

At the upper end of the subject properties, the watercourse flows through a corrugated steel pipe (CSP) culvert on Innis Lake Road. Flows are then conveyed downstream through reach TWHR-8 in a channel that is densely vegetated with in-stream vegetation in the form of grasses. There is a farm crossing in this reach in the form of a CSP culvert which is corroded and partially collapsing. The culvert did not have a perched outlet, but it did represent a potential erosional hazard, and if it fully collapses it could be a future hazard and fish passage barrier. Standing water was observed within the farm crossing during the August site visit, but not upstream or downstream of it. Downstream of the farm crossing the channel is more confined with more cattails growing within it.

The riparian corridor of reach TWHR-8 is devoid of trees and the channel banks are vegetated with grasses and shrubs. The riparian vegetation does not shade or overhang much of the surface area of the reach given the width of it and the lack of a canopy provided.

Through reach TWHR-8 the channel is wide (5 to 6 m) and exposed. A low-flow channel is not present in reach TWHR-8 as it flows from Innis Lake Road down to the farm crossing. During the spring site visit it was observed that flows were not contained within a meandering low flow channel, they are spread across the channel. The banks of the channel are steep, moderately stable, and well vegetated with limited erosion noted. The substrate of the reach is comprised of gravel, shale, cobble and trace boulders.

TWHR-7

The habitat is homogenous from the farm crossing downstream to the upstream end of TWHR-6, through the entirety of TWHR-7. Within this reach there is very dense in-stream vegetation in the form of Cattails (*Typha* sp.) Some standing water (>0.05 m deep) was observed, although the density of the vegetation would prevent the movement of fish to upstream reaches (i.e., TWHR-8).

The bankfull width and depth of this reach were measured to be 5.5 and 0.1 m, respectively. The substrate is comprised primarily of muck with limited granular materials (i.e., gravel) observed. The riparian vegetation is primarily comprised of grasses and shrubs with sporadic trees present on the immediate top of the channel bank or in the watercourse to provide intermittent shading.

The west bank is higher in elevation than the east throughout reach TWHR-7. The channel banks are mostly stable with minor erosion noted. However, significant erosion is noted around an in-stream tree.

TWHR-7A

This reach is entirely vegetated with grasses and forbs with a poorly defined bed and banks. In the downstream sections a defined bed and bank is not present as it confluences with reach TWHR-7. It does not provide direct fish habitat, but it does contribute to it through allochthonous transport and seasonal flow conveyance. Near the downstream limit of this feature an informal farm crossing is present where machinery has crossed the feature without a culvert or structure installed.

TWHR-6

Reach TWHR-6 flows primarily from north to south in a meandering channel through lands that are vegetated with deciduous vegetation. The channel banks are moderately eroded with roots and bank sloughing observed. The banks are severely undercut; up to 0.4 m. Abundant watercress was observed in this reach indicating the potential for groundwater upwelling within it.

The substrate of the watercourse is comprised primarily of silt and muck with little granular material observed. The bank full width and depth were measured to be 3.5 and 0.6 m, respectively.

The deciduous vegetation on the banks of the watercourse provides shading and overhead cover for fish species in the watercourse. Woody debris is present in the reach of the watercourse, which combined with the undercut banks, provides habitat and cover for fish species.

It was noted that within and adjacent to reach TWHR-6 there is remnant farm equipment and anthropogenic debris in the form of a large plastic barrel and a mobile trailer.

3.3.7.2 Eastern Tributary (TWHRA-5 to TWHRA-6a)

TWHRA-5 and TWHRA-6

TWHRA-5 and TWHRA-6 are contiguous in terms of the fish habitat provided. The entirety of the channel was dry during the summer site visit; however flowing water was observed within the channel during the April HDF assessment. Burnside staff also visited the site on June 11, 2025, and observed dry sections of channel and pockets of standing water.

The channel is sporadically braided through these reaches, and it flows through a forested valley. The riparian vegetation in the form of the deciduous trees forms a canopy over the watercourse that shades and provides overhead cover for aquatic life. There are sporadic small sections of the watercourse that are vegetated with grasses and wetland vegetation, as well as some in-stream trees and woody debris.

The bankfull width and depth of the reaches were measured to be 2.9 and 0.6 m, respectively. The substrate is comprised primarily of gravel, silt, shale and cobble. The banks of the channel exhibited significant erosion with tree roots and exposed banks visible.

Barriers to fish movement were not observed during the aquatic habitat assessment in reaches TWHRA-5 or TWHRA-6. Both reaches provide seasonal habitat for fish habitat. A channel with a defined bed and bank is present, but the lack of flow prevents fish from inhabiting reaches TWHRA-5 and TWHRA-6 during seasonally dry periods of the year.

TWHRA-6a

Reach 6 is a completely vegetated, poorly defined feature that flows into reach of TWHRA-6 generally in an east to west direction. It is vegetated with grasses and agricultural lands are present surrounding it. A channel with a defined bed and bank were not observed. Flowing water was observed within reach of TWHRA-6A during the site visit in early April, but flows were not confined within a channel. The reach is capable of providing indirect fish habitat through the conveyance of flows and allochthonous transport, but it is not direct fish habitat due to the lack of a defined channel and dense in-stream vegetation that would obstruct fish movement.

3.3.7.3 Watercourses Outside of Subject Properties

Western Tributary

Downstream and upstream of the subject properties, site access was not granted at the time of this report, and thus on-site aquatic habitat assessments could not be completed. Downstream, south, of the subject properties the watercourse flows through forested lands. Adjacent land uses include agriculture and residential rural properties. The watercourse flows through Mayfield Road through a concrete box culvert. The Scoped SWS (2022) for the SABE states the watercourse south of the subject properties is a medium constraint watercourse.

As per the Scoped SWS (2022) for the SABE, HDF's and low constraint watercourses are present immediately north of the subject properties. To the northwest of Innis Lake Road, Medium and Low Constraint watercourses, in addition to HDF are present upstream, northwest of Innis Lake Road. These flows are conveyed through the CSP culvert at the upstream limit of reach TWHR-8.

Eastern Tributary

Downstream of the subject properties the watercourse flows through forested lands. Agricultural and rural lands surround the watercourse in addition to a large truck parking depot west of the watercourse and north of Mayfield Road. The SABE (2022) states this is a High Constraint watercourse. Flows are maintained south of Mayfield Road through a concrete box culvert.

There are two reaches that flow into the eastern tributary (TWHRA-6), reaches TWHRA-7 and TWHRA-6A. Upstream, north of TWHRA-7, there is a mix of medium constraint watercourse reaches and HDFs which flow through a forested corridor situated within primarily agricultural lands. The conditions surrounding the upstream watercourse reaches and HDFs appear consistent from the review of aerial imagery from the northern subject land limits to Healey Road (see figure 2). At Healey Road the Scoped SWS (2022) for the SABE states that the features are HDFs. North of TWHRA-6A the watercourse flows through agricultural lands and is mapped as a Low Constraint watercourse in the Scoped SWS. Flows from this feature are conveyed through Centreville Creek Road through a CSP culvert.

3.3.8 Watercourse Constraint Ranking

Table 15 below outlines the constraint ranking for the various watercourses within the subject properties based on geomorphic, aquatic and terrestrial, and hydrology constraints. Further analysis of the constraints will be provided in Part B: Analysis and Impacts Report.

Table 15: Subject Properties - Watercourse Constraint Ranking

Reach ID	Geomorphic Constraint	Aquatic Constraint	Terrestrial Constraint	Hydrology Constraint	Integrated Constraint Ranking
Tributary B (East Tributary)					
TWHRB-6	<p>Medium</p> <ul style="list-style-type: none"> Limited riffle pool morphology (predominantly runs with few pools) Portions of channel historically modified Poor longitudinal substrate sorting Well-defined valley/floodplain Significant Valleyland 	Medium (intermittent flow)	High (sig. woodland)	<p>Medium</p> <ul style="list-style-type: none"> Regulated floodplain Drainage area 397 ha, Conveyance function can be replicated through design 	High
TWHRB-7	<p>Medium</p> <ul style="list-style-type: none"> Limited riffle pool morphology (predominantly runs with few pools) Historically modified Partially confined Not Significant Valleyland Channel would benefit from rehabilitation 	Medium (intermittent flow)	Medium	<p>Medium</p> <ul style="list-style-type: none"> Regulated floodplain Drainage area 328 ha, Conveyance function can be replicated through design 	Medium
TWHRB-7a	<p>Medium</p> <ul style="list-style-type: none"> No defined channel Historically modified Unconfined 	Medium (intermittent flow)	Medium	<p>Medium</p> <ul style="list-style-type: none"> Regulated floodplain at downstream extent Drainage area 78 ha 	Medium

Reach ID	Geomorphic Constraint	Aquatic Constraint	Terrestrial Constraint	Hydrology Constraint	Integrated Constraint Ranking
	<ul style="list-style-type: none"> Channel would benefit from rehabilitation 			<ul style="list-style-type: none"> Conveyance function can be replicated through design 	
TWHRB-8	<p>Medium</p> <ul style="list-style-type: none"> Limited riffle pool morphology (predominantly runs with few pools) Historically modified Not Significant Valleyland Channel would benefit from rehabilitation 	Medium (intermittent flow)	Medium	<p>Medium</p> <ul style="list-style-type: none"> Regulated floodplain Drainage area 241 ha Conveyance function can be replicated through design 	Medium
Tributary A (Western Tributary)					
TWHRA-5	<p>High</p> <ul style="list-style-type: none"> Riffle and pool morphology Well-defined valley/flood plain Significant Valleyland 	Medium (intermittent flow)	High (sig. woodland)	<p>Medium</p> <ul style="list-style-type: none"> Regulated floodplain Drainage area 399 ha Conveyance function can be replicated through design 	High

Reach ID	Geomorphic Constraint	Aquatic Constraint	Terrestrial Constraint	Hydrology Constraint	Integrated Constraint Ranking
TWHRA-6	<p>High</p> <ul style="list-style-type: none"> Limited riffle pool morphology (predominantly runs with few pools) Well-defined valley/flood plain Significant Valleyland 	Medium (intermittent flow)	High (sig. woodland and adjacent to wetland)	<p>High</p> <ul style="list-style-type: none"> Regulated floodplain Drainage area 361 ha Conveyance function can be replicated through design 	High
TWHRA-6a	<p>Medium</p> <ul style="list-style-type: none"> No riffle and pool morphology Historically modified Well-defined floodplain Unconfined 	Medium (intermittent flow)	High (wetland)	<p>Medium</p> <ul style="list-style-type: none"> Regulated floodplain Drainage area 126 ha Conveyance function can be replicated through design 	High

3.3.8.1 Opportunities for Restoration

Historical and recent aerial imagery, as well as field observations, confirm that a significant portion of the western tributary (Tributary B) has been historically modified to accommodate agricultural land uses. Reach TWHRB-8 consists of a relatively straight, over widened corridor with shallow flow conditions. The wide, exposed channel promotes laminar or stagnant flows during seasonal low-flow periods. The dense in-stream vegetation potentially limits fish movement from lower reaches of the watercourse to Reach TWHRB-8 and further upstream. A degraded farm crossing is also present along Reach TWHRB-8 and at the time of 2025 field work, appeared to be partially blocked with vegetation/debris. The channel lacks riffle and pool morphology and contains multiple flow paths. Although there are boulders and cobbles in sections of the reach, they are likely due to historical ad-hoc armouring. Reach TWHRB-7 has also been significantly modified and lacks riffle-pool morphology.

Vegetation along these two reaches is predominantly non-woody and the natural riparian buffer is limited, with agricultural crops approaching the channel margins. In several locations. This results in limited overhead cover and shade to the channel. In addition, the western valley slope along Reaches TWHRB-7 and TWHRB-8 is uniform in shape when compared to the more natural topography present on the east side of the channel and may be the result of agricultural land uses. Town of Caledon imagery for the years 2005 and 2007 captures the distribution of new material/fill across extensive areas of the agricultural fields west of the tributary and existing woodlot along Reach TWHRB-6.

The impacted channels, riparian areas and modified western valley slope associated with Reaches TWHRB-8 and TWHRB-7 present an opportunity for channel restoration and floodplain enhancements using principles of natural channel design. Removal of the degraded farm crossing and restoring the tributary with an appropriately sized bankfull channel with a meandering planform and morphological and substrate variability would significantly improve instream conditions and maintain more regular fish passage within and upstream of the Secondary Plan Area. Floodplain features such as pocket wetlands and woody plantings would provide a more natural floodplain form and provide shade and cover to the channel.

In addition to the above, a large barrel and outbuilding are present along Reach TWHRB-6. The barrel is resting in the channel, and the outbuilding is situated at the top of the eastern channel bank. It is recommended that the barrel and outbuilding be removed as part of the development to reduce erosion/scour risk and potential failure of the outbuilding in the channel.

3.3.9 Headwater Drainage Features

HDFs within the subject properties were mixed in structure and form, ranging from poorly defined field drainages and vegetated swales to naturally defined channels. In total,

17 HDF features were investigated on the subject properties. The majority of features on the subject properties were found in actively tilled agricultural fields or along their perimeters. However, some of the drainage networks do flow – wholly or at least via their lower reaches - through areas with Important Riparian Classification (i.e., forest or scrubland). Drainage features were segmented into sub-reaches when changes in hydrology, riparian vegetation, or site modifiers (e.g., tile drains) were observed. Fifty (50) reaches were documented and categorized. Important Hydrological Function, as defined by the protocol, was absent throughout HDFs on the subject properties.

Where PTE has not been granted within the study area, the information from the SABE (2022) will be used to determine if features are HDFs or watercourses. It is recommended that HDF surveys be completed on other properties within the study area as part of draft plan approval processes in order to identify and prescribe management recommendations to features if and when permission to enter is granted.

3.3.10 Reach-based Classification

Using hydrological characteristics, riparian vegetation, potential fish habitat and terrestrial linkage habitat, classification of each HDF feature was completed. Of the reaches within these networks, 16 were classified as 'Conservation', 14 as "Mitigation", two as "Maintain/Replicate Terrestrial Linkage" and 18 as 'No Management Concern', based on the management decision matrix provided on Figure 2 of the HDF Guideline (TRCA & CVC, 2014). A summary of reach-based classification is provided in Table 16 below.

Table 16: Headwater Drainage Feature Reach Classifications

Drainage	Reach	Hydrology	Modifier	Riparian Classification	Fish and Fish Habitat	Terrestrial Habitat	Management Recommendation
H1	R1	Limited Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	No Management Required
	R2	Limited Function	n/a	Important Function	Contributing Functions	Limited Function	No Management Required
H2	R1a	Contributing Function	Agricultural Practices	Valued Function	Contributing Functions	Limited Function	Mitigation
	R1	Contributing Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	Mitigation
	R2a	Contributing Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	Mitigation
	R2b	Contributing Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	Mitigation
H3	R1	Contributing Function	n/a	Valued Function	Contributing Functions	Limited Function	Mitigation
	R2	Contributing Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	Mitigation
	R3	Contributing Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	Mitigation
	R4	Limited Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	Mitigation
H4	R5	Contributing Function	n/a	Valued Function	Contributing Functions	Contributing Function	Mitigation
	R1	Contributing Function	n/a	Important Function	Contributing Functions	Contributing Function	Conservation

Drainage	Reach	Hydrology	Modifier	Riparian Classification	Fish and Fish Habitat	Terrestrial Habitat	Management Recommendation
H5	R1	Limited Function	n/a	Important Function	Contributing Functions	Contributing Function	Conservation
	R2	Contributing Function	n/a	Important Function	Contributing Functions	Contributing Function	Conservation
	R3a	Limited Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	No Management Required
	R3b	Limited Function	n/a	Important Function	Contributing Functions	Contributing Function	Maintain/Replicate Terrestrial Linkage
H6	R1	Limited Function	n/a	Important Function	Contributing Functions	Contributing Function	Mitigation
	R2	Contributing Function	n/a	Valued Function	Contributing Functions	Limited Function	Mitigation
	R3	Limited Function	Agricultural Practices	Important Function	Contributing Functions	Limited Function	No Management Required
H7	R1	Limited Function	n/a	Important Function	Contributing Functions	Contributing Function	Maintain/Replicate Terrestrial Linkage
	R1	Contributing Function	n/a	Important Function	Contributing Functions	Contributing Function	Conservation
H8	R2	Limited Function	n/a	Important Function	Contributing Functions	Limited Function	Conservation
	R3	Contributing Function	n/a	Important Function	Contributing Functions	Contributing Function	Conservation
	R1	Limited Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	No Management Required
H9	R1	Limited Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	No Management Required
	R1	Limited Function	n/a	Valued Function	Contributing Functions	Limited Function	No Management Required

Drainage	Reach	Hydrology	Modifier	Riparian Classification	Fish and Fish Habitat	Terrestrial Habitat	Management Recommendation
H11	R1	Contributing Function	n/a	Valued Function	Contributing Functions	Limited Function	Mitigation
	R2	Limited Function	n/a	Valued Function	Contributing Functions	Limited Function	No Management Required
	R2a	Limited Function	n/a	Limited Function	Contributing Functions	Limited Function	No Management Required
H12	R1	Contributing Function	n/a	Important Function	Contributing Functions	Contributing Function	Conservation
	R2	Contributing Function	n/a	Important Function	Contributing Functions	Contributing Function	Conservation
	R2a	Contributing Function	Agricultural Practices (tile drain outlet)	Important Function	Contributing Functions	Contributing Function	Conservation
	R3	Contributing Function	n/a	Important Function	Contributing Functions	Limited Function	Mitigation
	R4	Contributing Function	n/a	Important Function	Contributing Functions	Limited Function	Mitigation
R4a	Limited Function	n/a	Limited Function	Contributing Functions	Limited Function	No Management Required	
R4b	Limited Function	n/a	Limited Function	Contributing Functions	Limited Function	No Management Required	
R5	Contributing Function	n/a	Limited Function	Contributing Functions	Limited Function	Mitigation	
R5a	Limited Function	n/a	Limited Function	Contributing Functions	Limited Function	No Management Required	

Drainage	Reach	Hydrology	Modifier	Riparian Classification	Fish and Fish Habitat	Terrestrial Habitat	Management Recommendation
	R5b	Contributing Function	n/a	Limited Function	Contributing Functions	Limited Function	Mitigation
H14	R1	Limited Function	n/a	Important Function	Contributing Functions	Contributing Function	Conservation
	R2	Contributing Function	n/a	Important Function	Contributing Functions	Contributing Function	Conservation
	R3	Limited Function	n/a	Important Function	Contributing Functions	Limited Function	No Management Required
	R4	Limited Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	No Management Required
H15	R1	Limited Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	No Management Required
H16	R1	Limited Function	Agricultural Practices	Limited Function	Contributing Functions	Limited Function	No Management Required
H17	R1	Contributing Function	n/a	Limited Function	Contributing Functions	Limited Function	Mitigation
	R2	Contributing Function	n/a	Valued Function	Contributing Functions	Limited Function	Mitigation
	R3	Contributing Function	n/a	Valued Function	Contributing Functions	Limited Function	Mitigation
	R4	Contributing Function	n/a	Valued Function	Contributing Functions	Limited Function	Mitigation

Most features were dry, contained standing water, or were minimally flowing (i.e., less than 0.5L/s) during the April assessment, with all features dry by the August assessment. All HDFs have some degree of connectivity and are able to convey drainage to downstream watercourses. While all features were dry during the summer assessment, the surveys were all completed during the appropriate windows as per OSAP Section 4: Module 10 (S4:M10).

The H1 feature appears to originate from ponding within the hedgerow that discharges to an agricultural swale along the field edge. Its actual origin could not be accurately observed due to property access constraints. The lower reach of the feature is a broad and poorly defined, vegetated swale that meanders through the actively tilled agricultural field and then discharges to the watercourse, under post-rain or snowmelt conditions. The feature and the surrounding land are vegetated with crops. There was standing water observed throughout the feature during the April assessment and conditions were observed to be dry during subsequent site visits.

The H2 feature originates from ponding within the hedgerow before conveying flow through drainages devoid of definition in the agricultural field toward the watercourse. The upper twin reaches (i.e., H2-R2a and H2-R2b) confluence mid-way through the field. Drainage from reach H2-R1a pools in a large area before some of it discharges into the watercourse at the farm crossing. The remainder of the flow is conveyed through the subdrainage pathway H2-R1 northeast, parallel with the watercourse. Riparian vegetation transitions from cropped land to meadow at the upstream H2-R1 reach break, which eventually discharges to the reach TWHR-8 of the watercourse. Standing water and minimal flow conditions were observed during the April assessment, with dry conditions observed throughout the feature thereafter.

Feature H3 is mapped as a watercourse in the MNR ARA mapping; however, on-site conditions observed in 2025 reflect an ephemeral to intermittent HDF lacking consistent definition of bed and bank. Reaches H3-R3 and H3-R5 were short defined natural channels, whereas the others had no definition. H3-R2 and H3-R3 displayed some evidence of groundwater input (i.e., Watercress). Flow conditions throughout H3 varied from standing water (R4) to minimal flow (R1; R2) to significant flow (R3; R5) during the April assessment. The feature was entirely dry during the May and August assessments. The riparian vegetation of the uppermost and lowermost reaches (i.e., H3-R5 and H3-R1) are characterized by scrubland and meadow, respectively. The remaining middle reaches all flow through actively tilled agricultural land. While the uppermost reach (R5) has a management recommendation of Conservation, this was not applied to the downstream reaches. The presence of the hedgerow that surround reach R5 was the reason this feature was assigned the management recommendation of Conservation; it was not due to feature or flow conditions as the entire feature was dry during the second and third HDF assessments and is primarily poorly defined downstream of R5. Flow from

H3 will be maintained to the east branch of the West Humber River in the design and thus the lower entire feature has been assigned the Mitigation recommendation.

H4 and H9 are both short drainages, beginning at the perimeter of the agricultural field before immediately discharging into their respective watercourses. H4-R1 is a defined channel that conveys flow down a steep slope through scrubland to the eastern tributary. The field at the upper limit of H4-R1 was dry during all site visits. In April only, standing water was observed in H4-R1 as flows converged likely from all angles to the upper end of the reach. H9-R1 lacks definition and had standing water amongst crop land in April only.

Feature H5 is poorly defined throughout its length. It flows primarily along the interface of cropped land and scrubland before turning downhill toward the watercourse through the floodplain and losing definition further. One of the upper twin reaches (H5-R3a) does wholly flow through cropped land before confluencing with H5-R3b along the NHS limit. The individual reaches had varied flow conditions ranging from dry to minimal flow, during the April assessment, with all reaches being dry thereafter.

Feature H6 originates along the southeastern perimeter of the subject properties, along the field edge, and flows downhill through scrubland in the floodplain and discharging into the western tributary. All reaches had standing water in April and were dry during subsequent assessments. The central reach (i.e. H6-R2) is a defined natural channel through the steepest section of the feature, whereas both of the other reaches lack definition.

Features H7, H8 and H10 flow parallel with the watercourse before discharging into it. These three features flow north to south. All three features were either dry or with a mix of standing water during the April assessment; and were dry thereafter. The form of H7 is a broad swale that functions like a perimeter eaves-trough on the border of the agricultural field. H8 is mixed in form, beginning without definition in the upper reaches (i.e., H8-R3 and H8-R2), before turning downhill and becoming a defined natural channel in H8-R1. H10 has no definition and lacks direct connectivity to the watercourse, whereby water pools and infiltrates at the lower end of its singular reach. H10 flows directly parallel to reach TWHR-7.

Reaches through feature H11 are primarily characterized by meadow riparian vegetation, other than the subdrainage H11-R2a which briefly flows through cropped land before confluencing with the mainstem of H11. H11-R2 is a long meandering swale that directs water away from driveways and farm infrastructure before turning down a steep embankment (i.e., H11-R1) and becoming a naturally defined channel. H11-R1 had significant flow during the April assessment, whereas the upper reaches had standing water. All reaches were dry during subsequent assessments.

H12 originates just east of Innis Lake Road. It primarily flows from west to east in a swale formation toward the riparian forest surrounding the western tributary, with additional features (H12R5a and H12 R4a and R4b) observed to convey flow to it from the north. H12-R5a and H12-R4b were both dry and lacked any definition in the field despite being visible on aerial mapping. Flowing and standing water was observed through H12-R5b, H12-R4, and H12-R3 and the channel becomes more of a naturalized channel in the lower reaches. H12-R2 and H12-R1 are both natural channels which convey flows to the western tributary in a forested area. It was noted that a tile drain outlet was observed in H12-R2a. The upper reaches of these features (i.e., upstream of H12-R3) are surrounded by agricultural vegetation.

There is not an H13. In the field it was thought that H12 consisted of two separate features, but upon further investigation it was a singular drainage network.

The remaining features exist on the east side of the subject properties. H14 begins as a drainage of cropped land lacking definition before it enters scrubland within the floodplain. Reach H14-R2 is the only defined natural channel within the feature. H14-R1 loses all definition, discharging into the watercourse via sheetflow within the floodplain. H14-R1 was dry throughout all assessments, whereas the upper 3 reaches had some standing water during the April assessment only.

Features H15 and H16 each have a singular reach without definition. These drainages flow down the agricultural field and then discharge via sheetflow into the watercourse. Standing water was present in each during the April assessment, with all reaches being dry thereafter.

H17 is a mapped watercourse, but upon review in the field it is a poorly defined swale that conveys flow from near the northern limit of the subject properties in north to south direction. The feature is surrounded by agricultural fields and meadow vegetation. Flows are conveyed to the south of the subject properties; however this feature could not be observed due to property access constraints. The Scoped SWS (2022) for the SABE also maps H17 as watercourse within the subject properties. Approximately 115 m downstream of the southern limit of the subject properties, the Scoped SWS maps this as a Low Constraint watercourse. Flows are maintained south of Mayfield Road through a concrete pipe culvert. Flows are conveyed to the subject reach of watercourse south of the subject properties through a CSP culvert on Centreville Creek Road, approximately 230 m north of Mayfield Road.

Overall, the HDFs on the subject properties provide indirect fish habitat to fish and the aquatic network. The vast majority of the reaches are highly impacted by agricultural practices. No fish or suitable habitat (i.e., for feeding, cover, refuge or migration) were observed among the features on the study area. All 16 features provide indirect fish habitat via allochthonous transport.

Some features within and external to the subject properties were reviewed in the field with TRCA, Caledon, Burnside and GEO Morphix staff on April 7, 2026. Results and discussion surrounding this site visit are included in a report under a separate cover submitted by GEO Morphix.

3.3.11 Incidental Wildlife Observations

Incidental wildlife observations recorded by Burnside during field investigations are listed in Table 17. MNRs provincial ranks (i.e., S1 to S5) are used to set protection priorities for rare species and natural communities. The species observed are not listed as provincially and/or federally significant and are listed as secure, or apparently secure in Southern Ontario (in other words, they are ranked as S4 or S5, which is defined by MNR as species that are common, widespread, and abundant in the province or uncommon but not rare).

Table 17: Summary of Incidental Wildlife Observations by Burnside Staff on the Subject Properties

Common Name	Scientific Name	No. Observed	S-Rank	Location/Comments
Coyote	<i>Canis latrans</i>	1	S5	Scat observed
Raccoon	<i>Procyon lotor</i>	1	S5	Tracks observed
Red-tailed Hawk	<i>Buteo jamaicensis</i>	1	S5	Flyover

3.4 Preliminary Feature-Based Water Balance Risk Assessment

A preliminary feature-based water balance risk assessment was completed for the existing features within the study area including Phase 1 and Phase 2 lands. The assessment was conducted in accordance with the procedures outlined in the TRCA's *Wetland Water Balance Risk Evaluation* document (November 2017). Each wetland feature was screened based on the proposed concept plans. Risk ratings conclusions are used to establish the appropriate level of monitoring and analysis to be undertaken during future Feature Based Water Balance Assessments. A summary of risk characterizations has been provided below:

Low Risk – Impact to wetland hydrology unlikely. Pre-development water balance monitoring of wetland hydrology not required. Water balance complete using non-continuous modeling (e.g., Thornwaite-Mather method) with output at monthly resolution.

Medium Risk – Monitoring of wetland hydrology is required to establish pre-development baseline condition, continuous calibrated modeling (e.g., EPA SWMM) using daily data and weekly resolution. Development of a mitigation plan which compares pre-development and mitigated post-development hydroperiods.

High Risk – Same as medium risk but with an emphasis on characterization of groundwater interaction and potential integration of hydrological model where groundwater interaction is significant.

Table 18 below summarizes the Hydrological Change rating, Wetland Sensitivity rating and the resultant Risk Level of each feature based on the TRCA Figure 3: Wetland Risk Evaluation Decision Tree.

Table 18: Preliminary Feature-Based Water Balance Risk Evaluations

Phase	Feature & Catchment ID	Hydrological Change	Wetland Sensitivity	Risk Level
1	WTLD - A	Medium	High	High
1	WTLD - B	High	Medium	Medium
1	WTLD - C	Medium	High	High
1	WTLD - D	High	Medium	Medium
1	WTLD - E	High	Low-Medium	Medium
1	WTLD - F	High	Medium	Medium
1	WTLD - G	High	Medium	Medium
1	WTLD - 1	High	Low	Medium
1	WTLD - 2	Low	Medium	Low
1	WTLD - 3	Medium	Medium	Medium
1	WTLD - 4	Low	Low-Medium	Low
1	WTLD - 5	Low	Medium	Low
1	WTLD - 6	Low	Low	Low
1	WTLD - 7	Low	Low	Low
1	WTLD – 8**	High	Medium*	Medium
2	EXT-WTDL-A	Medium	Low	Low
2	EXT-WTDL-B	Medium	Low	Low
2	EXT-WTDL-C	High	Medium	Medium
2	EXT-WTDL-D	High	Medium*	Medium
2	EXT-WTDL-E	Medium	Medium*	Medium
2	EXT-WTDL-1	High	Medium	Medium
2	EXT-WTDL-2	Low	Medium	Low

*Prior to the implementation of feature Risk Levels or the commencement of feature-based water balance assessments, consultation with the TRCA should be undertaken to confirm monitoring/modeling methodology.

**Concept Plan has assumed removal of Feature WTLD-8

In the absence of Phase 2 ecological field studies, those sensitivity screenings are comprised of desktop evaluation only.

All water balance risk evaluation calculations and the existing and proposed drainage plans can be found in Appendix D.

4.0 Hydrogeology

A Hydrogeological Assessment for the study area was completed by Burnside and is included in Appendix C of this report. A summary of the findings of the Hydrogeological Assessment is provided below.

4.1 Physiography and Topography

The study area is located at the boundary between two physiographic regions known as the Peel Plain and the South Slope of the Oak Ridges Moraine (part of Lake Simcoe-Rideau Ecoregion 6E). The southernmost part of the study area, extending about 600 m north from Mayfield Road, is mapped in the Peel Plain region, which is characterized by flat to gently rolling plains gradually sloping towards Lake Ontario. The remainder of the study area is mapped within the South Slope region, which is characterized by gently rolling till plains and drumlins (Chapman and Putnam, 1984).

The study area mostly consists of gently undulating tablelands, traversed by several drainage features and tributaries of the West Humber River, draining the area in a southeasterly direction. The more significant watercourses feature steeply sloped valleys, particularly TWHRA, which crosses the subject properties through the center. Some small wetland communities are found along watercourses and in valley bottomlands.

4.2 Geology

Surficial geology mapping published by the Ontario Geological Survey (2010), shows the majority of the study area is overlain by glaciolacustrine-derived silty clay to clayey silt till mapped as the Halton till or Wildfield till. The tablelands in the southeast corner of the study area are mapped as lacustrine surficial deposits of silts and clays. Modern alluvial deposits have been mapped along the lower reaches of the watercourse valleys, consisting of fluvial silt, sand and gravel deposits.

Bedrock beneath the study area has been mapped as shale of the Georgian Bay Formation, as well as the Queenston Formation at the extreme northern and western edges of the study area (OGS, 2011). A review of MECP well records in the vicinity of the study area as well as the boreholes from the 2022/2025 geotechnical investigations indicate the depth to bedrock ranges from around 2.5 meters below ground surface (mbgs) in the watercourse valleys on the southwestern portion of the study area, dropping significantly to almost 30 mbgs along Centreville Creek Road at the eastern limits of the study area.

Eight cross-sections were prepared based on site specific borehole logs and data available from MECP well records to illustrate the local geological conditions across the study area (Figures 7 to 11 in Appendix C). These cross-sections show that the study

area is covered by a layer of mostly silt and clay till soils that ranges in thickness from about 2 m to 28 m. This dominant till overburden is interspersed with layers of gravel and sand in some areas, particularly through the central and eastern parts of the study area, where it is interpreted as a continuous layer at the interface between bedrock and overburden. The depth to bedrock ranges widely across the study area, and it is interpreted to be situated at the edge of a bedrock valley, with depth to bedrock increasing significantly moving east and south across the study area. Where the depth to bedrock is much greater, the layer of sand and gravel below the clay and silt-dominated top layer is estimated to be much thicker – potentially 16 m or more.

4.3 Hydraulic Conductivity

Various methods can be used to assess the hydraulic conductivity of soils (the ability of soil to transmit groundwater). Grainsize analysis and soil characteristics can be used to provide a general estimate of hydraulic conductivity, while single well bail-down tests can be used in monitoring wells to assess in-situ hydraulic conductivity.

Soil samples were collected during the drilling of select wells at various depths as part of the geotechnical investigation conducted across the subject properties by DS Consultants Ltd in 2025 (Appendix E). Soil samples were collected from depths ranging from 0.8 mbgs to 9.1 mbgs and consisted of silt and clay till soils. The Hazen estimation used to estimate hydraulic conductivity from soil samples is designed for more permeable sediments, and all soil samples were estimated to have a hydraulic conductivity lower than 1.0×10^{-6} cm/sec using this method.

Single well bail-down tests were undertaken in spring 2025 on 10 monitoring wells across the subject properties to estimate in-situ hydraulic conductivity of the till soils as well as the shale bedrock. This testing provided a range of hydraulic conductivity values across three orders of magnitude from 2.1×10^{-6} cm/sec to 5.9×10^{-4} cm/sec.

The highest hydraulic conductivities were found in wells screened in the shale bedrock or at the interface between shale bedrock and till overburden. These wells are located on the western half of the subject properties, where bedrock elevations are higher and more wells are screened partially or fully in the bedrock. These values ranged from 1.5×10^{-5} to 5.9×10^{-4} cm/sec and are interpreted to represent water-filled fractures commonly found in shale. The remaining tests were conducted in clay and silt till soils and ranged from 2.1×10^{-6} to 1.2×10^{-4} cm/sec. These represent moderately low to low hydraulic conductivity and are typical of the Halton till soils.

4.4 Local Groundwater Use

The study area and surrounding lands to the west, north and east consist largely of agricultural land and rural properties which may still rely on private well supplies. The

lands immediately to the south feature residential subdivisions that are municipally serviced by water from Lake Ontario.

A review of MECP well records within 500 m of the study area identified 101 total well records, of which 72 were water supply wells. Of the 72 water supply wells, 42 are screened in the bedrock, 26 are screened in the overburden, and 4 are screened in multiple layers. It is noted that well records do not indicate the current status of the well, and it is assumed that many of the wells listed to be in the developed area south of Mayfield Road are now decommissioned.

4.5 Groundwater Conditions

Groundwater levels have been monitored in 19 monitoring wells and 18 drive-point piezometers across the Phase 1 properties on a bi-monthly schedule since spring 2025 (see Figure 2, in Appendix C). The results of the groundwater level monitoring for the monitoring wells across the subject properties show seasonal fluctuations that vary based on location and screened material. A seasonally high water table was observed in between April and May, reflecting typical patterns of snow melt and higher precipitation in the spring. The highest water levels were less than 2 mbgs and occurred in shallow wells located close to the main watercourses or in the southern third of the subject properties. The lowest water table conditions occurred in October, reflecting the unusually warm and dry summer and early autumn of 2025. The lowest water levels were greater than 4 mbgs and were concentrated in wells located at higher elevations in the northeast quarter of the subject properties, with the exception of MW14d and MW15d, which are deep wells screened fully in shale bedrock.

Drive-point piezometers were installed in wetlands and along watercourses across the subject properties to monitor the shallow groundwater levels (found at 1 mbgs to 2 mbgs). Groundwater levels in these features were generally slow to respond to precipitation events due to low-permeability soils. In most cases, all water levels remained below ground surface and water levels in the deeper piezometers were found to be lower than in corresponding shallow piezometers, indicating a downward gradient (recharge conditions). One exception was found at PZ4s/d, located in the wetland community along TWHRB near the south limit of the subject properties which featured high groundwater levels in both piezometers and potential seasonally discharge conditions.

The subsurface flow of the shallow water table within the surficial till sediments was interpreted based on comparisons of the spring high water levels across the study area. Shallow groundwater patterns were found to mimic the surface water flow patterns, moving from higher to lower elevations. Within the study area, this movement was observed in a generally north-to-south direction and was strongly influenced by the steep watercourse valleys traversing the site.

Vertical groundwater movement across the study area was observed to be largely a downward gradient. Three pairs of nested wells (two wells installed at the same location but at different depths) were installed to compare water levels in shallow till soils and the bedrock or deeper till soils. All nested wells demonstrated a downward gradient, with the strongest gradients observed when the deep well was installed in bedrock. Most of the piezometers were nested as well, to show the groundwater function in wetlands and along watercourses. These areas also showed weak downward gradients for the most part indicating recharge conditions, with the exception of the lower reaches of TWHRB, where the piezometer groundwater levels are consistently high and show seasonal upward gradients, indicating potential groundwater discharge.

4.6 Groundwater Quality

Groundwater samples were collected from two monitoring wells (MW22-2 and MW25-13d, refer to Figure 2 in Appendix C for well locations) on July 8, 2025, to assess the groundwater quality in the shallow till soils. The samples were found to be hard and have high turbidity, which is typical of groundwater systems.

Sodium and chloride concentrations were found to be high, which may be indicative of impacts to the shallow groundwater system from road salt usage along the boundary roads. Total phosphorus was reported above the Provincial Water Quality Objective (PWQO) showing potential impacts from agricultural practices in the area (i.e., the application of fertilizers).

The reported metal concentrations were generally low; however, exceedances of the PWQO were reported for boron and iron and exceedances of the Ontario Drinking Water Quality Standards (ODWQS) were reported for iron and manganese. These metals are found to be naturally high in shale bedrock and it is interpreted that these exceedances are related to the natural leaching of the metals from the shale into the groundwater system.

4.7 Site-Wide Existing Conditions Water Balance

An existing conditions water balance was calculated using the Thornthwaite-Mather methodology to assess the existing infiltration volume for the study area. The total precipitation value was based on long-term average annual precipitation data from the Environment Canada Richmond Hill climate station (Station 6157012 - 43° 52'38.094" N, 79°26'52.074" W, elevation 240.0 masl) for the period between 1981 and 2010.

The infiltration factor for pervious areas was determined using the SWM Planning and Design Manual (2003) methodology for calculating infiltration and runoff components based on topography, soil type, land cover and soil moisture storage conditions. Please refer to Burnside's Innis Lake Hydrogeological Assessment – Part A Existing Conditions in Appendix C of this report for detailed calculations. Table 19 below summarizes the

Innis Lake Local Subwatershed Study - Part A Existing Conditions
May 2026

existing conditions water balance. Overall, the Phase 1 lands have approximately 189,800 m³/year of infiltration and the Phase 2 lands have approximately 304,500 m³/year of infiltration in existing conditions.

Table 19: Existing Conditions Water Balance Summary

	Phase 1 Lands	Phase 2 Lands	Total Pre-Development
Inputs (Volumes)			
Precipitation (m ³ /year)	1,392,500	2,136,300	3,528,800
Outputs (Volumes)			
Evaporation (m ³ /year)	15,100	8,300	23,400
Total Evapotranspiration (m ³ /year)	882,300	1,420,500	2,302,800
Total Infiltration (m ³ /year)	189,800	304,500	494,300
Total Runoff (m ³ /year)	305,200	403,000	708,200

5.0 Geotechnical

The Geotechnical Report from DS Consultants can be found in Appendix E.

5.1 Background Conditions

A total of 31 boreholes (BH22-1 to BH22-21, BH25-4 to BH25-10 and BH25-13 to BH25-15) were drilled to depths ranging from 2.1 to 12.2 m below existing grade. The subsurface conditions encountered at the site generally consist of topsoil/fill materials underlain by silty clay to clayey silt (till) overlying shale bedrock. Localized sandy soil (silty sand till) was found in some boreholes. Groundwater levels were recorded on March 31, 2022, and April 1, 2025, at depths ranging from 1.0 to 7.2 m below the existing grade, corresponding to Elevations 221.2 to 233.1 m.

5.2 Slope Stability Toe Erosion Assessment and Long-Term Stable Slope Summary

Stability assessment of two slopes (West Slope associated with TWHRB-8, TWHRB-7 and north portion of TWHRB-6, and East Slope associated with TWHRA-6 and north portion of TWHRA-5) to define the long-term stable top of slope (LTSTOS) was conducted. A toe erosion allowance of 5 m is applied for slope toe consisting of very stiff

to hard silty clay till or shale bedrock to determine the setback of the long-term stable slope.

Based on the slope stability analysis results and the borehole information, it can be concluded that a 2H:1V slope with 5 m of long-term toe erosion allowance is stable in terms of long-term stability at the site.

6.0 Hydrology and Hydraulics

This section of the LSS presents the existing conditions hydrology and hydraulics characterization in support of the Innis Lake Secondary Plan. The full reports can be found in Appendix F. This section will establish the baseline hydrology of the Secondary Plan Area, set SWM targets, identify downstream Flood Vulnerable Areas (FVA) and establish the existing conditions regulatory floodline.

6.1 Hydrologic Study Area

The Secondary Plan Area is located within the upper reaches of the Humber River watershed and is identified as part of the West Humber subwatershed. The hydrologic modelling will account for the Secondary Plan Area, in addition to external drainage from tributary areas upstream of the site that flow through the Secondary Plan Area.

The hydrologic analysis will also include flow nodes downstream of the Secondary Plan Area to Clearville Dam, per discussions with TRCA (Dilnesaw Chekol, TRCA and Stephen Damogbe, DSEL, February 2026), to ensure no adverse effects to areas downstream of the study area.

6.1.1 Existing Drainage

The pre-development land use of the Secondary Plan Area is composed of agricultural lands, with wetlands and head-water features dispersed throughout the plan. There are three tributaries to the West Humber River that run north-south through the plan, segmenting the development area into three distinct parcels. Topography of the parcels have a general slope from north to south and are sloped toward the tributaries, with steeper grades associated with the valley slopes of the existing valleys.

LiDAR completed in 2019 was used to refine the pre-development drainage patterns from the Humber River Watershed Hydrology model, alongside topographic survey of the parcels at 12250 Centreville Creek and 12351 Innis Lake Road. Topographic surveys of the boundary roads were also completed, which generally shows that road drainage is collected by road-side ditches that are carried downstream to Mayfield Road.

Five catchments of the West Humber River subwatershed were refined to support the hydrologic modelling as follows:

Table 20: Catchment Drainage Area Updates

Catchment ID	Description	Existing Drainage Area	Revised Existing Drainage Area	Description of Change
36.07	Existing condition NasHyd catchment	229.02	240.9	Revised using updated LiDAR-based delineation; area change +1.88 ha (+5.2%).
36.08	Existing condition NasHyd catchment	79.33	77.94	Split into two revised NasHyd components and re-combined for reporting; area change -1.39 ha (-1.7%).
36.09	Existing condition NasHyd catchment	87.91	78.11	Split into two revised NasHyd components and re-combined for reporting; area change -9.80 ha (-11.1%).
36.10	Existing condition NasHyd catchment	339.8	352.78	Split into two revised NasHyd components and re-combined for reporting; area change +12.98 ha (+3.8%).
36.11	Existing condition NasHyd catchment	146.65	137.75	Split into four revised NasHyd components and re-combined for reporting; area change -8.90 ha (-6.1%).

In general, modifications to the existing drainage boundaries and catchment areas were minimal (<1.1%). Figure 4 shows the existing drainage pattern for the Secondary Plan Area.

Table 21: Existing Catchment Total Peak Flows (m³/2)

Catchment ID	36.07		36.08		36.09		36.10		36.11	
	6-hr	12-hr	6-hr	12-hr	6-hr	12-hr	6-hr	12-hr	6-hr	12-hr
Existing Drainage Area (ha)	229.02		79.33		87.91		339.8		146.65	
2 Year	0.129	0.183	0.112	0.147	0.089	0.119	0.219	0.309	0.105	0.147
5 Year	0.249	0.321	0.216	0.258	0.171	0.209	0.422	0.541	0.202	0.257
10 Year	2.986	3.21	2.286	2.223	1.889	1.896	MISSING	MISSING	2.332	2.435
25 Year	3.882	4.07	2.963	2.813	2.458	2.411	MISSING	MISSING	3.042	3.1
50 Year	4.569	4.72	3.48	3.255	2.894	2.799	MISSING	MISSING	3.588	3.602
100 Year	5.256	5.378	3.996	3.701	3.33	3.191	MISSING	MISSING	4.135	4.111
Regional	14.45	14.45	7.758	7.758	7.46	7.46	MISSING	MISSING	10.595	10.595

Table 22: Updated Catchment Area Total Peak Flows- Uncontrolled (m³/s)

Catchment ID	36.07		36.08		36.09		36.10		36.11	
	6-hr	12-hr	6-hr	12-hr	6-hr	12-hr	6-hr	12-hr	6-hr	12-hr
Updated Drainage Area (ha)	240.9		77.94		78.11		352.78		137.75	
2 Year	0.322	0.429	0.648	0.713	0.581	0.642	0.542	0.717	0.927	1.028
5 Year	0.553	0.678	1.112	1.137	1.003	1.035	0.928	1.13	1.622	1.67
10 Year	3.14	3.376	2.284	2.215	2.081	2.01	6.021	6.236	3.255	3.156
25 Year	4.083	4.281	2.959	2.797	2.715	2.565	7.827	7.913	4.256	4.032
50 Year	4.805	4.964	3.473	3.234	3.201	2.984	9.21	9.177	5.025	4.695
100 Year	5.528	5.656	3.984	3.675	3.689	3.408	10.595	10.457	5.798	5.369
Regional	15.2	15.2	7.809	7.809	7.489	7.489	26.219	26.219	12.562	12.562

Table 23: Existing Drainage Area vs. Updated Existing Drainage Area Flow Comparison

Catchment ID Area (+/-%)	36.07		36.08		36.09		36.10		36.11	
	6-hr	12-hr	6-hr	12-hr	6-hr	12-hr	6-hr	12-hr	6-hr	12-hr
	+5.2%		-1.7%		-11.1%		+3.8%		-6.1%	
2 Year	+149.6%	+134.4%	+478.6%	+385.0%	+552.8%	+439.5%	+147.5%	+132.0%	+782.9%	+599.3%
5 Year	+122.1%	+111.2%	+414.8%	+340.7%	+486.5%	+395.2%	+119.9%	+108.9%	+703.0%	+549.8%
10 Year	+5.2%	+5.2%	-0.1%	-0.4%	+10.2%	+6.0%	N/A	N/A	+39.6%	+29.6%
25 Year	+5.2%	+5.2%	-0.1%	-0.6%	+10.5%	+6.4%	N/A	N/A	+39.9%	+30.1%
50 Year	+5.2%	+5.2%	-0.2%	-0.6%	+10.6%	+6.6%	N/A	N/A	+40.1%	+30.3%
100 Year	+5.2%	+5.2%	-0.3%	-0.7%	+10.8%	+6.8%	N/A	N/A	+40.2%	+30.6%
Regional	+5.2%	+5.2%	+0.7%	+0.7%	+0.4%	+0.4%	N/A	N/A	+18.6%	+18.6%

The 2-year to 5-year flows are increased by over 100% in the updated existing conditions compared to the original TRCA model outputs. This is a result of updating the hydrologic catchment parameters and changing the StandHyd catchments into NasHyd catchments. The original modelling files from the TRCA did not contain the NASHYD 0560 from the 10-yr to Regional result file, hence why the 36.10 results are not available for comparison.

The updated flows for catchments 36.07, 36.08, and 36.09 did not result in significant changes compared to the TRCA model as the flows are generally within 10%. As such, there are no recommendations for downstream areas. Catchment 36.11 has flows increased up to 40% in the 100-yr storm and up to 18.6% for the Regional storm event. These increases to the Regional and 100-yr flows should be considered for any downstream flooding and FVA analysis.

There are seven culverts identified along Mayfield Road and Innis Lake Road, which are shown on Grading Drawing (Drawing 1). Additional surveys on Innis Lake Road and Centreville Creek Road will be needed to identify all culvert crossings. A review of existing undersized crossings was completed in Part A of the Scoped SWS (2022) for the SABE with respect to identifying backwater conditions during the Regional Storm event, and no undersized structures within the Secondary Plan area or downstream was identified.

It is understood that the Region will be widening Mayfield Road along the frontage of the Secondary Plan Area, from the existing rural 2-lane section to an urbanized 6-lane section, with accompanying storm sewers to collect and convey road drainage. The design is currently on-going with construction anticipated to begin in Spring 2027.

6.2 Desktop Assessment and Background Review

6.2.1 Reports

In preparation of the hydrologic and hydraulic assessment to establish the SWM strategy, the following reports, design guidelines, and standards have been reviewed and referenced:

- Development Standards Manual (Town of Caledon, 2019)
- Final Report Humber River Hydrology Update (Civica, 2018)
- Humber River Watershed Characterization Report (TRCA, 2023)
- Ministry of Environment (MOE) Stormwater Management Planning and Design Manual dated March 2003
- Region of Peel Settlement Area Boundary Expansion Study (SABE), (2022)
- Scoped SWS, Part A: Existing Conditions and Characterization (Final Report) Settlement Area Boundary Expansion, Region of Peel (Wood., 2022)

- Scoped SWS, Part B: Detailed Studies and Impact Assessment (Final Report), Settlement Area Boundary Expansion, Region of Peel, (Wood., 2022)
- Scoped SWS, Part C: Implementation Plan (Final Report), Settlement Area Boundary Expansion, Region of Peel (Wood., 2022)
- Stormwater Management Criteria, (TRCA, 2012)
- TRCA Low Impact Development Stormwater Management Planning and Design Guide, dated 2010 Version 1.0
- Thermal Impacts of Urbanization including Preventative and Mitigation Techniques (CVC, 2011)

6.2.2 Hydrology

The TRCA provided a calibrated hydrologic model of the Humber River Watershed, originally developed and validated in 2015 using monitored storm event data measured by flow-gauges distributed throughout the watershed. The model was subsequently updated in 2018 to incorporate future land use conditions as defined by the Official Plans of the Local and Regional municipalities. The TRCA hydrology update (Civica, 2018) confirmed that the 6 and 12-hour AES storms represent the critical design storms for flooding impacts. The Humber River Visual Otthymo Hydrologic Model, obtained from the TRCA in 2025, was used in the technical analysis.

The Scoped SWS (2022) for the SABE reviewed the 2018 Humber River Hydrology Update and noted that a continuous simulation was not completed as part of the study. Accordingly, it recommends that future studies incorporate continuous simulation for the hydrologic analyses to assess erosion (i.e., duration analysis) and water budget assessment using long-term meteorological datasets to evaluate impacts and the SWM plan.

Section 6.3 of this report will refine the catchment areas established by the TRCA as part of the 2018 Humber River Hydrology Report using LiDAR data and topographic survey information that was obtained for the Innis Lake Secondary Plan.

6.2.3 Hydraulics

Hydraulic analysis of open watercourses is typically conducted using a one dimensional or two-dimensional hydraulic model to establish the regulatory floodlines within an NHS system. In the West Humber watershed, the TRCA developed a HEC-RAS hydraulic model simulating the Regulatory event (greater of Regional storm of 100-year event). The existing Regulatory floodplain mapping, as approved by the TRCA, is provided in Appendix F. The Humber River Zone 2 HEC-RAS Hydraulic Model was obtained from the TRCA in 2025.

The floodline mapping through the SABE (2022) is categorized as engineered and estimated. Engineered floodlines are developed using engineered hydraulic models that

use detailed data collection for channel / floodplain geometry and includes hydraulic structures, such as culverts and bridges. In comparison, the estimated floodlines are developed using simplified hydraulic models based on basic channel topography and does not include hydraulic structures. Where estimated, the floodplain mapping is required to be confirmed based on detailed topographic survey and fluvial review to confirm it meets minimum drainage requirements (e.g., 50 ha) and meets the definition for a watercourse per the Conservation Authorities Act (O. Reg. 41/24).

The hydraulic model was updated to establish preliminary floodlines and define development limits.

6.3 Updated Hydrologic and Hydraulic Models

As discussed in Section 6.2, existing hydrologic and hydraulic modeling were provided by TRCA for the West Humber Watershed. This section discusses updates to the hydrologic and hydraulic modeling as a result of the detailed investigations completed as part of this report.

6.3.1 Existing Hydrologics

Catchment areas within the West Humber River subwatershed were adjusted based off the LiDAR and topographic survey collected for the study area. Current land use was verified in the TRCA model based off aerial photography. The Runoff Coefficient was updated according to the identified land use. Other hydrologic parameters for the catchments in the site were determined with reference to the TRCA and Town of Caledon guidelines.

Based on the above, the hydrologic parameters for the pre-development conditions were determined and summarized in Table 24 below.

Table 24: Pre-Development Hydrologic Parameters

Catchment Description	36.07				36.08	36.09	36.10	36.11
	Drainage Area (Ha)	240.9	77.94	78.11	352.78	137.75		
Total Imperviousness (%)	N/A - NasHyd	N/A - NasHyd	N/A - NasHyd	N/A - NasHyd	N/A - NasHyd			
Curve Number	91.1	92.3	91.3	91.3	90.6			
Initial Abstraction (mm)	10.0	10.0	10.0	10.0	10.0			
Time to Peak (hrs)	6.66	2.66	3.71	5.86	5.15			

6.3.2 Existing Hydraulics

Channel and crossing geometry within the study area were refined using site-specific topographic survey data collected at 12250 Centreville Creek and 12351 Innis Lake Road, with LiDAR data applied to characterize the remaining portions of the Study Area. Manning’s roughness coefficients were reviewed and adjusted as appropriate. The updated channel geometry was cross-checked against the TRCA hydraulic model for the reach south of Mayfield Road to confirm consistency at the downstream tie-in location. Updated peak flows from the VO model were incorporated into the West Humber River HEC-RAS model to refine the existing Regional Storm floodplain elevations through the Secondary Plan Area. The summary of the updated HEC-RAS reaches is shown in Table 1 of the Hydraulic Memo included in Appendix F.

Based on this analysis, design water levels under existing conditions were established and incorporated into the development limit constraint mapping and overall design of the site. No updates to the downstream flood elevations are required, as the peak flows at the downstream nodes generally match existing conditions. Additional details of the floodplain assessment, including the refined digital HEC-RAS model is provided in Appendix F. The updated Regional floodplain has also been provided in Appendix F.

6.4 Stormwater Management Criteria

A summary of the stormwater runoff criteria that consider the design criteria above and agency guidelines noted under Section 6.2.1 are provided below in Table 25:

Table 25: Stormwater Runoff Criteria

Criteria	Control Measure	Agency
Quantity Control	<ul style="list-style-type: none"> Control post-development peak flow rates per unit flow Equation F Sub-Basin 36, per Table E.1 of TRCA’s Stormwater Management Criteria. Regional Storm controls are required to mitigate increases to peak flows downstream, particularly at FVAs. 	<ul style="list-style-type: none"> TRCA, Town TRCA
Quality Control	<ul style="list-style-type: none"> MECP Enhanced Level Protection (80% TSS Removal) 	<ul style="list-style-type: none"> TRCA, Town
Erosion Control	<ul style="list-style-type: none"> Minimum 5 mm on-site retention Attenuation of the 25 mm rainfall runoff for a minimum of 48 hours 	<ul style="list-style-type: none"> TRCA TRCA, Town

Quantity Control

SWM criteria have been established in accordance with the design guidelines and standards outlined in Section 6.2.1, as well as through consultation with relevant agencies. Based on discussions with the Toronto and Region Conservation Authority (Dilnesaw Chekol, TRCA and Kenny Sun, DSEL, August 2024), the 2-year through 100-year unit flow target release rates are derived using Equation F (Sub-Basin 36) for the West Humber River in accordance with TRCA SWM Criteria. These rates are provided in Attachment 1 of Appendix F.

As noted in Section 6.3.2, the VO model was updated to reflect the latest drainage patterns and hydrologic parameters from observed conditions. Pre-development peak flows for the Regional Storm event (Hurricane Hazel) were extracted for each catchment under existing conditions. The total existing conditions catchment peak flow was divided by the total catchment area to get a quantity control target unit rate, which is provided in Attachment 1 of Appendix F.

In addition, quantity control requirements have been established to ensure no increases in peak flows at downstream FVAs. The pre-development Regional Storm peak flows at nodes downstream of the Secondary Plan Area, including the FVAs, are used to confirm that the SWM strategy mitigates any increases to peak flows to the downstream nodes. Please refer to Appendix F for node locations, pre-development peak flows, and a digital link to the hydrologic modeling files. Table 26 summarizes the unitary target release rates for each catchment area.

Table 26: Unit Target Release Rates by Catchment

Catchment	Area	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	Regional
36.07	229.02	5.60	8.48	10.50	13.18	15.25	17.33	63.09
36.08	79.33	6.36	9.68	11.95	15.02	17.46	19.78	97.82
36.09	87.91	6.29	9.57	11.81	14.85	17.25	19.54	84.86
36.10	339.80	5.32	8.03	9.95	12.49	14.43	16.41	67.89
36.11	146.65	5.92	8.99	11.11	13.95	16.18	18.36	72.28

Quality Control

In accordance with TRCA’s Stormwater Management Criteria (2012), watercourses and water bodies within TRCA jurisdiction are classified as requiring an Enhanced level of water quality protection, corresponding to 80% total suspended solids (TSS) removal, as defined by MECP.

Similarly, the Town of Caledon 2019 Development Standards Manual requires that all new SWM facilities be designed to achieve this Enhanced level of protection.

Erosion Control

As outlined in TRCAs Stormwater Management Criteria (2012), all sites are required to retain the first 5 mm of runoff from each rainfall event to mitigate erosion impacts.

Where SWM ponds are proposed, extended detention of the 25 mm rainfall event over a minimum 48-hour period is required, in accordance with both TRCA criteria and the Town of Caledon's 2019 Development Standards Manual.

6.5 Flood Vulnerable Areas

The Scoped SWS (2022) for the SABE identified four FVAs within their study area, as mapped and defined by TRCA. One FVA is located downstream of the Hydrologic Study Area: the Main Humber River FVA at the confluence with the West Humber River, within the City of Toronto.

As part of the existing conditions catchment refinements, the peak flow changes from 0.00 m³/s to -0.037 m³/s (0.01% change) at the downstream FVA node ADDHYD 0770 for the 10-yr to 100-yr AES event. The Regional storm event outputs from the VO model did not have numerical outputs so a comparison is not available; further discussion can be found in the Hydrology memo provided in Appendix F. The changes to peak flows are not anticipated to have significant impacts on downstream floodline elevations or conveyance structures. Therefore, downstream floodline updates are not warranted and impacts to the downstream flood vulnerable area are negligible.

It has been considered in the SWM design that the Scoped SWS (2022) for the SABE acknowledges that timing effects may be unfavorable for traditional SWM and that this may lead to increases in peak flows downstream due to lagged release of outflows.

7.0 Baseline Surface Water Monitoring

7.1 Water Quantity

7.1.1 Methodology

Eleven surface water quality and quantity sampling locations (i.e., WH1 to WH11) were established during spring 2025 in the Phase 1 subject properties. A map of all monitoring locations is provided in Appendix G1. Water quantity monitoring activities were completed for a full monitoring season from April 1, 2025, to November 30, 2025, at sites WH1 to WH9. Monitoring at sites WH10 and WH11 was initiated on April 24, 2025, and continued for the duration of the monitoring period. Monitoring activities at each location included the following:

- Continuous water level and temperature monitoring at 15-minute intervals using pressure transducers installed at the stream bed, with an additional atmospheric sensor installed nearby to measure air temperature and barometric pressure.
- Discrete ADV readings along established cross-sections to develop a stage discharge curve.
- Monumented photographs of all sampling activities to verify location and timing.

7.1.2 Results

Water level and discrete discharge measurements were collected to characterize baseline conditions and better understand stream response to various precipitation events throughout the year. Baseflow is the component of streamflow derived from natural storage sources and does not include direct runoff from precipitation. There must not be any evidence in the stage discharge hydrograph of any recent storm events when considering baseflow. Water level responses depend on the magnitude of the rainfall and antecedent conditions. Minimum and maximum water levels for each month of the monitoring season for 2025 are summarized below in Table 27.

Table 27: Minimum and Maximum Water Levels at Each Monitoring Location

Site		Water Level (m)	
		Minimum	Maximum
Tributary A East Branch	WH1	0.09	0.84
	WH2	0.00	0.34
Tributary A	WH3	0.19	1.14
	WH4	0.00	0.40
	WH5	0.00	0.90
	WH11	0.00	0.19
Tributary B	WH6	0.40	1.12
	WH7	0.00	0.19
	WH8	0.00	0.09
	WH9	0.00	0.88
	WH10	0.00	0.24

In 2025, maximum water levels were observed during the spring rain event on April 3 and 4, following 68.6 mm of precipitation over 48 hours. It is important to note that sites WH10 and WH11 were installed on April 24, 2025, and as such, their maximum water levels were observed on May 22, 2025, following 26.6 mm of precipitation in 48 hours. Refer to Appendix G2 for further details related to water levels at each monitoring location in 2025.

Due to the majority of sites being dry between precipitation events, only two discrete discharge measurements measured using the ADV were collected for the 2025

monitoring season. Further measurements will be taken in the 2026 monitoring season to provide more data to support the development stage discharge curve.

7.2 Water Quality

7.2.1 Methodology

The surface water quality sampling program is event-based, capturing at least one wet event (> 10 mm of rain in 24 hours) and one dry event (48 hours with no precipitation) seasonally (spring, summer, fall). During wet weather sampling, two samples are collected. The first is collected during the ascending limb, and the second is collected during the receding limb of the hydrograph. The grab sampling method is utilized to collect both the ascending and receding limb samples. Water quality sampling activities at all locations included the following:

- Laboratory-analyzed measurement of the following parameters during each event:
 - Ammonia
 - Anions (Nitrate, Nitrite, Phosphate, Chloride)
 - BOD₅ (Biochemical Oxygen Demand)
 - Metals (Al, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, P, K, Se, Si, Ag, Na, Sr, Tl, Sn, Ti, W, U, V, Zn, Zr)
 - PAH (Polycyclic Aromatic Hydrocarbons)
 - pH / Alkalinity
 - Total Kjeldahl Nitrogen (TKN)
 - Total Phosphorus
 - Total Suspended Solids (TSS)
- In situ measurement of the following parameters during each event:
 - Temperature
 - Turbidity
 - Dissolved Oxygen
 - Conductivity
- Monumented photographs of all sampling activities to verify location and timing.

In addition, at the onset of the 2025 monitoring season, a GEO Morphix weather station was installed approximately 2.2 km east of the study area measuring from the center of the subject site. During the 2025 monitoring period (April 1 to November 30), precipitation was recorded on 91 of 263 monitoring days, and there were 13 occurrences of daily rainfall ≥ 10 mm. A summary of water quality sampling events is presented in Table 28.

Table 28: 2025 Wet and Dry Event Sampling Conditions

Event	Sampling Date and Time (yyyy-mm-dd hh:mm)	Event Type		Prior 24-Hour Rainfall (mm)	Sampling Days Rainfall (mm)	Total Event Rainfall (mm)
1	2025-05-22 09:15	Rain	Ascending Limb	13.0	15.0	28.0
	2025-05-23 08:56		Receding Limb			
2	2025-05-28 09:13	Dry		0.0	4.2*	4.2*
3	2025-07-23 09:21	Dry		0.0	0.0	0.0
4	2025-08-19 13:19	Rain	Ascending Limb	0.0	27.2	27.2
	2025-08-20 09:07		Receding Limb			
5	2025-10-30 14:00	Rain	Ascending Limb	0.0	15.6	15.6
	2025-10-31 10:12		Receding Limb			
6	2025-11-18 09:18	Dry		0.0	0.0	0.0

*Precipitation began following dry event sampling

7.2.2 Laboratory Results

All sampled parameters were compared to Provincial Water Quality Objective guidelines, where applicable, to provide additional information. Notably, numerous monitoring locations were dry throughout the monitoring season, with WH8 being dry during all sampling events. As such, exceedances discussed below are representative of sites where water was present.

In 2025, aluminum, copper, and iron were measured to be in exceedances of the PWQO at all monitoring sites during multiple sampling events. Exceedances of cobalt were noted during one or more sampling events at sites WH1, WH3, WH4, WH6, WH10, and WH11. Additionally, arsenic was measured in exceedance during one or more sampling events at sites WH1, WH3, WH4, WH6, and WH10. Lead was also noted to be in exceedance during one or more sampling events at sites WH3, WH4, WH6, and WH10. Lastly, sampling parameters that were only observed to be in exceedance at one location include boron at site WH10, and cadmium and zinc at site WH6. A full summary of exceedances observed in 2025 monitoring and the full record of lab analysis is provided in Appendix G4.

All parameters measured in exceedance of the PWQO during 2025 sampling efforts are primarily metals, apart from arsenic and boron, which are metalloids. The principle

surrounding land use is composed of agricultural fields, as such the exceeding metals and metalloids are likely sourced from agricultural applications (manure/fertilizers, pesticides, etc.). Additionally, given the high traffic in the area a likely source of heavy metals could also be airborne urban road dust. Urban road dust consists of small particles most commonly created from wear on vehicle parts (Hwang et al., 2016), including farm equipment. Lastly, exceedances may also be a baseline characteristic of the system as some parameters are naturally occurring in soil and rocks. Overall, the results presented are representative of baseline conditions. Water quality sampling will continue in 2026 for comparative analysis.

7.2.3 In-Situ Results

Total Suspended Solids and Turbidity

Total suspended solids and turbidity measure the concentration of organic and inorganic matter in suspension and relate to the lack of clarity or transparency of water. Suspended matter consists of silt, clay, fine particles of organic and inorganic matter, soluble organic compounds, plankton, and other microscopic organisms. The higher the concentration of these substances in water, the more turbid the water becomes. Environmental samples vary within the normal range of 1 to 1000 NTUs (CCME, 2002). TSS and turbidity will differ from watercourse to watercourse, depending on flow conditions and time of year. TSS and turbidity measurements taken at each sampling location during water quality monitoring events in 2025 are summarized in Table 29 and Table 30. Accredited laboratory results are included in Appendix G2 for reference.

Table 29: Total Suspended Solids Measurements During Sampling Events

Event	Total Suspended Solids (mg/L)										
	Tributary A East Branch		Tributary A				Tributary B				
	WH1	WH2	WH3	WH4	WH5	WH11	WH6	WH7	WH8	WH9	WH10
<i>2025 Rain Events</i>											
1 (AL)	38.5	34.5	17.0	33.0	22.3	21.7	22.0	21.0	Dry	33.0	N/A
1 (RL)	19.5	20.3	19.3	35.0	24.7	18.5	6.3	11.3	Dry	7.0	8.0
4 (AL)	151.0	Dry	17.3	Dry	Dry	Dry	7.0	Dry	Dry	Dry	Dry
4 (RL)	11.5	Dry	10.3	Dry	Dry	Dry	15.0	Dry	Dry	16.0	Dry
5 (AL)	17.7	Dry	6.0	Dry	Dry	Dry	15.7	Dry	Dry	1.7	Dry
5 (RL)	37.0	Dry	16.0	Dry	Dry	Dry	55.0	Dry	Dry	19.3	13.7
<i>2025 Dry Events</i>											
2	18.3	Dry	16.7	N/A	5.3	4.3	195.0	Dry	Dry	14.7	11.7
3	146.0	Dry	16.3	Dry	Dry	Dry	26.7	Dry	Dry	14.0	Dry
6	25.3	Dry	8.3	Dry	12.0	Dry	5.0	Dry	Dry	45.0	38.5

AL – Ascending Limb of Rain Event

RL – Receding Limb of Rain Event

Table 30: Turbidity Measurements During Sampling Events

Event	Turbidity (NTU)										
	Tributary A East Branch		Tributary A				Tributary B				
	WH1	WH2	WH3	WH4	WH5	WH11	WH6	WH7	WH8	WH9	WH10
<i>2025 Rain Events</i>											
1 (AL)	36.9	28.1	31.8	46.1	31.8	38.4	21.5	43.4	Dry	23.2	18.9
1 (RL)	33.0	20.3	28.6	40.7	33.2	34.8	16.8	17.8	Dry	11.1	15.1
4 (AL)	135.8	Dry	11.6	Dry	Dry	Dry	11.9	Dry	Dry	Dry	Dry
4 (RL)	9.4	Dry	6.8	Dry	Dry	Dry	30.2	Dry	Dry	9.4	Dry
5 (AL)	18.2	Dry	4.8	Dry	Dry	Dry	26.6	Dry	Dry	1.3	Dry
5 (RL)	53.8	Dry	28.0	Dry	8.8	Dry	OR	Dry	Dry	15.9	5.8
<i>2025 Dry Events</i>											
2	3.0	Dry	3.1	36.5	2.4	5.3	4.8	Dry	Dry	6.6	6.3
3	56.5	Dry	17.3	Dry	Dry	Dry	5.7	Dry	Dry	6.8	Dry
6	7.1	Dry	6.4	Dry	1.8	Dry	3.9	Dry	Dry	3.8	4.3

AL – Ascending Limb of Rain Event

RL – Receding Limb of Rain Event

Overall, during the spring, summer, and fall sampling events, TSS and turbidity values were greater during the seasonal rain event compared to the dry event. This is anticipated, as during the ascending and peak flows, the watercourse will have additional capacity to transport sediment, thus increasing TSS/turbidity. During dry events, sites likely have reduced flow rates, allowing for suspended sediment to fall out of suspension and deposit back onto the bed. Refer to Appendix G for a detailed description of total suspended solids and turbidity across stations.

Water Temperature

Temperature plays a significant role in influencing aquatic life and chemical interactions within aquatic environments. An aquatic organism’s temperature tolerance differs based on various factors, including species, age, acclimation range, exposure to toxic substances, and season. Changes in temperature also influence the solubility and reaction equilibria of many chemicals, including dissolved oxygen. Temperatures measured at each sampling location during water quality monitoring events are summarized in Table 31.

Table 31: Average and Maximum Water Temperature Per Sampling Locations

Site		Water Temperature (°C)	
		Summer Average ¹	Maximum
Tributary A East Branch	WH1	18.0	26.8
	WH2*	Dry	15.9
Tributary A	WH3	17.2	21.3
	WH4*	19.9	23.3
	WH5*	Dry	22.7
	WH11	Dry	18.0
Tributary B	WH6	19.0	22.8
	WH7*	Dry	12.1
	WH8*	Dry	
	WH9	21.4	35.3
	WH10*	Dry	22.5

¹Summer average July and August 2025

*Site observed dry periodically throughout the monitoring period

Water temperatures were only included in the analysis if there was greater than 0.05 m of water present within the channel. Water levels below 0.05 m can result in ambient air temperature being recorded. As noted above, sites WH2, WH4, WH5, WH7, WH8, WH10 and WH11 were periodically dry during the summer and fall months.

Water temperatures generally follow diurnal fluctuations in air temperature, with more gradual variations observed in locations with deeper channels and increased canopy

coverage. Sites WH3 and WH6 are located next to concrete box culverts at the downstream extents of Tributary A and Tributary B, respectively, and are generally shaded by riparian vegetation. Sites WH1, WH2, WH4, WH7, WH8, and WH10 are generally grassy swales with minimal canopy cover. Lastly, WH5 and WH9 are located in narrow riparian corridors between agricultural fields, however, there are scattered trees that provide intermittent shade.

A thermal stream classification (based on Chu et al., 2009) was performed by comparing continuous water temperatures and air temperatures in July and August of 2025. The associated nomograms correlate the daily maximum air temperature to the maximum daily water temperature measured between 4:00 pm and 6:00 pm. Maximum daily water temperatures are only considered for this analysis if they follow three consecutive days with no rainfall and maximum air temperatures are above 24.5 °C (Chu et al., 2009). This technique categorizes the thermal regime of the channel based on nomograms defined by Stoneman and Jones (1996).

In 2025, there were six days in July and eight days in August that met the above requirements for thermal classification. Figure 10, **Error! Reference source not found.** and **Error! Reference source not found.** compare the thermal classification for the Tributary A East Branch, Tributary A, and Tributary B, respectively. Site WH2 was also dry in both July and August and was therefore not included in the thermal classification of Tributary A East Branch. Sites WH4, WH5 and WH11 were dry in July and August and was therefore not included in the thermal classification of Tributary A. Sites WH7, WH8 and WH10 were dry in July and August and was therefore not included in the thermal classification of Tributary B. Site WH9 was also dry in August and therefore only dates in July were considered in the thermal classification of Tributary B.

Figure 10: 2025 Thermal Classification of Tributary A East Branch at WH1

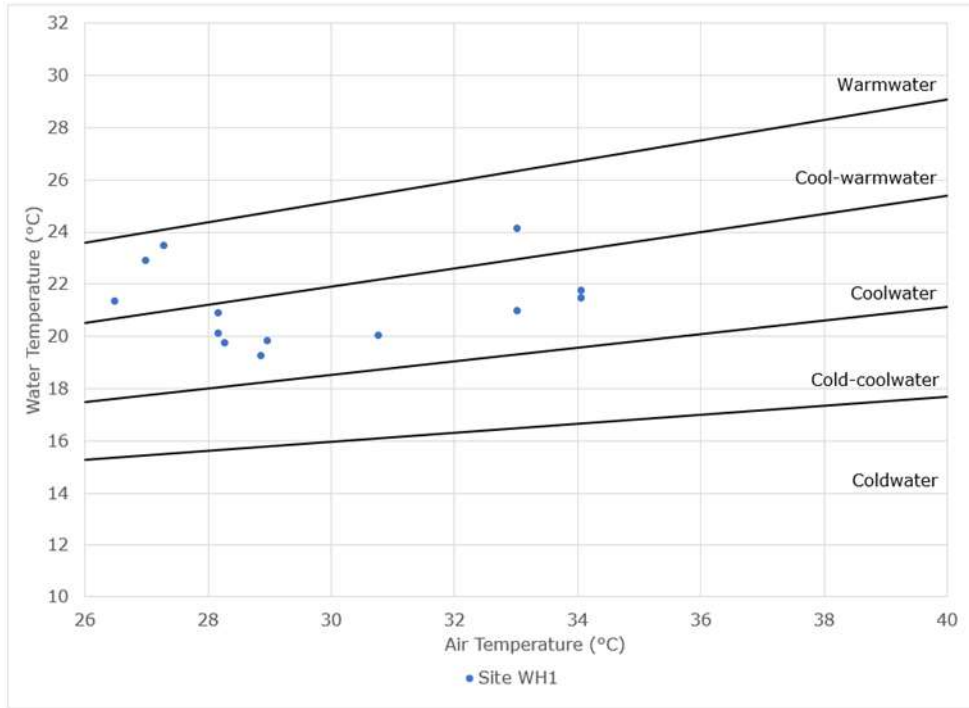


Figure 11: 2025 Thermal Classification of Tributary A at WH3

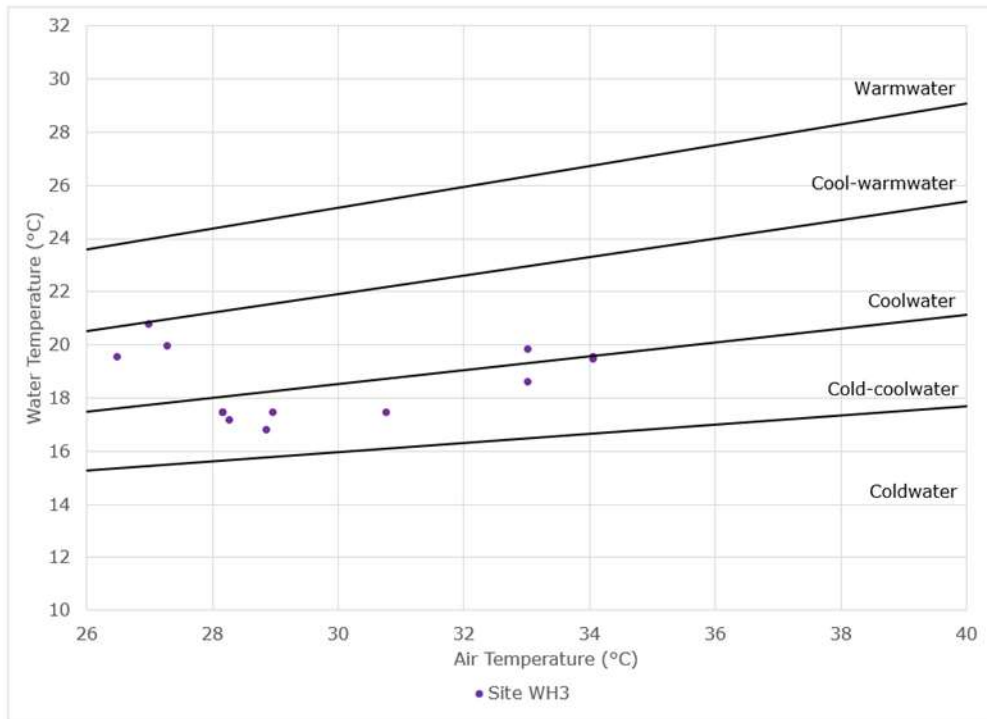
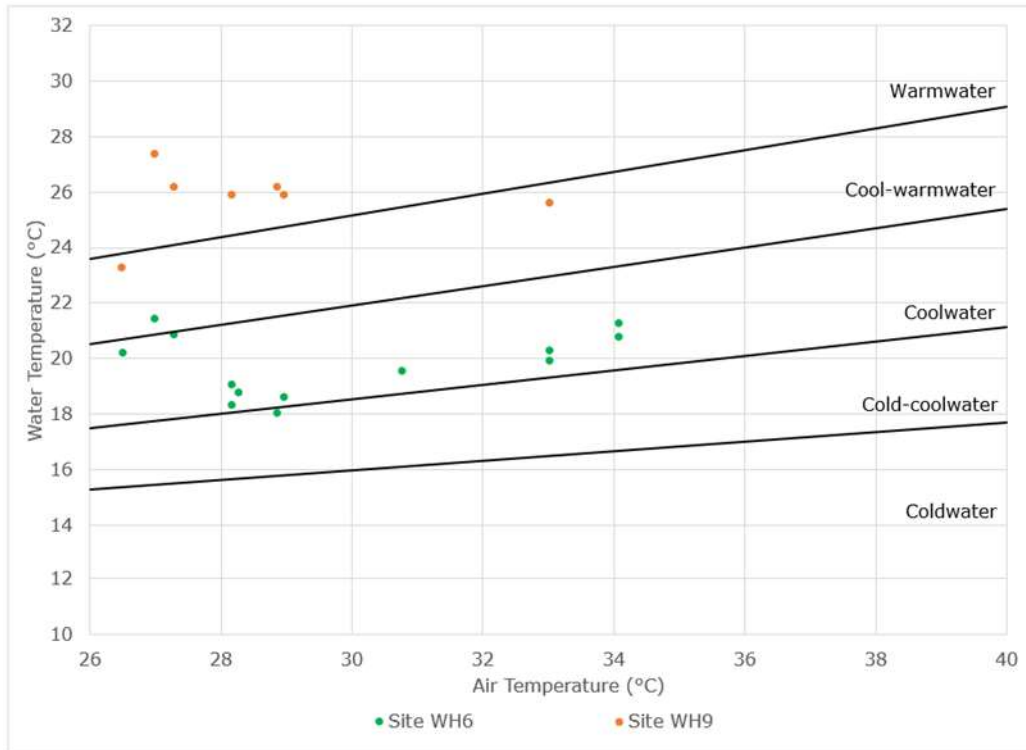


Figure 12: 2025 Thermal Classification of Tributary B at WH6 and WH9



Along Tributary A East Branch, the maximum water recorded temperature was 26.8°C, and the summer average temperature was measured to be 18.0°C. These measurements were collected at site WH1, as site WH2 was periodically dry. As such, the thermal classifications along Tributary A East Branch at site WH1 ranged from coolwater to cool warmwater. Along Tributary A, maximum water temperature was 23.3°C, and the summer average temperature ranged from 17.2 to 19.9°C. The thermal regime was classified as cold-coolwater to coldwater. Lastly, along Tributary B, maximum water temperature was 35.3°C, and the summer average water temperature ranged from 19.0 to 21.4°C. The thermal classification along Tributary B ranged from coolwater to warmwater; with site WH6, located at the downstream extent of the Tributary, having a cooler thermal regime than site WH9, which is located at the upstream extent of the reach. Complete continuous temperature data and discrete measurements are provided in Appendix G2.

Dissolved Oxygen

Dissolved oxygen is a fundamental parameter for aquatic life. Oxygen solubility is governed by atmospheric and hydrostatic pressure, turbulence, temperature, salinity, and biological processes. The lowest acceptable dissolved oxygen concentration for aquatic life is between 5.5 mg/L and 6.0 mg/L for warm water streams, and between 6.5 mg/L and 9.5 mg/L for cold water streams, depending on the aquatic organism’s life stage and the stream’s thermal classification (CCME, 1999). Dissolved oxygen

concentration measurements at each sampling location during water quality monitoring events from 2025 are summarized in Table 32 and Table 33.

Table 32: Dissolved Oxygen (mg/L) Measurements During Sampling Events

Event	Dissolved Oxygen (mg/L)										
	Tributary A East Branch		Tributary A				Tributary B				
	WH1	WH2	WH3	WH4	WH5	WH11	WH6	WH7	WH8	WH9	WH10
2025 Rain Events											
1 (AL)	9.15	5.38	9.05	8.49	9.90	10.40	9.27	8.51	Dry	9.97	9.55
1 (RL)	8.75	5.58	9.50	8.69	10.08	10.46	9.66	9.63	Dry	10.39	9.54
4 (AL)	6.49	Dry	2.43	Dry	Dry	Dry	2.06	Dry	Dry	Dry	Dry
4 (RL)	8.37	Dry	8.62	Dry	Dry	Dry	7.71	Dry	Dry	8.04	Dry
5 (AL)	9.22	Dry	10.29	Dry	Dry	Dry	3.73	Dry	Dry	10.36	Dry
5 (RL)	6.45	Dry	11.14	Dry	8.72	Dry	8.91	Dry	Dry	6.40	8.47
2025 Dry Events											
2	7.02	Dry	9.75	9.75	12.06	9.47	7.57	Dry	Dry	10.53	8.36
3	3.19	Dry	10.66	Dry	Dry	Dry	0.95	Dry	Dry	0.81	Dry
6	5.78	Dry	9.32	Dry	9.37	Dry	3.80	Dry	Dry	10.63	8.74

AL – Ascending Limb of Rain Event

RL – Receding Limb of Rain Event

Table 33: Dissolved Oxygen (%) Measurements During Sampling Events

Event	Dissolved Oxygen (%)										
	Tributary A East Branch		Tributary A				Tributary B				
	WH1	WH2	WH3	WH4	WH5	WH11	WH6	WH7	WH8	WH9	WH10
2025 Rain Events											
1 (AL)	81.3	49.2	80.1	76.6	88.7	91.1	83.0	76.1	Dry	87.8	83.8
1 (RL)	78.5	52.1	84.6	81.3	91.2	92.8	85.5	78.6	Dry	92.1	85.1
4 (AL)	67.1	Dry	28.2	Dry	Dry	Dry	22.5	Dry	Dry	Dry	Dry
4 (RL)	93.6	Dry	98.5	Dry	Dry	Dry	85.1	Dry	Dry	90.0	Dry
5 (AL)	76.4	Dry	86.7	Dry	Dry	Dry	32.3	Dry	Dry	90.1	Dry
5 (RL)	53.2	Dry	92.7	Dry	71.4	Dry	73.2	Dry	Dry	52.7	68.3
2025 Dry Events											
2	66.8	Dry	91.3	7.50	116.6	84.3	71.3	Dry	Dry	101.4	78.5
3	32.3	Dry	114.3	Dry	Dry	Dry	9.7	Dry	Dry	8.3	Dry
6	53.2	Dry	71.8	Dry	71.5	Dry	28.8	Dry	Dry	78.9	63.5

AL – Ascending Limb of Rain Event

RL – Receding Limb of Rain Event

Dissolved oxygen concentrations in 2025 along Tributary A East Branch ranged from 3.19 to 9.22 mg/L during wet and dry event sampling, with an average concentration of 6.85 mg/L. Along Tributary A, dissolved oxygen concentrations ranged from 2.43 to 12.06 mg/L, with an average concentration of 9.4 mg/L across all sampling events. Lastly, Tributary B had dissolved oxygen concentrations ranging from 0.81 to 10.63 mg/L, with an average concentration of 7.65 mg/L. Across all monitoring sites, average dissolved oxygen concentrations were above the lowest acceptable concentration to support aquatic life. Additionally, maximum dissolved oxygen concentrations were generally observed during the spring or fall sampling events, whereas minimum values were measured during the warm summer months. As dissolved oxygen and temperature have an inverse relationship, where the capacity for water to dissolve oxygen is lower when water temperatures increase, lower DO concentrations are expected during these periods. Appendix G2 provides a complete record of discrete water quality measurements.

Conductivity

Conductivity is useful as a general measure of stream water quality. Conductivity measures the ability for electrical current to pass through water and provides an estimate of water salinity. Each stream tends to have a relatively constant range of conductivity that, once established, can be used as a baseline for comparison with regular conductivity measurements. Mid-range conductivity (50 to 1500 µS) is the normal background for most major rivers. Conductivity outside this range could indicate that the water is not suitable for certain species of aquatic organisms (Mathur, 2015). Higher conductivity (1500 to 10,000 µS) may be due to increased discharge from precipitation or sources of pollution entering a stream (Mathur, 2015). In Southern Ontario, road salting during the winter results in a significant source of salt that can drain into watercourses and increase conductivity observed during spring flows. Conductivity measurements at each sampling location during water quality monitoring events are summarized in Table 34.

Table 34: Conductivity Measurements During Water Quality Sampling Events

Event	Conductivity (µS)										
	Tributary A East Branch		Tributary A				Tributary B				
	WH1	WH2	WH3	WH4	WH5	WH11	WH6	WH7	WH8	WH9	WH10
2025 Rain Events											
1 (AL)	936	551	986	957	979	868	554	294	Dry	496	492
1 (RL)	924	716	935	974	1083	932	752	484	Dry	899	771
4 (AL)	474	Dry	8628	Dry	Dry	Dry	1366	Dry	Dry	Dry	Dry
4 (RL)	1016	Dry	9313	Dry	Dry	Dry	972	Dry	Dry	1225	Dry
5 (AL)	571	Dry	6171	Dry	Dry	Dry	1171	Dry	Dry	457	Dry
5 (RL)	978	Dry	2177	Dry	1274	Dry	645	Dry	Dry	399	917

Event	Conductivity (µs)										
	Tributary A East Branch		Tributary A				Tributary B				
	WH1	WH2	WH3	WH4	WH5	WH11	WH6	WH7	WH8	WH9	WH10
2025 Dry Events											
2	3106	Dry	1048	1292	1208	945	958	Dry	Dry	546	953
3	704	Dry	7412	Dry	Dry	Dry	890	Dry	Dry	1255	Dry
6	1041	Dry	3615	Dry	1221	Dry	722	Dry	Dry	383	648

AL – Ascending Limb of Rain Event

RL – Receding Limb of Rain Event

Conductivity measured during wet and dry event sampling ranged from 474 to 3106 µs along Tributary A East Branch, 868 to 9313 µs along Tributary A, and 294 to 1366 µs along Tributary B. Average conductivity along Tributary A East Branch was 1001 µs and within the mid-range. Average conductivity along Tributary A was 2601 µs and within the higher-range conductivity. Lastly, average conductivity along Tributary B was 760 µs and within the mid-range. Maximum conductivity measurements were generally observed at site WH3. This may be attributed to its proximity to Mayfield Road, and increased inputs of stormwater and road salts. Conductivity will continue to be monitored in 2026 to characterize baseline water quality. A complete record of discrete water quality measurements is provided in Appendix G2.

8.0 Fluvial Geomorphology

8.1 Reach Delineation

Reaches are homogeneous segments of channel used in geomorphological investigations. Reaches are studied semi-independently as each is expected to function in a manner that is at least slightly different from adjoining reaches. This method allows for a meaningful characterization of a watercourse as the aggregate of reaches, or an understanding of a reach, for example, as it relates to a proposed activity. Reaches are typically delineated based on changes in the following:

- Channel planform
- Channel gradient
- Physiography
- Land cover (land use or vegetation)
- Flow, due to tributary inputs
- Soil type and surficial geology
- Historical channel modifications

This follows scientifically defensible methodology proposed by Montgomery and Buffington (1997), Richards et al. (1997), and the TRCA (2004). Reaches are first delineated as a desktop exercise using available data and information such as aerial

photography, topographic maps, geology information and physiography maps. The results are then verified in the field.

Reaches within the subject lands were previously delineated at a high-level of assessment as part of the SWS prepared by Wood (2022) via a desktop review and windshield survey. Reaches were further refined by GEO Morphix through additional desktop studies and field work. Reaches delineated solely based on a desktop assessment where field access was not possible are subject to refinement when permission to access is granted. Watercourse reach delineation is graphically presented in Appendix H1.

8.2 Reach Observations

Field investigations were completed on May 15 and 16, 2025, and September 18, 2025, within the Phase 1 lands. Right-of-way (ROW) observations were largely completed on March 13, 2026. The following observations were completed on a reach-by-reach basis, where possible:

- Descriptions of riparian conditions
- Estimates of bankfull channel dimensions
- Determination of bed and bank material composition and structure
- Confirmation of valley form (i.e., unconfined, partially confined, confined)
- Observations of erosion, scour, or deposition
- Collection of photographs to document watercourses, riparian areas, adjacent land use, and channel disturbances such as crossing structures

These observations and measurements are summarized in Table 35. Field descriptions are supplemented and supported with representative photographs included in Appendix H3. Field sheets, including those completed for reach characterization and rapid assessments, are also provided in Appendix H4.

Reaches TWHRA-3e and TWHRB-5b are currently mapped as HDFs in Appendix H1. Reach TWHRA-3e is summarized in this report based on observations collected by GEO Morphix Ltd in September 2025 following permission to enter the property. Reach TWHRB-5b is being reviewed in consultation with the TRCA. It is currently mapped as an HDF and is subject to additional field work in 2026. For detailed descriptions of each reach, refer to Appendix H of this Report.

Table 35: General Reach Characteristics

Reach Name	Avg. Bankfull Width (m)	Avg. Bankfull Depth (m)	Bed Substrate	Bank Materials	Valley Type	Dominant Riparian Conditions	Notes
Tributary A East Branch							
1TWHRA-3b	2.53	0.45	Clay/silt to gravel in riffles; clay/silt in pools	Clay/silt	Confined	Wide riparian buffer consisting of grasses and herbaceous vegetation	Wide valley bottom with wetland properties/ vegetation; low sinuosity
1TWHRA-3b-1	1.65	0.22	Clay/silt to boulders in riffles; clay/silt in pools	Clay/silt	Unconfined	Narrow riparian buffer of grasses and mature trees	Confluence of multiple roadside ditches; moderate entrenchment in the ROW due to high left bank
TWHRA-3d	1.87	0.45	Clay/silt		Confined	Moderate riparian buffer consisting of grasses and trees	Well-defined channel with no riffle and pool morphology; 0.12 m knickpoint at the upstream reach break
1TWHRA-3e*	1.03	0.18	Clay/silt		Confined	Moderate buffer of grasses and herbaceous vegetation; riparian corridor as lined with trees	Low-definition swale; extreme encroachment of riparian vegetation; dry at the time of assessment

Innis Lake Local Subwatershed Study - Part A Existing Conditions
May 2026

Reach Name	Avg. Bankfull Width (m)	Avg. Bankfull Depth (m)	Bed Substrate	Bank Materials	Valley Type	Dominant Riparian Conditions	Notes
Tributary A							
TWHRA-5	3.60	0.32	Clay/silt to cobble in pools; gravel/cobble in riffles	Clay/silt to cobble, parent material	Confined	Wide riparian buffer of grasses and mature trees	Moderately entrenched; exposed shale in channel banks and bed; riffle and pool morphology; rooted knickpoints
TWHRA-6	3.01	0.46	Clay/silt to cobbles	Clay/silt and sand	Confined	Wide buffer of continuous grasses and mature trees	Limited riffle and pool morphology; point bars poorly formed; limited undercutting along the reach
TWHRA-6a	0.68	0.18	Clay/silt	Clay/silt	Unconfined	Moderate riparian buffer of grasses	Low sinuosity; multiple flow paths; gained definition towards the downstream extent
TWHRA-7	2.20	0.49	Clay/silt to cobbles	Clay/silt and sand	Confined	Moderate riparian buffer of grasses and mature trees	No riffle and pool morphology; undercut banks; limited flow; stagnant water at the downstream extent of reach

Reach Name	Avg. Bankfull Width (m)	Avg. Bankfull Depth (m)	Bed Substrate	Bank Materials	Valley Type	Dominant Riparian Conditions	Notes
Tributary B							
TWHRB-5b	0.88	0.19	Clay/silt, sand, gravel	Clay/silt	Unconfined	Manicured lawn with occasional landscaped trees	Artificially defined and straightened feature that drains to a roadside ditch parallel to and under Mayfield Road
TWHRB-6	3.27	0.41	Clay/silt, gravel to parent material	Clay/silt	Unconfined	Wide buffer of fragmented grasses and mature trees	Watercress present at upstream end; moderate amount of woody debris
TWHRB-7	6.42	0.46	Clay/silt, boulder		Partially confined	Narrow riparian buffer of grasses and isolated trees	Historical modification; limited erosion; no riffle and pool morphology; standing water at time of assessment
TWHRB-7a*	10.6	-	Clay/silt		Unconfined	Narrow riparian buffer of continuous grasses	Swale between agriculture fields; poorly defined bed/banks; dry at time of assessment
TWHRB-8	4.46	1.31	Clay/silt to boulder	Clay/silt, sand	Partially confined	Narrow riparian buffer of continuous grasses	Historically modified; multiple flow paths due to overwidening; cobbles in the stream bed mid-reach

* Feature width/depth due to lack of bankfull indicators and channel definition

† Roadside observation within the right of way (ROW) only

8.3 Rapid Assessments

Rapid assessments were completed to identify dominant geomorphic processes, document stream health, and to identify any areas of concern regarding erosion or instability. Channel instability was objectively quantified through the application of the MOE (2003) Rapid Geomorphic Assessment (RGA). Observations were quantified using an index that identifies channel sensitivity based on evidence of aggradation, degradation, channel widening, and planimetric adjustment. The index produces values that indicate whether a channel is stable/in regime (score <0.20), stressed/transitional (score 0.21-0.40), or adjusting (score >0.41).

The Rapid Stream Assessment Technique (RSAT) was also employed to provide a broader view of the system as it considers the ecological function of the watercourse (Galli, 1996). Observations were made of channel stability, channel scouring or sediment deposition, instream and riparian habitats, and water quality. The RSAT score ranks the channel as maintaining a poor (<13), fair (13-24), good (25-34), or excellent (35-42) degree of stream health.

The reaches were also classified according to a modified Downs (1995) Channel Evolution Model, which describes successional stages of a channel as a result of a perturbation, namely hydromodification. Understanding the current stage of the system is beneficial as this allows one to predict how the channel will continue to evolve or respond to an alteration to the system.

Reaches that were only observed from the ROW due to access limitations were not assessed using the RGA (MOE, 2003), RSAT (Galli, 1996) or Downs (1995) tools. In addition, rapid geomorphic assessment tools were not applied to reaches currently mapped as HDFs. A summary of the reach classifications and rapid assessment scores is provided in Table 36 for reaches where field access was possible. For additional details regarding rapid geomorphic assessment observations, refer to Appendix H.

Table 36: Summary of Rapid Assessment Results

Reach	RGA (MOE, 2003)		RSAT (Galli, 1996)			Downs (1995) Model
	Score	Condition	Form of Adjustment	Score	Condition	
Tributary A East Branch						
TWHRA-3d	0.32	In transition/stress	Evidence of Aggradation	23	Fair	Physical instream habitat m
Tributary A						
TWHRA-5	0.42	In adjustment	Evidence of widening	23	Fair	Channel stability, riparian habitat conditions M/E
TWHRA-6	0.38	In transition/stress	Evidence of widening	23	Fair	Channel scouring/sediment deposition, physical instream habitat, riparian habitat conditions M
TWHRA-6a	0	In regime	N/A	25	Good	Riparian habitat conditions S
TWHRA-7	0.19	In regime	Evidence of aggradation	23	Fair	Riparian habitat conditions S/E

Reach	RGA (MOE, 2003)			RSAT (Galli, 1996)			Downs (1995) Model
	Score	Condition	Form of Adjustment	Score	Condition	Limiting Feature(s)	
Tributary B							
TWHRB-6	0.42	In adjustment	Evidence of aggradation	26	Good	Channel scouring/sediment deposition and physical instream habitat	M/E
TWHRB-7	0.14	In Regime	Evidence of planimetric form adjustment	22	Fair	Physical instream habitat, riparian habitat conditions	S
TWHRB-7a	Swale - rapid assessment tools not applied						
TWHRB-8	0.21	In transition/stress	Evidence of planimetric form adjustment/ Evidence of aggradation	23	Fair	Riparian habitat conditions	S

8.4 Erosion Hazard Delineation

Most watercourses in southern Ontario have a natural tendency to develop and maintain a meandering planform provided there are no topographical or spatial constraints. When defining the limits of an erosion hazard for a watercourse, unconfined and confined systems are assessed differently (TRCA, 2004 and MNR, 2002). Unconfined systems are those with streams in open areas (i.e., valley not apparent) or with valley walls that are positioned at a sufficient distance where the channel cannot reasonably be expected to contact because of migration under existing or future hydrologic scenarios. In this type of setting, the extent of the erosion hazard is delineated by the meander belt width, which is defined as the lateral extent that a channel has historically occupied and will likely occupy in the future.

Following MNR (2002), the meander belt width can be applied, at minimum, based on 20 times the bankfull channel width. Alternatively, the meander belt width can be determined through a detailed geomorphological study that examines the largest channel meanders observed through historical and recent aerial photograph interpretation. The meander belt width can then be graphically defined using orthorectified aerial imagery by determining the channel centerline and the channel's central tendency (i.e., meander belt axis). In cases where the channel is not discernible in aerial photographs or the channel has been substantially modified, empirical models can be used to estimate the meander belt width.

Confined systems, in contrast, are those where a watercourse is contained within a defined valley where meander bend migration may be constrained by valley walls. Partially confined systems are those where meander bends are adjacent to only one valley wall and the watercourse is therefore restricted in migration and floodplain occupation on one side of the valley system. In these settings, where the channel is positioned within 15 m of a valley slope, the erosion hazard is generally defined by the toe erosion allowance, stable slope allowance, and erosion access allowance. In some instances, a meander belt width may also apply in partially confined systems (i.e., where the channel is greater than 15 m from the valley slope toe).

The MNR (2002) outlines several approaches for establishing an appropriate toe erosion allowance where watercourses are confined by valley walls and located within 15 m of the toe of slope, which are as follows:

1. Calculating the average annual recession rate based on a minimum of 25 years of record.
2. Applying a 15 m toe erosion allowance measured inland horizontally and perpendicular to the toe of the watercourse slope.

3. Soil types and hydraulic processes.
4. Use of a study that applies accepted geotechnical and engineering principles based on a minimum of 25 years of record.

Through review of available topographic survey and LiDAR data, as well as field reconnaissance, it was determined that Reaches THWRB-7a, TWHRB-6, TWHRA-6a and TWHRA-3b-1 within the Phase 1 lands are unconfined. While slopes are present along portions of Reaches THWRB-7a, TWHRB-6 and TWHRA-6a, they are less than 6H:1V and as such, a geotechnical slope stability assessment was not conducted and the meander belt width governs the erosion hazard. Meander belt widths were also assigned to Reaches TWHRA-3b to TWHRA-3d. The valley adjacent to these reaches may require review by a geotechnical engineer to determine whether a geotechnical slope stability assessment is warranted.

Reaches TWHRB-7 and TWHRB-8 were evaluated to be partially confined, whereby a defined valley slope was present on the west side of the channel. Reaches TWHRA-7 and TWHRA-6 within the Phase 1 lands were evaluated as confined. Reach TWHRA-5 was evaluated to be largely confined except for a section of channel in the upstream extent of the reach where the valley slope was relatively shallow on the east side of the channel.

As a conservative approach, meander belt widths were delineated for the full extent of all reaches; however, the long-term stable top of slope governs the erosion hazard in locations where there is a well-defined valley slope as denoted by DS Consultants Ltd. (2026; Appendix E).

Preliminary erosion hazard delineation was completed for all reaches where access was not granted based on desktop assessment and limited ROW observations, where appropriate. All preliminary meander belt widths are subject to refinement when access to non-participating parcels becomes available. In addition, the top of bank will be staked with the TRCA in the latter half of 2026, which may result in refinements to the outer erosion hazard constraint (i.e., the meander belt width, staked top of bank or long-term stable top of slope).

8.4.1 Meander Belt Width Assessment – Unconfined Reaches

Generally, the preferred approach for delineating meander belt widths is to measure maximum meander amplitudes for a minimum 25-year period. Imagery for the years 1974, 1999 and 2018 were reviewed to calculate meander amplitudes along Reaches TWHRA-6, TWHRA-5 and TWHRB-6. As no natural meanders were present along Reach THWRA-6a due to historical straightening, a meander along Reach TWHRA-6b was used as a surrogate. This meander amplitude was also applied to Reaches TWHRA-6c and TWHRA-6d. Maximum meander amplitudes are summarized in Table

Innis Lake Local Subwatershed Study - Part A Existing Conditions
May 2026

37, below. A 20% factor of safety was added to these values to determine the meander belt widths.

Table 37: Summary of Maximum Meander Amplitudes and Meander Belt Widths based on Imagery from 1974, 1999 and 2018

Reach	Image Year	Maximum Meander Amplitude (m)	Meander Belt Width (m) ^c
TWHRA-6b	2018	18.32	22
TWHRA-6	1999	16.58	20
TWHRA-5 ^a	1999	30.09	36
TWHRB-6 ^b	1974	24.80	30

^a Channel not visible in 2018 imagery due to canopy cover.

^b Channel straightened after 1974.

^c Includes 20% factor of safety.

Meander belt widths were also calculated using empirical modelling for comparison purposes. Refer to the Fluvial Geomorphology Assessment in Appendix H for specific models used in the delineation. Where available, feature/bankfull channel dimensions collected during field reconnaissance were used in the equations. With the exception of Reaches TWRHA-6a to TWHRA-6d noted above, all preliminary meander belt widths in the Phase 2 lands are based on the results of empirical modelling as these reaches have largely been straightened to accommodate agricultural land uses and lack natural meanders. Empirical modelling results are summarized in Table 38 below. The extents of all recommended meander belt widths for existing conditions are graphically defined in Appendix H5.

Table 38- Summary of Meander Belt Widths for Existing Conditions

Reach	Modelled Meander Belt Width (m)					Meander Belt Width Using Maximum Meander Amplitude* (m)	Recommended Meander Belt Width (m)
	Modified Williams (1986) Area*	Modified Williams (1986) Width*	Ward et al. (2002) Width	Ward et al. (2002) Drainage Area*	TRCA (2004)**		
Tributary A							
TWHRA-5	40	33	37	44	29	36	36
TWHRA-6	30	21	24	42	31	20	22
TWHRA-6a	8	5	6	10	13	22	22
TWHRA-7	25	15	16	34	22	N/A	22
TWHRA-8	Not Field Assessed			32	21	N/A	21
TWHRA-9				30	21	N/A	21
TWHRA-9a				32	29	N/A	21
TWHRA-10a				18	17	N/A	17
TWHRA-10b				18	14	N/A	14
Tributary A East Branch							
TWHRA-3ba	27	18	20	23	15	N/A	20
TWHRA-3b-1	13	11	12	6	-12	N/A	13
TWHRA-3c	Not Field Assessed			19	20	N/A	20
TWHRA-3d	7	22	13	14	17	N/A	17
Tributary B							
TWHRB-6	30	23	26	44	34	30	30

Reach	Modelled Meander Belt Width (m)					Meander Belt Width Using Maximum Meander Amplitude* (m)	Recommended Meander Belt Width (m)
	Modified Williams (1986) Area*	Modified Williams (1986) Width*	Ward et al. (2002) Width	Ward et al. (2002) Drainage Area*	TRCA (2004)**		
TWHRB-7	51	49	56	40	26	30	30
TWHRB-7ab	N/C	85	97	22	30	N/A	13
TWHRB-8	47	45	51	35	28	N/A	30

* Includes 20% factor of safety

** Includes one standard error (8.63 m) as factor of safety

a Based on channel dimensions measured within the ROW only

b Poorly defined channel, feature widths used in meander belt width calculations are not representative of bankfull channel dimensions

N/A – No natural meanders present along the reach

N/C – Not calculated as reach was poorly defined and feature depth could not be reliably measured

The recommended meander belt widths for reaches where maximum meander amplitudes were measured or used as a surrogate for an adjacent reach are summarized as follows:

- Reach TWHRA-5 had a maximum meander amplitude of 30.09 m and a meander belt width of 36 m.
- Reach TWHRA-6 had a maximum meander amplitude of 16.58 m and a meander belt width of 20 m.
- Reach TWHRA-6b had a maximum meander amplitude of 18.32 m and a meander belt width of 22 m.
- Reach TWHRA-6b 22 m meander belt width was used as a surrogate for Reach TWHRA-6a, which lacked natural meanders due to historical straightening and Reach THWRA-7, which had a smaller maximum meander amplitude when compared to TWHRA-6b.
- Reach TWHRB-6 had a maximum meander amplitude of 24.8 m and a corresponding meander belt width of 30 m, which was based on the 1974 historical aerial (i.e., prior to channel straightening).
- Reach TWHRB-6 30 m meander belt width was applied upstream to Reaches TWHRB-7 and TWHRA-8 as the cross-sectional geometry of these reaches was substantially modified due to historical straightening and agricultural practices.

The remaining meander belt widths in the Phase 1 and 2 lands were based on empirical equations and are summarized as follows:

- The 17 m meander belt width for Reach TWHRA-3d follows the TRCA (2004) equation as it is the approximate median of the modelled values and is considered conservative (i.e., it uses the drainage area and 2-year flow calculated using OWIT [MNR,2024] and Moin and Shaw [1985] as documented by MNR [2020]).
- A meander belt width of 20 m is recommended for Reach TWHRA-3c following TRCA (2004) as channel measurements could not be collected due to site access limitations.
- A meander belt width of 20 m is recommended for Reach TWHRA-3b based on the Ward et al. (2002) channel width equation as it is consistent with the upstream meander belt width and represents the approximate median of modelled values.
- Reach TWHRA—3b-1 has a recommended meander belt width of 13 m based on the modified Williams (1986) area equation as it is the maximum calculated value (erosion was noted based on observations from the ROW).
- The meander belt width based on the maximum meander amplitude in Reach TWHRA-6b was applied upstream to Reaches TWHRA-6c and TWHRA-6d
- The TRCA (2004) modelled meander belt widths were applied to the remaining reaches along Tributary A in the Phase 2 lands (i.e., THWRA-8, TWHRA-9, TWHRA-9a, TWHRA-10a and TWHRA-10b).

Preliminary meander belt widths within the Phase 2 lands are subject to refinement following the completion of field work. Preliminary meander belt widths within the Phase 1 lands were largely based on a desktop assessment and limited observations within the ROW and as such, are also subject to refinement when access becomes available, and field work can be conducted.

8.4.2 Toe Erosion Allowance Recommendation for Phase 1 Lands

Recent and historical imagery for confined and partially confined reaches within the Phase 1 lands was reviewed to assess if a meander migration rate could be reliably determined where the channel was in contact with valley walls. Due to tree cover, channel size and image resolution, the outer banks of meander bends were obscured by the forest canopy or could not be accurately digitized. Therefore, MNR (2002) was reviewed to recommend a suitable toe erosion allowance (Table 39).

Table 39: Toe Erosion Allowance Guide Adapted from MNR (2002)

Material Type	Evidence of Active Erosion	No Evidence of Active Erosion		
		Bankfull Channel Width		
		< 5 m	30 m	> 30 m
Hard Rock (Granite)	0 – 2 m	0 m	0 m	1 m
Soft Rock (Shale, Limestone) Cobbles, Boulders	2 – 5 m	0 m	1 m	2 m
Stiff/Hard Cohesive Soils (Clays, Clay Silt), Coarse Granular (Gravels), Tills	5 – 8 m	1 m	2 m	4 m
Soft/Firm Cohesive Soil, loose granular, (sand, silt) Fill	8 – 15 m	1 – 2 m	5 m	7 m

Field observations noted that channel bank materials along Reaches TWHRB-7 and TWHRB-8 consisted of clay/silt and clay/silt and sand, respectively. Shale bedrock fragments were also noted at the ground surface adjacent to Reach TWHRB-8. Reach TWHRA-5 channel banks contained clay/silt to parent material (shale bedrock), while Reaches TWHRA-6 and TWHRA-7 contained clay/silt and sand. This is generally consistent with boreholes drilled in support of the slope stability assessment (DS Consultants Ltd, 2026). Native subsurface materials ranged from stiff to hard in consistency and a shale complex/shale bedrock was encountered at depth in multiple boreholes (2026). Table 39 indicates that a toe erosion allowance of 2 to 5 m is appropriate where there is evidence of active erosion and materials consist of soft rock. A toe erosion allowance ranging from 5 to 8 m is appropriate where there is evidence of active erosion and materials consist of stiff/hard cohesive soils. A toe erosion allowance

of 5 m is therefore recommended for confined and partially confined reaches within the Phase 1 lands where the channel is within 15 m of the valley slope toe and is to be applied from the edge of channel. This should be reviewed in tandem with the geotechnical slope stability assessment prepared by DS Consultants Ltd. (2026).

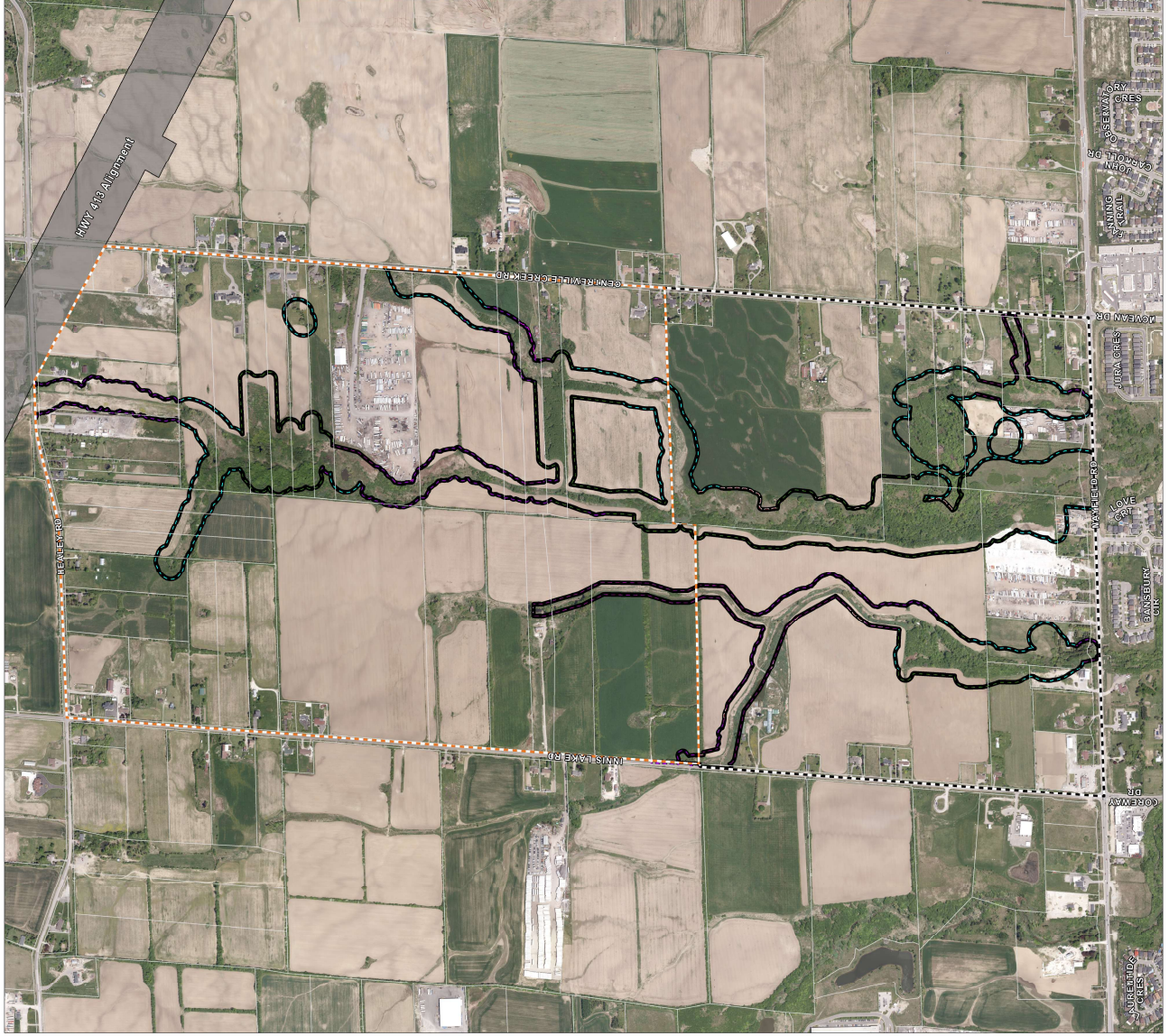
9.0 Constraints

The constraints developed through the multidisciplinary assessment described above include the following components:

- HDFs.
- Preliminary regional floodplain and associated 10 m setback.
- Meander belt width and associated 10 m setback.
- Long-term stable top of slope and associated 10 m setback.
- Wetlands and associated 30 m setback.
- Significant Woodlands and associated 20 m setback.

The details of each of these constraints are shown in Figure 13. These constraints align with the definition of NHS as provided in the Scoped SWS (2022) for the SABE and Future Caledon OP.

The cumulation of these constraints creates a single outer constraint that has been applied as the NHS for the study area. The NHS, as shown in Figure 14, is considered confirmed within the subject properties where detailed field studies were completed. The NHS within the study area, but outside of the subject lands, is considered preliminary until field verification can occur at a later date. Moving forward, this outer constraint will act as the NHS for the Innis Lake LSS. There are areas of the determined NHS that differ from the Preliminary NHS presented in the SABE (2022). These differences are based on refinement through detailed field studies and these refinements will be discussed in detail in the Part B Analysis, Impact Assessment, Mitigations and Recommendations report.



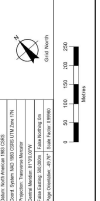
- 10m Slope Network
- Preliminary Regional Floodplain (RSEU)
- Preliminary Regional Floodplain (RSEU) 10m
- 10m Study Area
- Mandated Width = 10m
- Mandated Width (Detention)
- 20m Significant Woodland Setback
- 30m Water Setback
- 30m Water Setback
- Overland Constraint
- Phase 1 Study Area
- Phase 2 Study Area

REVISED

1. Nature of the Study
 2. Nature of the Study
 3. Nature of the Study
 4. Nature of the Study

DISCLAIMER

1. This study is a preliminary study and is not intended to be used for any other purpose.
 2. The study is based on the best available information and is subject to change as more information becomes available.
 3. The study is not a guarantee of performance or results.
 4. The study is not a substitute for professional engineering or other services.
 5. The study is not a substitute for a site-specific study.



BURNSIDE

MATTAMY HOMES

**INNIS LAKE SECONDARY PLAN -
 SUBWATERSHED STUDY
 OUTER CONSTRAINTS**

Sheet No. 14

Project No. 20200507

Date: 11/15/2020

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