Humber Station Comprehensive Environmental Impact Study and Management Plan

Phase 3 - Comprehensive Implementation Plan, Monitoring Plan, and Adaptive Management Plan

Town of Caledon, Ontario

Submitted to:

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Statement of Conditions

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Executive Summary

This Phase 3 Comprehensive Environmental Impact Study and Management Plan (CEISMP), is focused on providing a detailed restoration plan for the preliminary Natural Heritage System (NHS), including retained natural feature buffers, compensation feature (woodland, wetland, drainage channel realignment) design and stormwater management pond outfall design. This Phase 3 report also outlines the NHS phasing considerations from a planning, ecology, geotechnical and engineering perspective for conformity with policies and best management practices by discipline. Finally, this Phase 3 CEISMP includes a comprehensive monitoring and adaptive management plan, from pre-development throughout construction and post-development until assumption. The monitoring plan includes ecological (terrestrial and aquatic), fluvial geomorphology, hydrogeology, surface water engineering, erosion and sediment control and landscape architecture monitoring.

This restoration and enhancement plan includes the location and proposed restoration approach, based on Site Area physiography and NHS landscape connectivity for:

- Buffer planting for retained natural features;
- Compensation and enhancement (location, grading, planting) approach for:
    - Removed wetlands (0.38 ha) and creation of 1.32 ha of riparian and tableland wetland (Wetland Compensation Areas 1 through 3 (0.74ha) and Drainage realignment natural feature enhancement design (0.58 ha));
    - Removed woodland (0.34 ha) and creation of 0.35 ha of compensation woodland;
    - Realignment of 1,087 m of drainage feature length to create a final drainage feature length of 1,438 m;
    - Terrestrial Crayfish habitat relocation associated with partial wetland relocation (Wetland Relocation Area A);
    - Breeding amphibian habitat (species) removal associated with wetland removal; and
- Fluvial and ecological considerations for stormwater management pond outfall design.

The Preliminary NHS consists of one north-south corridor (Clarkway Drive Tributary), enhanced connectivity north-south (through the drainage feature realignment), and a new west-east corridor (Wetland Relocation Area A connecting Clarkway Tributary to Existing Woodland 2; Conceptual Wetland Compensation Area 2 connects to the Clarkway Drive Tributary; **Figure 3, Appendix A**). Ecological targets for the Preliminary NHS (retained/created features) are provided, intending to be incorporated and implemented in future planning submissions (i.e., Draft Plan and Site Plan Applications).

The Humber Station Employment Area (Study Area) NHS and development plan is to be built in multiple stages with the bulk of the Prologis Site and NHS construction occurring first. A Landownership Plan is included for reference in reviewing the phased development buildout and responsible parties for implementing the development areas and the preliminary NHS (**Figure 4, Appendix A**). The Implementation Plan of this Phase 3 report summarizes the engineering, ecology and hydrogeology buildout considerations including construction and conveyance processes, and municipal and agency permitting requirements. An NHS implementation phasing plan (**Table 9, Appendix C**) and wildlife construction window (**Table 10, Appendix C**) are provided.

Lastly, **Table 11** (**Appendix C**) of the Phase 3 CEISMP provides a proposed long-term monitoring plan (baseline, during construction, post-construction) and comprehensive adaptive management plan for each discipline (ecology, hydrology, hydrogeology). Agency permits typically stipulate where annual or milestone monitoring is required. Where adaptive management is triggered, it is standard to prepare a monitoring report (for internal use or agency submission) that documents triggers for adaptive management, action taken and follow-up monitoring and reporting planned.

The intent of the Phase 3 CEISMP is to address the items noted above and ensure they align with the goals for the NHS for the Study Area. Phase 3 has been prepared in alignment with the approved Terms of Reference (TOR; approved August 2022).

1. Introduction

1.1 Background

GEI Consultants Canada Ltd. (GEI), Schaeffers Consulting Engineers (SCE), and Arcadis Professional Services (Canada) Inc. (Arcadis), have been retained by the Humber Station Village Landowners Group Inc. (HSV LOG), to prepare the Phase 1, 2 and 3 Comprehensive Environmental Impact Study and Management Plan (CEISMP), for the Humber Station Employment Area (herein referred to as the Study Area) located in Bolton, Ontario. The Study Area is generally bound by Mayfield Road to the south, Humber Station Road to the west, a tributary of the West Humber River (referred to as the Clarkway Drive Tributary) to the east and Healey Road to the north (refer to **Figure 1**, **Appendix A**). The Study Area is approximately 220.55ha in area and is legally described as Lots 1-5, Concession 5 (Albion). It is in the West Humber watershed, within the jurisdiction of Toronto Region Conservation Authority (TRCA).

The Phased CEISMP is being completed to support an amendment to the Town of Caledon's Official Plan, to establish a Secondary Plan land use and policy framework for the Study Area **(Figure 6, Appendix A).**

The Region of Peel Official Plan (RPOP; 2022) identifies the Study Area as part of the Urban System, within the Bolton Residential Expansion Settlement Area, and designates the Study Area as an Employment Area.

Within the Town of Caledon Official Plan (Caledon OP; 1978, Consolidated 2024), the Study Area is located within the Bolton Settlement Area and is designated as New Employment Area. In addition, Headwater Drainage Feature 3 (HDF-3) and its associated pond, the Clarkway Drive Tributary and the northern Woodland 1 are identified as Environmental Policy Areas (EPA).

The Town of Caledon policies require that a CEISMP or local Subwatershed Study (SWS) be prepared in support of applications for development that are adjacent to EPA. The Terms of Reference (TOR) for this CEISMP was submitted to the TRCA and the Town of Caledon (the Town) in January 2022 and approved in August 2022; a copy of this is included in the Phase 1 CEISMP report (Appendix B1). Like a SWS, the CEISMP is a comprehensive planning framework describing how a wide range of development elements will be addressed. This includes the following three phases of reporting:

- **Phase 1:** Provide characterization of existing environmental condition, address the relevant natural features and functions identified in the PPS, RPOP, and Caledon OP; and provide the foundation for the layout of the Secondary Plan by defining and delineating elements such as the Natural Heritage System (NHS) and transportation and servicing networks;
- **Phase 2:** Detailed analysis, impact assessment, mitigation, and recommendations based on the findings from Phase 1 and the proposed Land Use Concept; and
- **Phase 3:** Implementation plan, monitoring plan, and adaptive management plan based on the findings from Phase 2.

1.2 Phase 1 and Phase 2 CEISMP Summary

As documented in the Phase 1 CEISMP, the Study Area is comprised mainly of actively cultivated fields with most of the natural and cultural vegetation in the east valley, which surrounds a tributary of the West Humber River. One large woodlot (8.09 ha) occurs on the tableland in the north-west corner of the Study Area, and a second smaller woodlot (1.20 ha) is in the north-central portion. The remainder of vegetation communities on the tableland are small and isolated non-treed wetlands and cultural vegetation communities (**Figures 1** and **2**, **Appendix A**). Scattered residential dwellings also occur in the Study Area, fronting onto the bordering roads. A tributary of the West Humber River (the Clarkway Drive Tributary) provides direct warm water fish habitat and flows in a north-south direction at the east end of the Study Area and generally occurs within a defined valley. HDF-3 also provides seasonal warm water fish habitat and flows in a north-south direction at the north central and west end of the Study Area.

As part of the Phase 1 CEISMP, GEI completed field investigations in 2017, 2018, 2021, 2022, and 2023 to achieve a fulsome understanding of the ecological conditions within the Study Area, and to address specific requests for targeted surveys from the TRCA. As outlined in the approved TOR (attached as Appendix B1 in the Phase 1 CEISMP), Phase 1 of the CEISMP characterizes existing conditions, demonstrates a baseline inventory and provides a cross-synthesis of the various disciplines.

As part of the Phase 1 CEISMP the following significant natural heritage features were identified:

- Significant wetlands;
- Significant woodland;
- Fish habitat;
- Significant wildlife habitat (SWH):
    - Seasonal Concentration Areas of Animals (Candidate Bat Maternity Colonies within FOD habitats);
    - Specialized Wildlife Habitat (Candidate Seeps and Spring);
    - Species of Conservation Concern (Terrestrial Crayfish, Snapping Turtle (*Chelydra serpentina*), Eastern Wood Peewee *(Contopus virens),* Monarch *(Danaus plexippus*), and Yellow-banded Bumblebee *(Bombus terricola*)*);* and
- Habitat of endangered and threatened species (SAR Bats and Bank Swallow (*Riparia riparia*) foraging habitat).

Additional natural heritage features within the Study Area included evaluated non-significant wetlands and other woodlands.

Phase 2 CEISMP focused on natural heritage features and functions and impact assessment and mitigation of the proposed development. The components of the Phase 2 CEISMP include an assessment of potential impacts of the land use plan on natural heritage features and functions, and groundwater and surface water systems, including:

- Terrestrial and aquatic impacts, including recommendations for the avoidance, minimizing and/or mitigation of potential impacts to these features;
- Preliminary assessment of compensation efforts for proposed feature removals and realignment;
- Impacts to geotechnical conditions and slope stability;

- Impacts to local groundwater resources, groundwater supported features, and recommendations for mitigation measures;
- Hydrologic, floodplain and regional storm impacts;
- Geomorphic assessments and erosion sensitivity analyses;
- Servicing and grading impacts;
- Stormwater management (SWM) plans and SWM pond design;
- A brief description of natural heritage mitigation and restoration opportunities; and
- Recommended mitigative measures and best management practices from each discipline.

Through the Phase 2 CEISMP report, the above impacts were contemplated and assessed in alignment with relevant legislation, policies and regulations. To ensure alignment with the Caledon OP the Phase 2 CEISMP was prepared in conjunction with the Humber Station Employment Area Secondary Plan policies, which were revised to address specific environmental conditions for the preliminary NHS. This includes a proposed amendment to the Caledon OP to modify how Core Woodland Areas can be addressed during planning applications, as follows:

> *7.18.7.2: The limits of wetlands, woodlands, stream corridors, natural hazards, and their buffers/setbacks within the Secondary Plan Area are established through the recommendations of the Final CEISMP and form the basis for the Environmental Policy Area designation. Development and site alteration will not be permitted within this designation except as set out in the Final CEISMP and the policies of this Plan.*

The secondary plan policies have been approved as Official Plan Amendment (OPA) 287 for this Secondary Plan area. The preliminary NHS will proceed to include minor compensation and enhancement of the Core Areas; the details of this compensation are included in this report and will be further detailed through site-specific Environmental Management Plan (EMP) as required.

The results of the Phase 2 CEISMP are further addressed through this Phase 3 report to address the implementation of the preliminary NHS, inclusive of retained features, compensation and relocation areas, restoration and enhancement areas, and vegetated protection zones (VPZs).

1.3 Purpose of Phase 3 CEISMP

As noted earlier, this Phase 3 CEISMP is focused on providing a conceptual restoration plan for the preliminary NHS, including retained natural feature buffers, compensation and relocation feature (woodland, wetland, drainage channel realignment) design and stormwater management (SWM) pond outfall design. This Phase 3 report also outlines the NHS phasing considerations from a planning, ecology, geotechnical and engineering perspective for conformity with policies and best management practices by discipline. Finally, this Phase 3 CEISMP includes a comprehensive monitoring and adaptive management plan, from pre-development throughout construction and post-development until assumption. The monitoring plan includes ecological (terrestrial, aquatic), fluvial geomorphology, hydrogeology, surface water engineering, erosion and sediment control and landscape architecture monitoring and should guide the development of the EMP for future site-specific applications.

2. Restoration and Enhancement Plan

This restoration and enhancement plan, based on the impact assessment and recommendations from the Phase 2 CEISMP and Humber Station Employment Area Secondary Plan policies includes:

- Buffer planting approach for retained natural features;
- Relocation approach partially removed wetland (0.30 ha);
- Compensation (location, grading, planting) approach for:
    - Removed wetlands (0.076 ha);
    - Removed woodland (0.34 ha);
    - Realignment of 1,087 m of drainage feature length;
    - Terrestrial Crayfish habitat relocation associated with partial wetland relocation (0.30 ha);
    - Breeding amphibian habitat removal (species) associated with wetland removal; and
    - Fluvial and ecological considerations for stormwater management pond outfall design.

A restoration and enhancement plan are prescribed in the sections below, informed by physiography, surficial geology, retained native communities in the Study Area and natural heritage system landscape connectivity within and adjacent to the Study Area.

2.1 Pre-development Existing Natural Heritage System

2.1.1 Physical Setting

The uppermost mapped bedrock unit underlying the Study Area is the Upper Ordovician Georgian Bay Formation (Ontario Geological Survey, 2005). The Georgian Bay Formation consists of dark blue grey to black shale with interbeds of limestone (Ontario Geological Survey, 2005). The mapped surficial Quaternary deposits at the Study Area consist predominantly of clayey silt till with shale and siltstone clasts. This till unit has been interpreted to be the Halton Till. As identified in the “Soil Survey of Peel County” (Hoffman and Richards, 1953), soils in this area were derived from parent materials of lacustrine soil over clay till or heavy textured till with imperfect drainage. The Peel clay member and / or Monaghan clay loam covers much of the Bolton area. The Peel clay member generally corresponds to areas of glaciolacustrine deposits, and the Monaghan clay loam corresponds to the area of surficial till (Hoffman and Richards, 1953). The soils mapping and Quaternary geology mapping are generally consistent.

The regional topography of the Study Area generally slopes in a southeasterly direction. Ground elevations at the Study Area range from about 245 meters above sea level (masl) in the northern portion of the Study Area to approximately 230 masl in the southern portion of the Study Area. Regional drainage is generally directed south/southeast into the Humber River and eventually discharges into Lake Ontario. There is an incised tributary of the West Humber River that trends in a north south direction along the eastern Study Area boundary, referred to as the Clarkway Drive Tributary. In addition, two other incised Headwater Drainage Features (HDFs) occur within the Study Area; HDF-8 and HDF-3 (**Figure 2, Appendix A**).

2.1.2 Existing Landscape Setting and Connectivity

The Study Area is unique as it spans a portion of both Ecoregion 6E and 7E. The southern fifth of the Study Area is located within Ecoregion 7E (specifically eco-district 7E-4), while the remainder of the Study Area is located within Ecoregion 6E (specifically eco-district 6E-7). Ecoregion 7E is located within the Carolinian, or Deciduous Forest Zone (also referred to as the mixed wood plains), an area characterized by a relatively warmer climate, which supports plant species typical of more southern areas. Broadleaved trees, including American Beech (*Fagus grandifolia*), Sugar Maple (*Acer saccharum*), Basswood (*Tilia americana)*, Red Maple (*Acer rubrum)*, White Oak (*Quercus alba)* and Bur Oak (*Quercus macrocarpa)*, dominate natural upland forest cover in this region (Rowe, 1972). Also found in this region are Canada's main distribution of Black Walnut, Sycamore, Swamp White Oak (*Quercus bicolor)* and Shagbark Hickory (*Carya ovata)*. However, a majority of the Study Area is located within the Lake Simcoe-Rideau Ecoregion 6E, which extends from Lake Huron to the Ottawa River, and includes most of the Lake Ontario shore and the Ontario portion of the St. Lawrence River Valley. Ecoregion 6E falls within the Great Lakes-St. Lawrence forest region, an area of moderate climate where natural succession leads to forests of shade tolerant hardwood species including Sugar Maple, American Beech and shade intermediate species such as Red Oak (*Quercus rubra*) and Yellow Birch (*Betula alleghaniensis*), as well as associations of White Pine (*Pinus strobus*) and Red Pine (*Pinus resinosa*).

Consideration of the larger ecological matrix or landscape contributes to a better understanding of potential interactions between abiotic and biotic flows and exchanges. No ANSIs or ESAs are identified within 120 m of the Study Area. As depicted in **Figure 2 (Appendix A)**, the landscape surrounding the Study Area is dominated by agricultural fields. Under existing conditions there is one north-south corridor associated with the Clarkway Drive Tributary which ultimately feeds into the West Humber River. The Clarkway Tributary (4.7 m in average width) is comprised of upland and wetland vegetation communities, and non-woody and woody vegetation types. The Clarkway Tributary likely provides a corridor function for terrestrial, semi-aquatic and aquatic flora and fauna. North of Bolton, the corridor leads to a large continuous forest in the Humber River valley. South of Mayfield Road, the Clarkway Tributary continues through agricultural fields and residential developments before joining at Claireville Conservation Area. Based on the criteria provided by Peel-Caledon Significant Wildlife Habitat Study (North-South Environmental Inc. *et al*. 2009), the Clarkway Drive Tributary and its associated valleyland may be considered a regional movement corridor as the natural features connected cross active agricultural lands within the landscape.

Other primary wildlife linkage corridors found near the Study Area may include the Greenbelt Protected Countryside corridor west of the Study Area. This feature affords a larger naturalized area that may provide additional cover and refuge for wildlife. Continuous forest cover protects wildlife while they are foraging, migrating, mating and/or overwintering from predators and human-intervention. Larger mammals can range over larger areas in response to seasonal behaviours and requirements. Typically, wildlife will follow traditional migration routes or corridors (OMNR 2000). These two wildlife corridors (i.e., the Clarkway Drive Tributary and the Greenbelt Protected Countryside) are generally impeded by the existing road network around the greater Study Area which serves as a barrier to wildlife movement due to busy roads. Specifically, Mayfield Road is a major arterial roadway for Caledon and Brampton. With increased densification projected within the Bolton Area, it is anticipated that all surrounding roadways including Humber Station Road (to the west), and Healy Road (to the north) will become busier and will pose an increased risk to wildlife movement. No suitable wildlife passage opportunities (e.g., culverts) were documented during ecological inventories.

2.1.3 Vegetation Communities

The Study Area is dominated by actively cultivated fields, with natural features generally associated with the Clarkway Drive Tributary, and several forest and wetland communities (**Figure 2, Appendix A)**.

Within the Study Area, several wetlands were determined to be Significant Wetlands (PSW). Confirmed and assumed PSWs are associated with the Clarkway Drive Tributary and the existing pond located at the downstream extent of HDF-3. The Deciduous Forest (FOD) within a non-participating property in the north and the Fresh – Moist Basswood Deciduous Forest (FOD8-3) complexed with the adjacent CUT1-7 communities within the north central portion of the Study Area are also considered Significant Woodlands.

- Nine locally (Peel Region, TRCA) rare plants were observed, as per the rankings of Varga et al. (2005) and TRCA (2021). The locally rare species were:
    - White Spruce (*Picea glauca*) – planted;
    - Tall Beggarticks (*Bidens vulgata*) – occasional at edges of meadows along the tributary;
    - Marsh Seedbox (*Ludwigia palustris*) – occasional in MAM2-2;
    - Pennsylvania Smartweed (*Persicaria pensylvanica*) – occasional on the shore of SAS1-1;
    - Catchweed Bedstraw (*Galium aparine*) – occasional in unit FOD8-3;
    - Peach-leaved Willow (*Salix amygdaloides*) – local along the tributary, drainages, and SAS1-1;
    - Sandbar Willow (*Salix interior*) – local along the tributary, drainages, and SAS1-1;
    - Small's Spike-rush (*Eleocharis palustris*) – local in MAM2-2 and along exposed banks of the tributary; and
    - Small Pondweed (*Potamogeton pusillus*) – common in SAS1-1.
- Depending on the timing of wetland removal and wetland compensation construction, opportunities to salvage individual rare species should be assessed in future planning stages.

2.1.4 Wildlife Species and Habitat

The following SAR were observed during wildlife surveys within the Study Area:

- Eastern Wood-Pewee (*Contopus virens*; Special Concern in Ontario and Canada) identified within the northwestern FOD community in a non-participating property;
- Snapping Turtle (*Chelydra serpentina*; Special Concern in Ontario and Canada) observed in SAS1-1 associated with HDF-3 and within the Clarkway Tributary;
- Monarch (*Danaus plexippus*; Special Concern in Ontario and Endangered in Canada) observed in old field/meadow locations associated with the Clarkway Drive tributary;
- Yellow-banded Bumble Bee (*Bombus terricola;* Special Concern in Ontario and Canada) observed in old field/meadow and wetland locations associated with the Clarkway Drive tributary;

- Barn Swallow (*Hirundo rusica;* Special Concern in Ontario and Canada) nesting habitat occurs in two replacement structures that were installed in 2017, and have been observed foraging off-site over the PSW associated with the northern portion of the Clarkway Drive Tributary; and
- Bank Swallow (*Riparia riparia;* Threatened in Ontario and Canada) foraging habitat observed off-site over the PSW associated with the northern portion of the Clarkway Drive Tributary.

In addition, the Clarkway Drive Tributary provides direct fish habitat, and HDF-3 provides seasonal warm water fish habitat. The Clarkway Drive Tributary and HDF-8 provide baseflow and coarse sediment supply to offsite habitat for Redside Dace, located approximately 4.5 km downstream of the Study Area. No Redside Dace habitat is present in the Study Area.

Within the Study Area, the following Significant Wildlife Habitat (SWH) types are present:

- Seasonal Concentration Areas of Animals:
  - Candidate Bat Maternity Colonies within northwestern FOD community in a non-participating property.
- Specialized Wildlife Habitat:
  - Candidate Seeps and Spring within northwestern FOD community in a non-participating property and southeast FOD7-6 community located in non-participating properties.
- Species of Conservation Concern:
  - Terrestrial Crayfish (MAM2-2 associated with HDF-3, MAS2/MAM2, MAM2-10/MAM2-2, MAS2, MAS2-1 communities associated with the Clarkway Drive tributary);
  - Snapping Turtle (SAS1-1, Clarkway Drive tributary);
  - Eastern Wood Peewee (FOD);
  - Monarch (MAM2-10/MAM2-2 and MAS2-1 communities associated with the Clarkway Drive tributary); and
  - Yellow-banded Bumblebee (MAM2-10/MAM2-2 and MAS2-1 communities associated with the Clarkway Drive tributary).

2.2 Proposed Natural Feature Removals and Compensation Requirements

2.2.1 Drainage Feature Realignment Design

Within the Study Area, portions of HDF-3 are proposed for realignment from Healey Road within a non-participating property to the agricultural pond (SAS1-1) and surrounding SWT2-2 community. The proposed realignment will result in the removal of 1,087 m of channel but creates 1,438 m of channel length, representing a net gain of 351 m (**Figure 3, Appendix A**).

HDF-3 is identified as providing seasonal fish habitat. The natural drainage feature realignment is anticipated to provide an overall ecological benefit by improving water quality and riparian vegetation compared to the existing drainage which has been historically straightened and degraded by ongoing agricultural management resulting in siltation from ploughing to the edge of the feature, and pollution from fertilizers. This drainage feature realignment will undergo a natural channel design that incorporates native riparian vegetation and floodplain wetlands (online and offline) to support surface water storage along the feature. The proposed drainage feature realignment is anticipated to provide improved fish habitat compared to existing conditions. It will also provide connectivity between other features within the preliminary NHS including retained and compensation woodlands and wetlands.

Portions of HDF-8 (8a1, 8a2, and 8a3 are to be retained), and HDFs 4a,10a, 11a, 12a, 13a, and 15a are proposed for removal. Compensation to ensure the function to downstream fish habitat is replicated and enhanced will be implemented through the design of SWM Ponds 1 and 3, as well as the creation of wetland compensation habitat (Wetland Compensation Area 2). Similar to HDF-3, these features are currently disturbed and degraded due to active agricultural practices causing siltation due to ploughing and pollution from fertilizers. As such removal and replication in an enhanced state is anticipated to provide a net gain.

2.2.2 Wetlands and Woodlands

As described in the Phase 2 CEISMP, 0.34 ha of woodland is proposed for removal, 0.376 ha of wetland (Wetland B1; partial Wetland C1) is proposed for removal, (**Table 1**). This Phase 3 CEISMP provides the ecological design for woodland compensation (0.35 ha), wetland compensation (0.076 ha) and enhancement 0.58 ha) as well as wetland relocation (0.39 ha). The proposed realigned drainage channel provides offline and online wetland compensation and wetland enhancement areas (Wetland Compensation Area 1 and Drainage Realignment Enhancement Area), and the extended floodplain of the proposed realigned drainage channel provides online wetland relocation (Wetland Relocation Area A). Wetland Compensation Area 2 is provided for compensation for the removal of HDF 3. (**Tables 1-2**; **Figure 3, Appendix A**).

Table 1: Proposed Woodland and Wetland Removal and Compensation

Feature Type	Removed (ha)	Compensation (ha)	Relocation (ha)	Enhancement (ha)	Net Gain (ha)
Woodland	0.34	0.35	NA	N/A	+ 0.01
Wetland	0.38	0.07	0.39	0.58	+ 1.04

Table 2: Proposed Wetland Compensation and Enhancement Areas

Compensation Wetland Number	Riparian Wetland (ha)	Tableland Wetland (ha)	Total Area (ha)
Drainage Feature Enhancement	0.58	N/A	0.58
Compensation Area 1	0.076	N/A	0.076
Relocation Area A	0.39	N/A	0.39
Compensation Area 2	N/A	0.35	0.35
TOTAL	1.04	0.35	1.40

2.3 Preliminary Natural Heritage System

The preliminary NHS is comprised of significant natural heritage features and functions and their buffers as identified through the Phase 1 and Phase 2 CEISMP; it also includes created compensation natural features as identified in the Phase 2 CEISMP and detailed within this Phase 3 CEISMP (**Figure 3, Appendix A**).

The compensation features (woodland and wetlands) and drainage feature wetland enhancements will support a more robust NHS, including increased connectivity between the new and retained natural features (**Figure 3, Appendix A**).

This Phase 3 CEISMP provides ecological targets for the preliminary NHS, summarizes applicable policies and best practices for retained natural feature buffers and created natural features and includes conceptual compensation design (natural channel, wetlands, woodland), including hydraulic analysis, water availability assessment and targeted vegetation communities.

2.3.1 Terrestrial Connectivity and Landscape Scale Screening Exercise

Under pre-development conditions there is one north-south corridor (**Figure 2, Appendix A**) associated with the Clarkway Drive Tributary valley which enters the Study Area from the north-east and exits the Study Area at Mayfield Road.

The proposed preliminary NHS (**Figure 3, Appendix A**) is designed to maintain this north-south corridor and proposes additional opportunities for connectivity between retained, compensation, and enhancement features within the Study Area. The preliminary NHS proposes an east-west connection between the realigned drainage channel (HDF-3) and retained Woodland 2/Wetland C1 to the Clarkway Drive Tributary valley. This new NHS connection will be approximately 60 m wide and will connect the retained upland Significant Woodland (FOD8-3) to the realigned drainage channel to Wetland Relocation Area A and the Woodland Compensation Area, to the upland setback of the Clarkway Drive Tributary.

A wide diversity of habitats are provided along this new east-west corridor including upland woodlands, a riparian channel with online (shallow marsh) and offline (meadow marsh) wetlands within the floodplain, the vegetated setback of the Clarkway Drive Tributary, and the watercourse itself. This east-west corridor allows for flora and fauna gene flow between the north-south corridor associated with the Clarkway Drive Tributary.

HDF-3 is proposed to be enhanced through the realignment and naturalization process and will provide increased north-south connectivity.

The proposed NHS also includes a 20 m wide east-west connection between the Clarkway Tributary through the conceptual wetland compensation area 2.

2.3.2 NHS Ecological Targets

The following NHS ecological targets are proposed:

- Create a dynamic stable realigned drainage feature that will naturally evolve over time;
- Provide natural vegetative cover across the entire created NHS and all NHS buffers;

- Achieve an overall measurable net gain in native vegetation community types and species diversity (flora and fauna);
- Create breeding, summer use and overwintering habitat for American Toad (*Anaxyrus americanus*), Northern Leopard Frog (*Lithobates pipiens*), Green Frog (*Rana clamitans*) and Gray Tree Frog (*Dryophytes versicolor*);
- Create improved habitat through compensation efforts for Terrestrial Crayfish (SWH) and indirect fish habitat;
- Provide habitat for certain life stages of various bird and small and medium sized mammal species;
- Mitigate removal of wetlands and woodland by providing appropriate areas for compensation and by increasing ecological functions within created wetland and woodland features;
- Map abundance of Category 1 invasive species (i.e., *Rhamnus cathartica*, *Phragmites australis ssp. australis*) and *Populus alba* (Category 2) within retained natural features;
- Invasive species management risk assessment to determine whether it is ecologically, socially, and economically viable to manage a given invasive species population;
- Where invasive species risk assessment identifies opportunities for invasive management for a given species, carry out invasive management as per Ontario Invasive Plant Council (OIPC) best management practices (OIPC, 2024);
- Proper disposal of invasive species (i.e., Phragmites), that are within development area as per OIPC best management practice (OIPC, 2024);
- Explore salvage and transplant of native species within removed features into created features and or retained feature buffers, where feasible;
- Enhance local linkages and connectivity for wildlife movement and gene flow; and
- Consider best management practices for road crossings, if necessary, to support movement of amphibians, reptiles, small and medium sized mammals under road crossings.

It is expected that future planning applications (i.e., draft plan of subdivision and site plan application) will adhere to and implement these NHS ecological targets.

2.3.3 Targeted Invasive Species Mapping and Management

At the planning submission that follows the CEISMP (i.e. Draft Plan of Subdivision or Site Plan Application) it is expected that the abundance of Category 1 invasive species (i.e., *Rhamnus cathartica*, *Phragmites australis* ssp. *australis*) and *Populus alba* (Category 2) within retained natural features will be mapped and an invasive management plan developed, where appropriate.

Prioritization is required as part of the invasive species management assessment to determine whether it is ecologically, socially, and economically viable to manage a given invasive species population. Generally, the risk assessment focuses on: (a) whether the species can be reasonably eradicated or contained and (b) the risk that the species poses to high-quality retained features in the vicinity.

Species-specific invasive species management strategies should consider multiple variables when determining whether active management is warranted (i.e., using chemical, biological, or physical interventions) or whether indirect management is appropriate (i.e., supporting natural succession). These variables include species' biological traits, proximity to dispersal routes and rare or sensitive features (i.e., significant natural heritage features, Species at Risk), impairment to recreational opportunities, practicality of control efforts, and likelihood of re-invasion from off-site (where management is not possible). The prioritization process segregates high priority from lower priority invasive occurrences and helps define management approaches. High priority areas for invasive species treatment are where the greatest potential exists to eradicate the invasive species, protect Species at Risk that are of highest concern, and manage invasive species that require the least amount of labour investment.

Where the risk assessment identifies that active management is warranted, the management level that can be reasonably achieved must be determined. There are five management levels:

- Eradicate;
- Eradicate/Contain;
- Contain;
- Control; and
- Follow-up.

Eradication aims to target invasive species having smaller, more localized populations. Eradicate/contain should be viewed as 'eradicate, if possible, but contain if eradication is not feasible based on existing conditions. Containing an invasive species is an approach intended to cordon widespread plants into isolated sites by removing or treating thinner populations/outlying specimens. The goal is to slow the rate of spread and contain the core population. Efforts to contain an invasive species must continue indefinitely unless the feasibility of eradicating the core occurrence changes. Control (sometimes referred to as asset-based protection) means strategically choosing specific locations within an invasive population where control efforts will be undertaken. This approach is typically reserved for the most invasive species that occupy significant areas and threaten high-value features, such as Species at Risk (Sherman 2015; U.S. Fish and Wildlife Service et al. 2018). If historical records indicate the occurrence had been removed or treated, it should be placed into the category of "follow-up" – indicating additional surveys should be conducted to determine if the species has re-established and, if so, the percent cover of the species within the native habitat.

Of note, the significant woodland for which a minor removal and compensation has been proposed (Woodland 2; **Figure 3, Appendix A**), is comprised of both native FOD8-3* forest, and CUT comprised mostly of Common Buckthorn (*Rhamnus cathartica*). To support the Phase 2 CEISMP recommendations for improving the ecological integrity of the retained features, it is recommended that an EMP for this area include a discussion of the results of the invasive species management risk assessment. As noted in the phase 2 report, the invasive species management risk assessment will identify where management is appropriate.

2.3.4 Compensation Design and Methodology

The following policies and best management practices informed the restoration and enhancement plan:

- Erosion and Sediment Control Guideline for Urban Construction (TRCA, 2019);
- Guideline for Determining Ecosystem Compensation (TRCA, June 2023);
- Post-Construction Restoration Guidelines (TRCA, July 2004). This guideline applies to the FOD8-3 which is proposed for partial removed;
- Preserving and Restoring Healthy Soil: Best Practices for Urban Construction, (TRCA, June 2012);
- Seed Mix Guidelines (TRCA, January 2022);
- Humber Station Employment Area Land Use Plan (SGL Planning, 2024 – submitted as part of the OPA process for the Study Area); and
- International principles and standards for the practice of ecological restoration. Second edition. Restoration Ecology S1-S46 (Gann et al. 2019).

2.3.5 Targeted and Reference Vegetation Communities

The design process of restoring or creating ecosystems depends on the use of native reference sites to inform restoration activities (Gann et al., 2019). Reference sites are defined as ecosystems that have experienced little to no human intervention or disturbance, and that are as close to historically natural as possible (Pollock et al., 2012). In the discipline of ecosystem restoration, reference sites are a vital tool for assessing current conditions and developing restoration goals for natural areas (Gann et al., 2019). They are used to inform scientists of the best management practices to lead to a healthy recovery of a degraded ecosystem, and they can also be used to assess whether current management practices are moving the restoration of a site in the direction of recovery (Pollock et al., 2012).

To be used as a reference site, proposed locations must have specific characteristics. To assist ecologists in identifying appropriate reference sites, The Society for Ecological Restoration (SER) has outlined six essential reference site attributes. These attributes include: 1) absence of threats, 2) suitable physical conditions, 3) appropriate species composition, 4) ample structural diversity, 5) adequate ecosystem function, and 6) sufficient external exchanges (Gann et al., 2019).

In Southern Ontario, there are few reference sites that meet the six reference site attributes as the natural environment was highly altered >200 years ago, primarily from the removal of woodlands and other natural habitat types for agricultural practices. This is also true for Caledon and the surrounding landscape, which can be described as containing lands heavily influenced by anthropogenic activities. When appropriate reference sites cannot be determined for a restoration project, Certified Ecological Restoration Practitioners (CERPs) will use target ecosystems as an alternative. While reference sites are physical locations where data has been collected and it has been determined that the SER's reference site attributes are adequately met, target ecosystems are conceptual descriptions of community assemblages, such as those found in the ELC manual (Lee et al. 1998). The target ecosystem method leaves more to the discretion of the CERP; however, since the community descriptions in the ELC manual are based on data collected from actual sites within Ontario, these descriptions should serve as a fair alternative to reference sites when necessary.

Physiographic Considerations

When selecting reference sites and target ecosystems, CERPs must consider the physiographic conditions of the area to be restored. This approach ensures the greatest likelihood of success for communities that have been restored on the landscape.

As previously stated in **Section 2.1**, the Study Area is situated in the Peel Plain physiographic region. The soil texture present within the Clarkway Tributary is a clay to silt texture. The primary soil texture will inform the design of restoration vegetation communities.

2.4 Created Natural Heritage System Design

2.4.1 Retained NHS Buffers

The Phase 2 CEISMP identified providing minimum 10 m buffers from Significant Woodland, 10 m buffers from local wetland and 30 m buffers from significant wetland. The natural feature buffers should be planted with native vegetation that are suitable based on soil texture, soil moisture, aspect and topography. Buffer plantings should consider the need for protection from sunscald and windthrow (treed communities) and for barrier planting to deter future residents from creating their own trails into the natural features.

2.4.2 Compensation Drainage Feature Realignment Design

The complete drainage feature realignment design is shown in **Appendix B** (Sheets G-01 through G-04, with channel details shown in G-06). The proposed design is also outlined in the Phase 2 CEISMP. The design creates a riffle-pool morphology to provide enhancements to aquatic habitat, provides connections between retained wetlands, and creates additional wetland habitat within the floodplain, which will receive flows from the channel at higher flows. It is anticipated that the slopes for this feature realignment will be planted with native shrubs and grasses, and any wetland design will follow the methods outlined below.

2.4.3 Compensation and Relocated Wetlands

Two wetland compensation areas and one wetland relocation are planned (**Figure 3, Appendix A)**. Compensation Area 1 is within the realigned drainage channel; Relocation Area A is a created extended floodplain from the realigned drainage channel and Compensation Area 2 is a tableland wetland hydrologically supported by precipitation. The preliminary wetland design is shown in (**Appendix B, Drawing G-05**).

Three wetland native vegetative communities are targeted for compensation and/or relocation (**Table 3**):

- Willow Thicket Swamp (SWT2-2) communities consist of <25% tree cover and >25% shrub cover. Dominated by hydrophytic tree and shrub species. Surface water inundation is >30% of ground coverage for part of the year. This vegetation type is targeted for the offline wetlands within the drainage realignment enhancement areas and Wetland Compensation Area 1;

- Mineral shallow marsh (MAS) communities consist of less than 25% cover of trees and shrubs with a hydrophytic emergent macrophyte cover greater than 25%. Water is expected to be standing through most of the growing season and substrates can range from bedrock to mineral to organic. This vegetation type is targeted for online wetlands within the proposed drainage realignment) and within Wetland Relocation Area A and Wetland Compensation Area 2; and
- Mineral Meadow Marsh (MAM2): Mineral soils seasonally flooded that later become moist to dry, features dominated by grasses/sedges intolerant to prolonged flooding, less than 25% cover of both emergent vegetation and trees/shrub. This vegetation type is targeted for offline wetlands within the proposed drainage realignment area, Wetland Relocation Area A and Wetland Compensation Area 2.

Table 3: Targeted Wetland Vegetation Community by Wetland Compensation/ Enhancement Area

Targeted Wetland Vegetation Community	Drainage Realignment Enhancement Wetlands and Wetland Compensation Area 1 – Riparian Offline Wetlands	Drainage Realignment Enhancement Wetlands – Riparian Online Wetlands	Wetland Relocation Area A	Wetland Compensation Area 2
Willow Thicket Swamp	Yes	No	No	No
Mineral Shallow Marsh	No	Yes	Yes	Yes
Mineral Meadow Marsh	Yes	No	Yes	Yes

2.4.3.1 Compensation and Relocation Wetland Water Availability Assessment

A critical component of designing wetlands is to determine whether appropriate water balances can be maintained post-development to ensure features continue to function properly; the typical hydroperiods for the proposed wetland compensation types can be seen in **Table 4**.

Table 4: Compensation and Relocation Wetland Vegetation Communities - Typical Hydroperiods

Wetland Type	Hydroperiod			
	Spring Freshet (late February to April 30)	**Summer (May - August)**	**Fall (September - November)**	**Winter (December - Early February)**
Willow Thicket Mineral Swamp (SWT2-2)	5-30 cm water depth with peaks up to 60 cm depth that dry down to 15 cm (or less) within 6 days	5-15 cm water depth with storm event peaks up to 60 cm depth that dry back down to 15 cm (or less) within 6 days. Can also go dry (0) for part of summer.	Same as spring	Frozen condition

Wetland Type	Hydroperiod			
	Spring Freshet (late February to April 30)	**Summer (May - August)**	**Fall (September - November)**	**Winter (December - Early February)**
Cattail Shallow Marsh (MAS2-1)	30-55 cm water depth with peak events drying back down to 45 cm (or less) within 1.5 months	Can have brief dry-down (several weeks to month) otherwise same as spring	Same as spring	Frozen condition
Mineral Meadow Marsh (MAM2)	0-30 cm water depth	Can go dry much or summer or periodically rewet (0-30 cm)	5-30 cm	Frozen condition

A water availability analysis was carried out for Wetland Relocation Area A and Wetland Compensation Area 2, and the Drainage Realignment Wetland Enhancement to assess whether the vegetation communities will be at risk due to drought conditions (**Table 4**), and whether they can be supported by precipitation alone. The present-day typical quantities of precipitation in the region will be compared to the expected levels of evapotranspiration. Integrating climate change considerations into water balance modeling involves incorporating projected changes in climate variables, such as the temperature, precipitation, evapotranspiration, and runoff, into existing water balance models. To account for climate change, the present-day results mentioned previously were compared against data from a 2041-2070s projection. The projected data, retrieved from a database developed by Environment and Climate Change Canada (ECCC), the Computer Research Institute of Montreal (CRIM), Ouranos, the Pacific Climate Impacts Consortium (PCIC), The Prairie Climate Centre (PCC), and HabitatSeven (ClimateData.ca, 2024). An ensemble of 16 climate models were used in the analysis to run plausible futures under a “business as usual” Representative Concentration Pathway (RCP) 8.5 emission scenario. An ensemble, or multi-model approach uses multiple models together to produce a full range of possible climate scenarios.

The water balance accounting methodology, developed by Thornthwaite and Mather (1957), equates the precipitation (P) over a given area to the summation of the change in water storage (S), evapotranspiration/evaporation (ET), surface water runoff (R) and infiltration (I) using the following equation:

- Precipitation (P): For the purposes of approximating the annual precipitation at this site, the monthly rainfall between 1981 and 2010 was used based on Environment Canada historical weather data from the “Albion Field Station” weather station (Climate ID 6150103, Latitude 43.92 N, Longitude -79.87 W, Elevation 221.0 metres), located about 11 km east of the site;
- Storage (S): Although there are groundwater storage gains and losses on a short-term basis, the net change in groundwater storage on a long-term basis is assumed to be zero due to the subsurface conditions (silty clay till). When the soil is completely saturated, there is no/minimal infiltration, and precipitation stays above ground up until standing water exceeds the limit of the wetland and spills over into the adjacent natural heritage feature;

- Evapotranspiration/Evaporation (PET): The evapotranspiration and evaporation components vary based on the characteristics of the land surface cover (i.e., type of vegetation, soil moisture conditions, perviousness of surfaces, etc.). Potential evaporation refers to total possible evaporation given an average monthly temperature, while the actual evaporation only includes the amount of water available as rainfall or storage; and
- Water Surplus: The difference between the mean precipitation and evapotranspiration is referred to as the water surplus. If a groundwater deficit exists, the surplus water infiltrates into the soil before accumulating in the form of standing water.

The analytical approach to calculate the water balance involves monthly storage balance calculations to determine the surpluses or deficits on a monthly basis. The following assumptions were used as part of the storage balance calculations:

- A soil moisture balance approach assumes that soils do not release water as potential recharge while a soil moisture deficit exists;
- During wetter periods, any excess of precipitation over evapotranspiration first goes to restore soil moisture. Considering the nature of the near surface soils (silty clay till) and a combination of wooded and wetland vegetation, a soil moisture storage capacity of 200 mm was used for the wetlands; and
- Once the soil moisture deficit is overcome, any further excess water accumulates in the wetland in the form of standing water.

Monthly potential evapotranspiration calculations accounting for latitude, climate and the actual evapotranspiration and water surplus components of the water balance based on the monthly precipitation and soil moisture conditions were calculated. Due to the clay to silt-textured till surficial geology in the study area, it is assumed that the majority of a given month's surplus will remain above the surface as standing water within the wetlands. As noted in the Phase 1 CEISMP, the pre-development recharge across the Study Area was estimated to be approximately 102 mm/year, which is considered relatively low.

The area of the proposed riparian wetlands are 1.046 ha and tableland wetlands are 0.39 ha (**Table 2**). For the purposes of the water balance calculation, Wetland Compensation 1 was combined with the drainage feature realignment enhancement wetlands. As all wetlands consist entirely of vegetated area, no impermeable surfaces were accounted for.

The floodplain wetland and tableland wetland designs can be found on **Sheet G-05** (**Appendix B**).

There is limited surface water exchange between the Wetland Relocation Area A and the realigned channel (<1 mm change during a 12-hour, 2-year design storm). The same applies for Wetland Compensation Area 2, which will only receive external flows during storms, from the rooftop drainage system. As such, a worst-case scenario was adopted for the water balance, where it was calculated that water levels in both Wetland Relocation Areas A and Wetland Compensation Area 2 would be sustainable under precipitation exclusively. The recommended quantities shall be perceived as maximum values, as it is normal for wetlands to experience less than maximum water levels in a typical year.

Table 5 and **Table 6**, below, show monthly soil moisture levels in a typical year, for present-day conditions and the 2041-2070s conditions respectively.

Table 5: Monthly Water Balance Results - Present Day Wetland Storage Conditions

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Av. Temp (°C)	-7.0	-5.9	-1.4	6.1	12.4	17.3	19.9	19.1	14.3	8.1	2.1	-3.9
Precip. (mm)	60.4	50.2	50.3	67.0	76.1	75.5	81.8	77.4	75.0	68.3	81.7	57.7
PET (mm)	0.0	0.0	0.0	32.6	77.3	110.5	130.0	114.9	73.5	36.5	7.5	0.0
P – PET (mm)	60.4	50.2	50.3	34.4	-1.2	-35.0	-48.2	-37.5	1.5	31.8	74.2	57.7
Δ Storage (mm)	0.0	0.0	0.0	0.0	-1.2	-35.0	-48.2	-37.5	1.5	31.8	74.2	0.0
Storage Lev. (mm)	500.0	500.0	500.0	500.0	498.8	463.9	415.6	378.1	379.6	411.4	485.5	500.0

Table 6: Water Balance Results (2041 – 2070 Wetland Storage Projected Conditions)

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Av. Temp (°C)	-2.8	-2.0	2.2	9.1	15.7	21.0	24.2	23.4	19.0	12.5	6.2	0.6
Precip. (mm)	61.8	57.4	64.4	79.7	72.8	69.1	59.3	68.7	66.8	62.0	81.7	72.5
PET (mm)	0.0	0.0	5.4	38.0	86.9	127.9	156.2	138.0	91.2	47.8	16.3	0.7
P – PET (mm)	61.8	57.4	59.0	41.7	-14.1	-58.8	-96.9	-69.3	-24.4	14.2	65.4	71.8
Δ Storage (mm)	0.0	0.0	0.0	0.0	-14.1	-58.8	-96.9	-69.3	-24.4	14.2	65.4	71.8
Storage Lev. (mm)	500.0	500.0	500.0	500.0	485.9	427.1	330.2	260.9	236.4	250.6	316.0	387.8

Once the general water balance was calculated for the Study Area, the normalized parameters were applied to the individual Compensation/Relocation Wetland Areas to establish volumetric requirements. **Table 7** and **Table 8** below, show the annual precipitation, evapotranspiration, and greatest monthly deficit for each wetland, volumetrically. The greatest monthly deficit is defined as the volume of water required to overcome the greatest monthly discrepancy between precipitation and evapotranspiration.

Table 7: Water Balance Summary - Present Day Precipitation, Evapotranspiration, and Deficits

Wetland Compensation Area	Annual Precipitation (m^3)	Annual Evapotranspiration (m^3)	Greatest Monthly Deficit (m^3)
Drainage Realignment Enhancement & Compensation Area 1	5394	3830	317
Compensation Area 2	2874	2041	169

Table 8: Water Balance Summary (2041 - 2070 Project Precipitation, Evapotranspiration and Deficits)

Wetland Compensation Area	Annual Precipitation (m^3)	Annual Evapotranspiration (m^3)	Greatest Monthly Deficit (m^3)
Drainage Realignment Enhancement & Compensation Area 1	5362	4655	637
Compensation Area 2	2857	2480	339

The Thornthwaite Mather water balance results from the present-day climate scenario suggest that groundwater and wetland storage are maintained at a reasonable level. As seen in **Table 5**, in a typical year, the storage in the system never fully depletes, reaching a minimum level of approximately 378 mm in the month of August, or a standing water level of 178 mm. The minimum storage is reached one month after the greatest monthly deficit occurs, in July.

When using a data representing the '2050s', the storage in the system reaches a minimum of 236 mm in the month of September, or a standing water level of 36 mm The increased temperature results in greater evapotranspiration and coupled with the decrease in summer-time precipitation, conditions become favourable for drier conditions. Since drier conditions prove unfavourable for wetland flora and fauna, some recommendations are made for future planning submissions to improve climate resilience for each Compensation/Relocation Wetland Area, and include:

- Wetland Compensation Area 1 and Drainage Realignment Enhancement Wetlands – This area is associated with the lowest drought-risk amongst the three compensation areas, due to its proximity to the realigned channel. Should drought conditions persist such that the realigned channel does not spill over into these wetlands in a frequent enough manner, modifications to the bank threshold elevations near the individual wetland can be made to promote more frequent inundation; and
- Increasing the volume (i.e., monthly, annual) of roof water that hydrologically supports Wetland Compensation Area 2 would help mitigate adverse effects of drought conditions for this analysis, a worst-scenario was adopted, where no inputs outside of precipitation were assumed to supplement the water in the Compensation/Relocation Wetland Areas.

These adaptive measures can be implemented as necessary through the Long-Term Monitoring and Adaptive Management process for the Study Area (**Table 3, Appendix C**).

2.4.3.2 Terrestrial Crayfish SWH Compensation Area

The small wetland (Wetland C1) next to the FOD8-3 provides Terrestrial Crayfish SWH and is proposed for partial removal, (0.30 ha) and compensation to accommodate the Prologis Site Plan. Terrestrial Crayfish are closely associated with clay substrates and wetlands where groundwater is close to the surface. There are two recommended options for habitat compensation to support terrestrial crayfish repopulation:

1. Retain a portion of the original wetland habitat which allows for natural recolonization by the terrestrial crayfish; and
2. Retain headwater contributions and create new habitat downstream from the original habitat to allow for contributions from upstream habitat.

A portion of Wetland C1 will be retained, while the rest will be relocated into Wetland Relocation Area A. With an HDF connection young crayfish will flush down to available wetland habitat where a breeding population can be established between 2-3 years (Savanta, 2019). Based on the Relocation Wetland A design discussed in **Section 2.4.3**, this relocation habitat should provide a suitable area for repopulation of terrestrial crayfish. Wetland Relocation Area A is an extended floodplain of the realigned drainage feature realignment and spring freshet conditions can support repopulation of Terrestrial Crayfish in Wetland Relocation Area A.

To accommodate the life cycle of terrestrial crayfish, habitat removals should occur in summer months when terrestrial crayfish burrow deepest into the substrate to limit disruption; no removals should occur during spring when terrestrial crayfish are closest to the surface.

Vegetation removal within terrestrial crayfish habitat to be removed will require bird nest sweep surveys within Migratory Birds Convention Act (1994) window. All tree removals within terrestrial crayfish habitat to be completed outside of the active windows for breeding birds and bats (March 15 to November 30), or bat exit surveys are required.

The retained portions of the SWH and the compensation area will be further protected by a 10 m vegetated buffer to provide important foraging habitat and protection to the wetland and SWH from sedimentation and surface water runoff.

2.4.3.3 Indirect Fish Habitat Compensation Area

Some HDFs (i.e., portions of HDF-8 and HDFs 4a,10a, 11a, 12a, 13a, and 15a), which provide indirect habitat for downstream fish habitat, including offsite Redside Dace (4.5 km downstream of the Study Area), are proposed for removal and replication of functions. These features are degraded due to ongoing agricultural practices, resulting in siltation from being ploughed through, and pollution from fertilizers.

Replication and enhancement of functions (baseflow and coarse sediment supply) is anticipated to be achieved through SWM Ponds 1 and 3, and Wetland Compensation Area 2. Ponds 1 and 3 will have extended detention (25 mm event over 48 hours) and are designed to deliver enhanced protection by maintaining a permanent pool, achieving 80% removal of total suspended solids (TSS). The permanent pools will be 3 m deep for thermal mitigation.

Wetland Compensation Area 2 has been designed to replicate and enhance contributing fish habitat functions by improving water quality and lowering water temperatures. This compensation wetland is hydrologically supported by precipitation inputs alone. To provide post-development site groundwater balance, roof tops are connected to Wetland Compensation Area 2. Water polishing is expected as flows are conveyed through the Wetland Compensation Area 2. Wetland Compensation Area 2 is proposed to provide flow to HDF-8 via an outlet. An additional, optional connection to the Clarkway Tributary may be provided by SCE. Riparian plantings within the 10 m VPZ for this wetland will also contribute to thermal mitigation for this feature.

Both SWM Ponds 1 and 3 and Wetland Compensation Area 2 will outlet to alluvium deposits to deliver coarse sediment supply to downstream fish habitat, including offsite habitat for Redside Dace. Compared to the existing impairment due to active agriculture described above, the proposed mitigation is expected to be a considerable improvement.

As the lands within the Study Area move through subsequent planning applications, adherence to the MNRF's Guidance for Development Activities in Redside Dace Protected Habitat (2016) and the Thermal Mitigation Checklist for Stormwater Management Ponds Discharging into Redside Dace Habitat (2014) is recommended to support the final design of compensation wetlands, stormwater ponds, and low impact development solutions as contemplated in the Phase 2 CEISMP.

2.4.4 Compensation Woodland

A portion of Fresh-Moist Lowland deciduous forest (FOD8-3) within Woodland 2 is proposed for removal and compensation to accommodate shifting the proposed drainage feature alignment to the west to provide the needed area for an industrial building footprint.

As outlined in the Phase 2 CEISMP, this woodland feature is considered a Core Woodland Area in the Town of Caledon Official Plan (2018). To support the removal of 0.06 ha of FOD8-3 (the remainder of the 0.34 ha of removals is CUT and CUM1), the Humber Station Employment Area Secondary Plan policies (Section 7.16.7.3) have been revised to permit minor encroachment and compensation as outlined in an approved CEISMP and EMP. This is based on the principal that the total native woodland removal is small (0.06 ha of the total 0.34 ha removal), and that final preliminary NHS will provide for an improved system with enhanced native woodlands, invasive species management, and improved NHS connectivity.

The woodland compensation is targeting a lowland deciduous forest community, with a treed canopy cover of 75% or greater once established on the landscape. A Fresh-moist Oak – Maple – Hickory Deciduous Forest (FOD9) is targeted for the compensation woodland. The FOD9 communities are generally a mix of upland and lowland/wetland species suitable for a riparian area. These communities are typically characterized by loam and clay soil textures, which are found within the Study Area, as well as species that are typically observed throughout the Study Area, such as Red Oak (*Quercus rubra*), White Oak (*Quercus alba*), Bur Oak (*Quercus macrocarpa*), Sugar Maple (*Acer saccharum*), Red Maple (*Acer rubrum*), Shagbark Hickory (*Carya ovata*) and Bitternut Hickory (*Carya cordiformis*) with the inclusion of sedge and fern species.

The Compensation Woodland is planned adjacent to the extended floodplain surrounding Wetland Relocation Area A. This is appropriately located as the partially removed woodland was adjacent to HDF-3 and its associated wetlands and will ensure that connectivity between these features is maintained in the NHS.

2.4.5 Amphibian Habitat Creation

The proposed development requires the removal of wetlands and woodlands; some of which provide suitable habitat conditions for four amphibian species, as noted below. Amphibian habitat creation, for compensation of this removal/realignment, is targeted to be created with woodland, wetland and proposed drainage channel realignment design.

Pre-development amphibian habitat proposed for realignment and compensation:

American Toad

- Breeding habitat: Marshes;
- Summer habitat: Woodland habitat; and
- Overwintering habitat: Hibernates terrestrially, burrows into soil below frost line.

Green Frog

- Breeding habitat: Stream banks;
- Summer habitat: Moist woodlands near water and riparian areas; and
- Overwintering habitat: Adults and tadpoles overwinter aquatically in the breeding pond or adults may move to another pond.

Grey Tree Frog

- Breeding Habitat: Marshes;
- Summer Habitat: Upland areas within forested or thicket habitats; and
- Overwintering Habitat: Hibernates terrestrially, within logs, tree roots or under leaf litter.

Northern Leopard Frog

- Breeding Habitat: Ephemeral wetlands, and stream banks; and
- Summer Habitat: Generalist species that are observed in a variety of habitat types, with a preference for more open communities.

Compensation and relocation wetlands to support amphibian habitat are generally designed with shallow slopes (4:1 to 8:1) facing suitable habitats to enable amphibians to move between the replicated wetlands and surrounding habitat (i.e., riparian and upland summer habitats). Shallow slopes provide a wide littoral zone to support emergent, meadow marsh and shrub vegetation. This vegetation provides egg attachment sites (e.g., emergent vegetation, branches), foraging habitat for insects (food source), shelter from predators, and overwintering habitat for some species. Steeper slope grading can also beneficial where the wetland polygon fronts the proposed development, to discourage wildlife movement towards development/roadways. Deciduous trees and shrubs are recommended to provide partial shade and leaf litter that will regulate wetland temperature and provide shelter sites and potential terrestrial overwintering habitat. Woody roots that interact with the littoral wetland zone can also serve as refugia and egg attachment sites.

2.5 Fluvial and Ecological Considerations for Stormwater Management Pond Outfall Location and Design

It is recommended that the proposed SWM pond outlets be placed entirely outside of natural heritage features (i.e., above staked top of bank, outside of woodland and wetland setbacks) with their outfalls placed and designed in collaboration with a fluvial geomorphologist to avoid erosion and sedimentation. Energy dissipation measures, such as a pocket wetlands, are recommended at the outlet, to reduce erosive forces downstream of the outlet. The pocket wetland would include a stone core, comprised of hydraulically sized substrate, designed to withstand the outlet's flow range. A layer of hydric soil is placed above the stone core and seeded with native vegetation. The pocket wetland would be intended to provide additional retention functions and promote infiltration within the feature. A level spreader at the wetland's outlet would allow dispersion of overland flow once the retention capacity is reached.

2.6 Restoration and Enhancement Plan Summary

The proposed preliminary NHS is planned to contain:

- One north-south corridor:
  - Through the retained Clarkway Drive Tributary valley.
- One east-west corridor:
  - Connecting Proposed Drainage Feature Realignment to the Clarkway Tributary valley through Wetland Relocation Area A and Woodland Compensation Area.
- Additional NHS connectivity:
  - North-south through the proposed HDF-3 Drainage Feature Realignment; and
  - West-east through the Clarkway Drive Tributary to Wetland Compensation Area 2.
- Minimum 10 m wide native vegetation buffer between woodlands (significant and non-significant) and development;
- Minimum 10 m wide native vegetation buffer between local wetlands and wetland compensation areas and development;
- Minimum 15 m wide native vegetation planted buffer between warm water fish habitat and development;
- 10 m setbacks from the Long-term Stable Top of Slope (LTSTOS) and Regional Floodline;
- 0.35 ha of woodland compensation;
- 1.40 ha of wetland relocation and compensation (riparian online and offline wetlands, tableland wetland);
- 1,438 m of realigned drainage channel length (representing a net gain of 351 m);
- Amphibian habitat creation (compensation wetland, woodland, drainage feature realignment); and
- Terrestrial Crayfish habitat with a 10 m wide native vegetation planted buffer (retained portions Wetland C1 and Wetland Compensation Area 2).

In addition, the following restoration actions are proposed to support a more robust preliminary NHS:

- EMPs to include targeted Invasive Species Mapping and management risk assessment for Common Buckthorn, Phragmites and White Poplar, where applicable;
- Relocation of one Barn Swallow replacement structure (50 m) to accommodate the proposed drainage feature realignment. The replacement structure will remain inside the NHS;
- Where feasible, salvage and transplant of rare species will be relocated from removed habitats into compensation habitats; and
- SWM Pond outfalls designed with stone size appropriate for the hydraulic gradient and suitable for native seeding.

3. NHS Implementation Plan

The implementation of the Study Area NHS is informed by planning, engineering and ecological constraints and opportunities during construction. This section includes the land ownership plan (including non-participants), provides a sequencing (phasing) for servicing and buildout, includes an NHS Implementation (Phasing) Plan in consideration of agency permitting and wildlife windows and indicates LOG responsibilities for implementation.

3.1 Implementation Considerations

The successful delivery of various components of the NHS requires an implementation plan that considers the following items:

- maintaining the environmental integrity of the existing NHS;
- sequencing of site works to maximize the ability to deliver the proposed NHS in a timely manner and integrating NHS delivery with development phasing plans;
- following agency required wildlife construction windows;
- cold-climate construction season as it relates to the “growing season”;
- erosion and sediment prevention and control;
- co-operation amongst the developers, consultants and Approval Agencies; and
- creativity and flexibility in solving implementation challenges.

A conceptual NHS Implementation (Phasing) Plan is provided in **Table 9** (**Appendix C**); however, each individual subdivision will require detailed implementation plans as part of subsequent planning applications.

3.2 Phased Buildout and Site Accessibility

The Study Area will be developed in phases. The initial phase of build out within the Study Area will be to support the Site Plan Application for the Prologis Phase 1A development (the George Bolton Parkway Extension). This initial phase will include interim servicing of the Phase 1A building, road design, and NHS construction within the Prologis lands (drainage feature realignment, partial woodland removal and compensation, partial Wetland C1 removal and relocation).

The majority of the proposed development is within the HSV LOG land holdings; see Landownership Plan in **Figure 4, Appendix A.** However, there will be restricted access to direct flows to the parcel where Wetland Compensation Area 2 and SWM Pond 3 will be constructed due to the non-participating property that separates parcels owned by Ballantry Homes. It is expected that this will be facilitated when this non-participating owner becomes a participant. An option to outlet Wetland Compensation Area 2 to Clarkway Tributary on the HSV LOG land holdings is also provided.

The remaining servicing, road structure and construction, will commence at a later phase once access is resolved.

3.3 Permitting Requirements to Agencies or other Parties

This section provides guidance for various regulatory permitting requirements necessary for the implementation of the development in the Study Area and in particular, the NHS, site grading and servicing.

Stakeholder Engagement

Stakeholder's will be engaged through the Planning and Development stages by way of Public Consultations and Formal Submissions. Stakeholder feedback received from this engagement will then be review by the development team and implemented into the plans and designs where possible. This engagement will follow the typical submission, comment, resubmission procedure until approval is received.

Stakeholder engagement has continued through Phases 1 to 3 of this CEISMP, with the following stakeholders being regularly engaged to provide feedback and comments:

- Town of Caledon;
- Peel Region;
- Toronto Regional Conservation Authority (TRCA);
- Ministry of Transportation Ontario (MTO, for future 413 ROW and related items); and
- Indigenous Nations (engagement as part of the Environmental Assessment).

Fisheries and Oceans Canada

As per the *Fisheries Act*, as administered by Fisheries and Oceans Canada (DFO), permits may be required for any activities that may result in the death of fish, or the harmful alteration, disruption or destruction of fish habitat. This may extend to any fish salvage or rescue that is required to support the ecological compensation efforts; a Scientific Collectors Permit is required to carry out this work. Should removal of no management, mitigation, or conservation HDFs' or culvert replacement occur when standing water is present (seasonal fish habitat), an MNRF permitted fish rescue will be required.

Where a project has the potential to cause impacts to fish or fish habitat, consultation with the DFO should occur to identify whether additional permits or approvals are required. DFO also is responsible for administering the SARA for aquatic species at risk and their habitat.

Submission of a Request for Review of the proposed drainage feature realignment and Wetland Compensation Area 2 is recommended to determine regulatory approvals required. Request for Review can be submitted to the local DFO office. Early engagement with the DFO can help ensure appropriate work authorizations are obtained prior to any works within the Study Area. In some cases, a Letter of Advice may be sufficient, which acts as a list of measures to implement to avoid and mitigate the potential for prohibited effects to fish and fish habitat. If avoidance is unlikely, pursuit of a permit will be required.

As part of the Request for Review, DFO will also provide guidance on whether a SARA permit is required due to any proposed works that may impact offsite occupied RSD habitat. Where regulatory approvals are required under both SARA and the *Fisheries Act*, it may be possible to get a *Fisheries Act* authorization that also acts as a SARA Permit.

Consultation with DFO will be required for the proposed realignment of HDF-3, and all correspondence must be provided to the Town prior to implementation.

Toronto and Region Conservation Authority

As per the *Conservation Authorities Act* and O. Reg. 41/24, permits will be required for development within TRCA regulated areas. This permit type will be required for the alteration and compensation of all regulated wetlands and the drainage feature realignment (HDF-3) within the Study Area.

Ministry of Environment, Conservation and Parks

Ontario Water Resources Act Certificate of Approval for SWM – All infrastructure (storm sewers, sanitary sewers, and watermains) requires a Certificate of Approval from MECP. SWM facilities discharging into watercourses also require MOE review and certification; this typically involves submission of detailed facility design reports demonstrating conformance to approved SWM targets.

Ontario Water Resources Act Permit-to-Take-Water – For construction dewatering, water takings of more than 50,000 L/day but less than 400,000 L/day may be registered on the Environmental Activity and Sector Registry (EASR) while water takings of more than 400,000 L/day required a Permit to Take Water (PTTW) issued by the MECP.

In 2025, amended Ontario Regulation 63/16 under the *Environmental Protection Act* removed the volumetric restriction that may have previously required a PTTW for construction dewatering activities. As of July 1, 2025, proponents will be required to self-register construction dewatering activities as an EASR regardless of the volume of water taking. Ontario Regulation 387/04 has also been amended to exempt foundation drainage systems used primarily for residential purposes, for takings of up to 379,000 L/day, from requiring approval or self-registration.

Based on the calculated dewatering rates described above, and considered the amended Ontario Regulation 63/16, an EASR would be required to support the installation of deep servicing

The application for an EASR will require supporting hydrogeological information, an assessment of potential impacts related to the dewatering, proposed monitoring and mitigation plans as well as details of the proposed location of discharged flows.

Endangered Species Act (2007) - The Province of Ontario is actively pursuing changes to SAR legislation through Bill 5, Protect Ontario by Unleashing our Economy Act, 2025, which received Royal Assent as of June 5th, 2025. Bill 5 includes changes to the ESA and introduces the Species Conservation Act (SCA).

Based on the current SAR legislation framework in the province, it is anticipated that thermal mitigation will be sufficient to avoid negative impacts to downstream Redside Dace habitat, and no permits under the ESA will be required for the proposed removal and replication of HDFs.

Should any development or site alteration be proposed within non-participating properties where candidate SAR habitat may occur, additional consultation with MECP may be required to understand registration and mitigation processes under the new *Species Conservation Act* (Draft 2025) which will be enacted on a date yet to be determined.

The Town must be provided with a copy of the submitted MECP Information Gathering Form (IGF) and correspondence with MECP regarding the results of the IGF.

Town of Caledon

Woodland removals and non-woodland trees proposed for removal and their required compensation should be evaluated through an appropriately scoped Arborist Report and Tree Preservation Plan, in alignment with the Town of Caledon's Terms of Reference (Caledon, 2020). A permit under the Town's Woodland Conservation Bylaw (By-law 2000-100 'Woodland Conservation') is only required for removals prior to site-specific planning approvals.

A Site Alteration Permit, Pre-Servicing Agreement, Topsoil Stripping Permit, and Construction Access Permit must also be obtained from the Town.

The various departments of the Town must also approve the trail system, park design, landscaping, general site grading and servicing, including underground (storm, sanitary, and water), above-ground design, SWM facility design, and maintenance plans. This approval process will be required as part of subsequent planning applications for the Study Area.

3.4 Sequencing of Servicing, NHS Construction and Build-out

The Humber Station Employment Area Natural Heritage System Implementation (Phasing) Plan (**Table 9**, **Appendix C**) provides the sequence of natural feature removal and NHS construction (compensation features, NHS buffers), providing constraints windows for each action.

To support sequencing for servicing and construction, a Wildlife Construction Window Table was prepared (**Table 10**, **Appendix C**) which summarizes the constraints and timing for construction to protect fish, bat, bird, amphibian, and reptile habitat.

Additional discussion on construction and conveyance and dewatering is provided in the sections below.

3.4.1 Construction and Conveyance

The following are best practices and guidelines that should be followed as part of the construction and conveyance of the Study Area:

- The isolation of in-stream work areas for the proposed drainage feature re-alignment is preferred to facilitate construction "in-the-dry" and thereby mitigate against the risk of downstream sediment transport while construction of the realigned drainage feature takes place;

- The current site plan does not propose any municipal services under the retained or proposed NHS. Should this change in future individual planning submission applications the construction of municipal services and road crossings of the NHS should be completed prior to the construction of any proposed NHS features (i.e., drainage feature, wetland);
- Soil investigations, along the proposed drainage feature realignment, Wetland Compensation Areas 1 and 2, Wetland Relocation Area A, and the Woodland Compensation Area is required to assess the potential for encountering layers of high hydraulic conductivity sediments;
- Where the site is being cut, topsoil and subsoil will be stockpiled, and topsoil will be tested for suitable plant growth prior to re-use on site as per TRCAs Health Soil Guidelines (2012);
- An assessment of the dewatering requirements for construction will be made based on the detailed construction plans (See **Section 3.4.2** for more information on dewatering recommendations). Management and mitigation plans will be developed to address groundwater control as well as the potential for long-term water table lowering. An EASR may be required from the MECP depending on the anticipated quantity of dewatering required during construction;
- Rigorous erosion and sediment control measures must be designed, implemented, and maintained throughout the construction period. At detailed design, an Erosion and Sediment Control Plan will be prepared and designed in conformance with the Town and TRCA guidelines. Erosion and sediment control will be implemented for all construction activities including topsoil stripping, earthworks, foundation excavation and stockpiling of materials and will remain in place and functional until bare surfaces are stabilized. Reference should be made to the *Erosion and Sediment Control Guide for Urban Construction (TRCA, 2*019) when preparing Erosion and Sediment Control Plans;
- The following erosion and sediment control measures should be considered for use during construction:
    - Natural features will be staked, and temporary fencing provided to keep machinery out of sensitive areas;
    - Sediment control fence and snow fence will be placed prior to earthwork;
    - Logistics/construction plan will be implemented to limit the size of disturbed areas, minimizing the non-essential clearing and grading areas;
    - Temporary sediment ponds will be utilized;
    - Rock check-dams and cut-off swales will be provided, where required, in order to control, slow down and direct runoff to sediment basins;
    - Sediment traps will be provided; and
    - Gravel mud mats will be installed at construction vehicle access points to minimize off-site tracking of sediments.
- All temporary erosion and sediment control measures will be routinely inspected/monitored and repaired during construction. Temporary controls will not be removed until the areas they serve are restored and stable;
- The “multiple barrier approach” will be applied to all construction stages to ensure erosion is prevented rather than reduced. Recommended measures are to be installed prior to the initiation of the earthworks and grading;

- All temporary erosion and sediment control measures will be routinely inspected and repaired during construction. Temporary controls will not be removed until the areas they serve are restored and stable. A third-party inspector will be involved to assess the temporary sediment and erosion control measures;
- Adequate riparian storage must be maintained, to the extent feasible, during construction periods:
    - Timing restrictions are typically imposed on in-stream work to avoid periods when fish are spawning. Eggs and embryos may be present at these stages and are particularly sensitive to sediment. In Ontario, most fish spawn in the spring, but some species spawn during the mid-to-late fall period. HDFs' proposed for removal that provide seasonal warmwater fish habitat, to be removed (following permitted fish rescue) July 16 through March 14. Should an HDF be dry outside of warmwater fish window, HDF removal can occur outside of this window and without fish rescue. These timing windows are guidelines, and some flexibility exists in these dates; however, approval from the TRCA and MECP is required for deviations from these timelines and stabilization strategies.
- Practical measures for the maintenance of seasonal water levels in retained wetlands and watercourses during construction, as well as monitoring requirements, must be identified and implemented, where feasible;
- The construction and conveyance of the projects to public ownership will be implemented through agreements between the landowners and the Town. These agreements will address extent of works, construction phasing, securities requirements, conveyance mechanisms, etc.; and
    - Generally appropriate timings for the above measures are included in **Table 9** (**Appendix C**).

3.4.2 Dewatering Requirements

Dewatering will be required for construction along George Bolton Parkway, Street A2, and the construction of the three stormwater management ponds. Minor seepage control may also be required along the proposed drainage feature realignment, Wetland Compensation Area 2 in the southeast portion of the Study Area, and the installation of the storage tank facility near HDF-3 east of Humber Station Road.

Site-specific dewatering requirements should be reviewed at the Draft Plan Approval stage. The Phase 2 CEISMP report provided an assessment of dewatering and depressurization requirements for the George Bolton Parkway and Street A2 sewer installations, as well as the three SWM ponds and the storage tank facility.

As noted in the Phase 2 CEISMP report, due to the proposed depths of the sanitary sewers, particularly along George Bolton Parkway and the north end of Street A2, the lower confined aquifer will need to be depressurized prior to start of construction activities to avoid potential issues associated with basal heave in the trench excavations associated with pressurized confined ORM aquifer (ORAC). However, the assessed depressurization requirements are moderate. The potential depressurization rates along George Bolton and Street A2 were calculated to be 57,439 L/day and 22,450 L/day, respectively with corresponding zones of influence (ZOIs) of 189 m and 148 m. Positive dewatering techniques (e.g., wellpoints, eductor wells and/or deep wells) are likely required but should be determined by the dewatering contractor.

Given this limited spatial extent, moderate withdrawal rate, and short-term nature of the depressurization required, the magnitude of potential impacts to surface water features on the overlying till plain or domestic water supplies area expected to be low. Wetland E1, associated with HDF-3, and Wetland F1, associated with the Clarkway Drive Tributary, occur within the depressurization ZOI for George Bolton Parkway and Street A2. However, at these locations, the surface water features are separated from the underlying confined ORM aquifer being depressurized by approximately 15 m of fine-grained till. This is relatively consistent across the Site. The overburden till is of low permeability and as such, any drawdown that propagates vertically from the underlying aquifer is likely to be attenuated within the till matrix. This is interpreted to limit the extent of water table lowering or desaturation effects. Hydraulic connectivity between surface features (e.g., wetlands, shallow wells) and the confined aquifer is interpreted to be negligible across the Site under natural conditions. Consequently, the risk of impacts on surface water features within the depressurization ZOI is considered low.

Short-term potential impacts to nearby domestic wells because of depressurization may occur; however, as noted in the Phase 2 CEISMP report, only one confirmed domestic well occurs within the estimated depressurization ZOI along Humber Station Road. In total, five residential properties that may have domestic wells are located within 500 m of the proposed alignment. It is understood that municipal potable water supplied by the Region of Peel is now available along Humber Station Road. If impacts are noted, tanked water can be provided on a short-term basis, or the impacted wells may be connected to the municipal water supply system.

Based on the discussion above, the proposed depressurization scenario is not expected to result in significant environmental impacts to nearby surficial features, provided that the pumping rate and drawdown are carefully monitored and managed during operations and the duration of dewatering is relatively short. If depressurization of the confined aquifer is sustained for extended periods of time, the change in vertical hydraulic gradients across the areas being depressurized may induce localized lowering of the water table.

Figure 5 (**Appendix A**) illustrates the approximate interpreted ZOI associated with depressurization.

For positive dewatering, three dewatering discharge options were identified:

- Discharge to vegetated areas as dispersed flow (using perforated pipes, sprinkler systems and other dispersion technologies) or as sheet flow with need to demonstrate that this will not adversely impact natural feature hydrology and/or result in vegetation/sediment loss;
- Discharge to temporary sediment pond or the SWM facilities; and
- Discharge to watercourse following pre-treatment.

Conversely, for areas of shallow services or excavations such as the south end of Street A2, or the proposed SWM Pond 3 and Stormwater Tank (located at the west side of the George Bolton Parkway), the estimated preliminary dewatering rates are relatively low (<5 m^3/day for any respective area) and the corresponding ZOI is also limited (~ <5 m). Trench excavations in clayey silt till soils with hydraulic conductivities less than 1×10^{-7} m/s typically present low groundwater inflow potential due to the very limited permeability of the native materials. However, localized seepage, trapped pore water, and perched groundwater may still be encountered and should be managed to maintain safe and dry working conditions. For

these areas, passive dewatering should be sufficient. Passive methods of dewatering include drainage via gravity and manual pumping via sump pumps or similar. Passive methods typically produce lower flows than positive methods of dewatering and have only a localized influence on the water table. Passive methods are generally used in low permeability systems, shallow perched systems, or following precipitation events.

Passive methods of dewatering are used by the contractor on an as-needed basis. In this regard, some amount of passive dewatering is anticipated but will not be known until construction is underway. Any dewatering is discharged using a properly constructed sump pump that consists of a perforated vertical collector pipe wrapped in geotextile fabric. The pump is positioned within the excavation and backfilled with clean stone. The resulting clean discharge is typically directed to the nearest sediment control measure on site, such as sedimentation ponds or drainage swales.

For construction dewatering, water takings of more than 50,000 L/day may be registered on the Environmental Activity and Sector Registry (EASR). The EASR will need to be obtained in accordance with provincial regulations prior to dewatering activities.

It is a requirement during any construction dewatering program that appropriate monitoring of the local groundwater levels and surface water features (wetlands and watercourses) adjacent to the dewatering area be conducted. Should monitoring indicate a radius of influence that could adversely affect the groundwater levels in adjacent natural features or interfere with groundwater supplies to local water wells, mitigation measures must be designed to compensate for the effects.

The long-term monitoring plan (LTMP) and comprehensive adaptive management plan (CAMP) presented in the Phase 3 CEISMP presents a proposed groundwater monitoring program based on the estimated ZOIs associated with short-term dewatering. A key objective of the LTMP is to distinguish potential groundwater-related impacts from natural trends at an early stage. This will provide an ability to focus monitoring to help determine the how/why/frequency of potential impacts and will assess cause-effect relationships between the environment and land use change.

3.4.3 Water Table Lowering

Urban development has the potential to lower the groundwater table as a result of reduced infiltration. In addition, the construction of buried services below the water table has the potential to capture and redirect groundwater flow through more permeable fill materials placed in the base of excavated trenches and may result in an overall lowering of the water table. However, services below the water table will be constructed to prevent redirection of flow. This will involve the use of anti-seepage collars or clay plugs surrounding the pipes to provide barriers to flow to prevent drainage of groundwater flow along granular bedding and erosion of the backfill materials.

Seasonally high-water table conditions have been documented in all retained wetlands across the Study Area. See the Phase 2 CEISMP Wetland Characterization Tables for details. As such, it is important to maintain the high-water table conditions in wetland areas during, and post construction. The LTMP and CAMP presented in the Phase 3 CEISMP present a proposed groundwater and surface water monitoring program in the vicinity of the retained wetlands across the Study Area.

Should minor groundwater seepage be encountered in work in the vicinity of any wetlands or the channel re-alignment during construction, treated groundwater should be collected and discharged back to the wetland feature. Contingency plans for construction will also be required should a zone of higher hydraulic conductivity be encountered unexpectedly during the excavations.

3.4.4 Private Well Water Supplies and Well Decommissioning

The proposed development will be municipally serviced, and the existing groundwater supply wells within the Study Area will be decommissioned as the development proceeds. In the interim, it is important to ensure that construction does not adversely affect local groundwater supplies while the private water supply wells are still in use.

The Region typically requires monitoring of private wells within 500 m of proposed construction works throughout the construction period. As noted in the Phase 2 CEISMP report, the interpreted ZOI associated with short-term construction depressurization of George Bolton Parkway and Street A2 is less than 200 m. Therefore, monitoring wells within 500 m of the Study Area is considered sufficient. Prior to the commencement of earthworks and servicing construction activities, it will be necessary to contact the residents within 500 m, who rely on groundwater supply wells, to document the location and condition of their wells and monitor their well conditions (water quantity and quality) throughout the earthworks period. Additional groundwater monitoring specific requirements are outlined in **Table 11** (**Appendix C**).

Prior to construction, it will be necessary to ensure that all inactive water supply wells, within the development footprint, have been located and properly decommissioned by a licensed water well contractor in accordance with Ontario Regulation 903. In addition, all groundwater monitoring and observation wells installed for the Study Area must be decommissioned in accordance with provincial regulations prior to or during the site development, unless they are maintained throughout the construction period for monitoring purposes.

3.5 Responsibilities for Implementation

The implementation (construction) of the Study Area and the NHS, and implementation of the monitoring program (baseline, during construction, post-construction) is the responsibility of each individual landowner. The exact timing of these activities will be identified through future planning applications.

In July 2025, OPA 287 was adopted by the Town of Caledon which amended the Town's Official Plan policies to introduce policies and mapping specific to the Study Area. OPA Policy 7.18.7.1 notes that the Final CEISMP must be completed to confirm/refine the limits of the Natural Heritage System shown on the corresponding Secondary Plan Schedule to the Town's satisfaction. These areas will be further implemented through their zoning as Environmental Policy Areas under the Town's Zoning By-law (2006-50).

Further, OPA Policy 7.18.7.4 of OPA 287 requires site-specific development approval to be supported by a site-specific EIS that demonstrates how the recommendations of the CEISMP will be implemented. It is also anticipated that conditions will be added to Draft Plan / Site Plan approvals for individual landowners to ensure the NHS is implemented in accordance with the CEISMP. It is assumed that the NHS outlined in the final CEISMP will be protected from site alteration and development until such a time that a site-specific *Planning Act* application has been initiated and approved to the Town's satisfaction.

3.6 Implementation Plan Summary

Key implementation items have been summarized in **Table 9** (**Appendix C**). This includes action items to facilitate protection of features, feature removals, feature realignment, compensation efforts, relocation efforts, restoration measures, culvert installations and stormwater management pond creation, the appropriate months for completion, and key considerations for these action items and their timelines. It is expected that this implementation plan will be reviewed and revised as the lands within the Study Area proceed through subsequent planning applications to better reflect site-specific alterations and construction.

4. Long Term Monitoring Plan and Comprehensive Adaptive Management Plan

The goal of the Phase 3 CEISMP is to compile a multidisciplinary approach for the restoration and enhancement of the NHS to enhance ecological integrity and function, optimize biodiversity and restore natural features. To support this, a proposed LTMP (baseline, during construction, post-construction) and CAMP is summarized for each discipline (ecology, hydrology, hydrogeology) in **Table 11 (Appendix C)**. The high-level recommendations for monitoring and adaptive management are intended to ensure that the compensation, restoration, and enhancements proposed through the Study Area preliminary NHS will properly establish to meet the ecological targets outline in **Section 2.3**.

Agency permits typically stipulate where annual or milestone monitoring is required. Where adaptive management is triggered, it is standard to prepare reporting (for internal use or agency submission) documenting triggers for adaptive management, action taken and follow-up monitoring and reporting planned.

5. Conclusions

The work proposed in this Phase 3 CEISMP is designed to compensate for proposed wetland, wildlife habitat, and woodland removal, and provide additional natural feature enhancement design through the drainage feature realignment, maintain and enhance existing natural heritage features, improve NHS connectivity, manage invasive species, and increase plant species and vegetation community diversity.

The Phase 3 CEISMP includes the following key components to support the long-term implementation of the NHS within the Study Area:

- Design of two compensation wetlands (one for compensation of HDF 3 removal) and one relocation wetland that will support several wetland vegetation types;
- Design of a drainage feature realignment to support enhanced aquatic habitat and to facilitate the compensation wetlands and enhancement wetlands;
- Design of compensation woodland that will support native deciduous woodland type;
- Provision of suitable amphibian breeding habitat within created wetlands resulting in an overall increase in amphibian breeding habitat in the Study Area;
- Compensation of appropriate wetland habitat for Terrestrial Crayfish (Species of Special Concern SWH);
- Diverse, native planting prescriptions within the created wetlands, riparian areas around the drainage feature realignment, woodland compensation area, and other restoration areas;
- Replication of indirect fish habitat functions and stormwater storage through the proposed Wetland Compensation Area 2 with improvements to water quality, quantity, and thermal regulation;
- Assessment of invasive species management opportunities;
- Natural Heritage System implementation considerations;
- Proposed phasing and sequencing of buildout;
- Permitting requirements;
- Responsible parties for implementation; and
- Proposed multi-disciplinary Long-term Monitoring Plan and Comprehensive Adaptive Management Plan.

These actions are intended to support the creation of a robust NHS and meet the NHS ecological targets outlined in **Section 2.3.2**. The long-term management plan and comprehensive adaptive management plan will support the long-term establishment of the NHS and ensure that there are robust measures in place to ensure the success of ecological form and function in the NHS.

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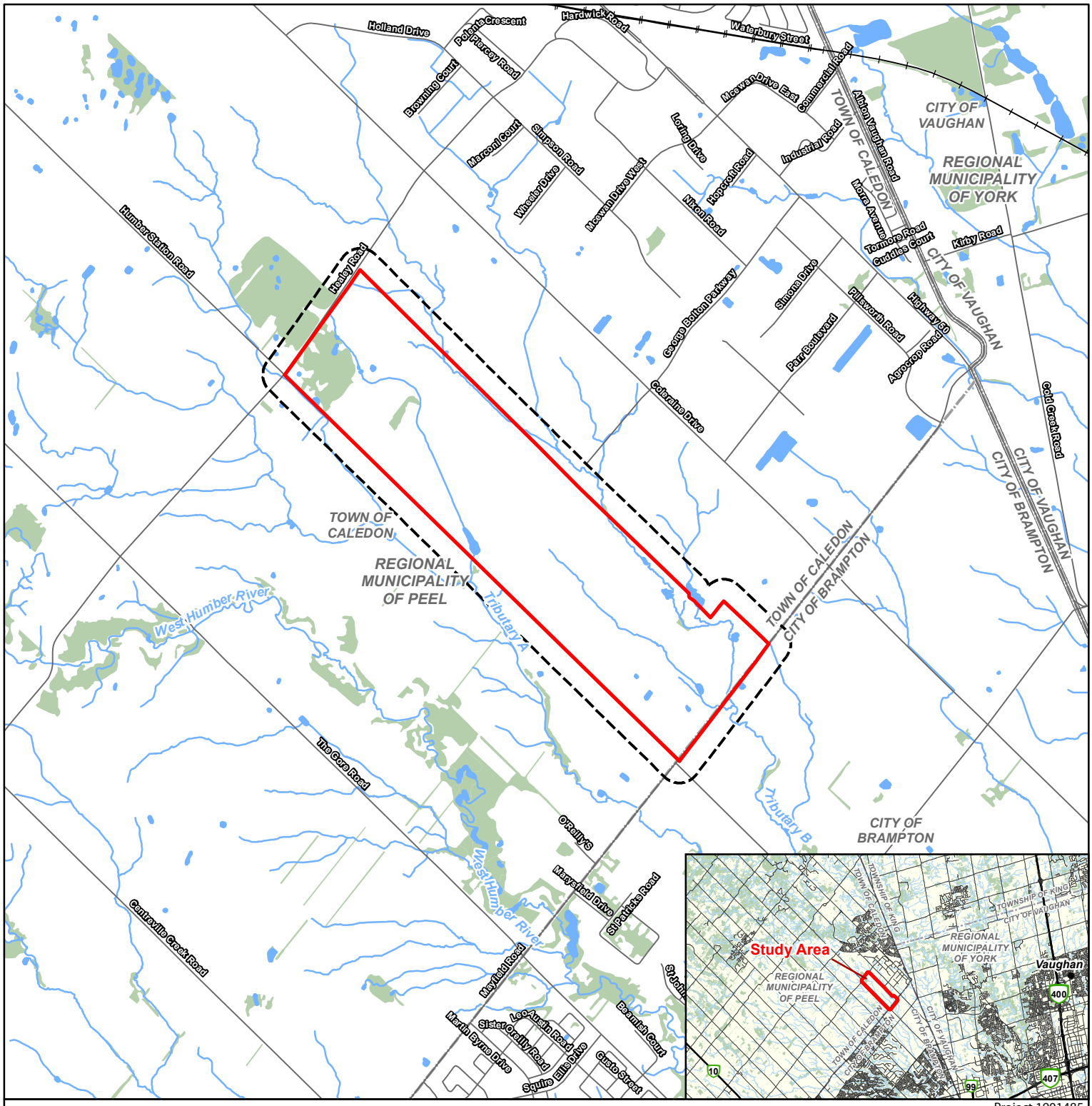
Appendix A

Figures



Project 1901485

Humber Station, Town of Caledon, ON

Figure 1
Location of Study Area

NOTES:
1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2024.

Legend

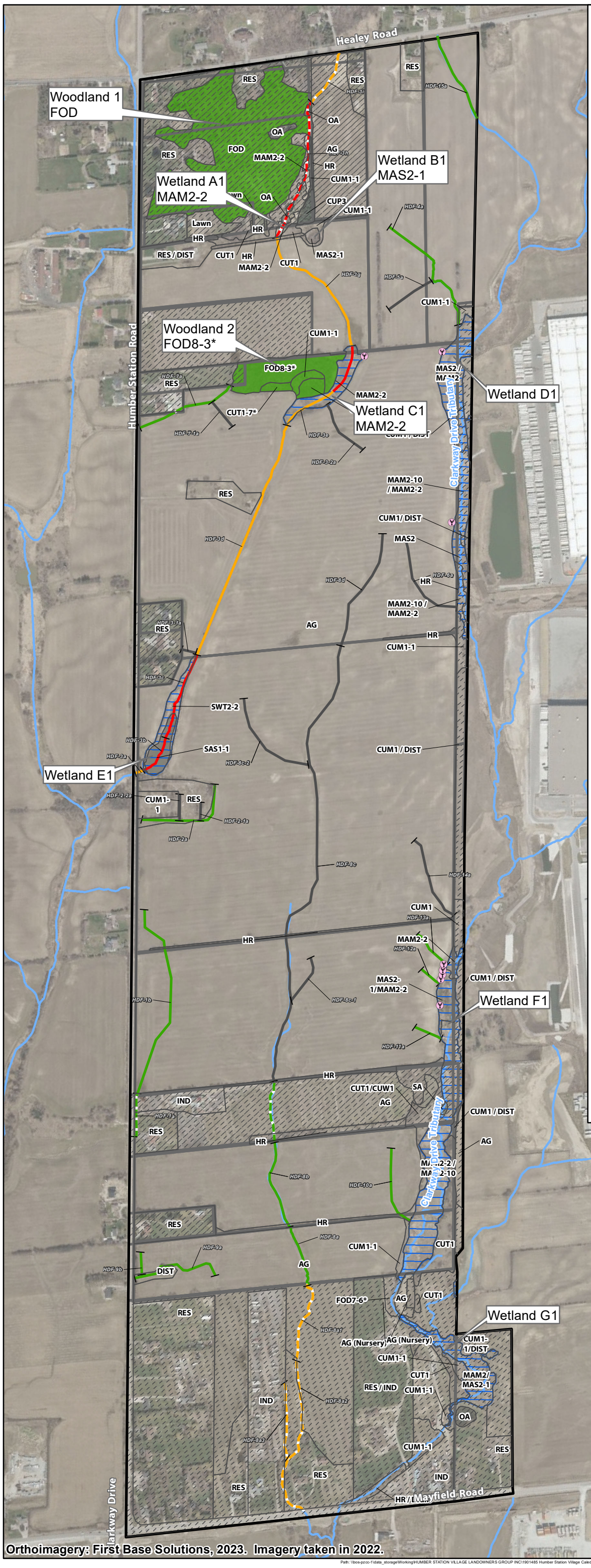
- Study Area
- 120 m Adjacent Lands
- Railway
- Municipal Boundary, Lower/Single Tier
- Municipal Boundary, Upper Tier
- Watercourse
- Waterbody
- Wooded Area

0 500 m

1:30,000

N

GEI Consultants



ELC Legend

CUM1-1	Dry Moist Old Field Meadow
CUP	Coniferous Plantation
CUT	Cultural Thicket
CUT1	Mineral Cultural Thicket
CUT1-1	Sumac Cultural Thicket
CUT1-7*	Buckthorn Cultural Thicket
FOD	Deciduous Forest
FOD7-6*	Fresh-Moist Manitoba Maple Lowland Deciduous Forest
FOD8-3*	Fresh-Moist Basswood Deciduous Forest
MAM	Meadow Marsh
MAM2	Mineral Meadow Marsh
MAM2-2	Reed-canary Grass Mineral Meadow Marsh
MAM2-10	Forb Mineral Meadow Marsh
MAS	Shallow Marsh
MAS2	Mineral Shallow Marsh
MAS2-1	Cattail Mineral Shallow Marsh
OA	Open Aquatic
SAS1-1	Pondweed Submerged Shallow Aquatic
SWT2-2	Willow Mineral Thicket Swamp

AG	Agricultural
DIST	Disturbed
H	Hedgerow
IND	Industrial
Lawn	Lawn
Pond	Pond
RES	Residential

**Not included in Southern Ontario ELC Field Guide.*

- Study Area
- Participating Properties
- Non-participating Properties
- Watercourse (MNRF LIO)
- Ecological Land Classification
- Significant Woodland
- Terrestrial Crayfish Chimney Observation
- Significant Wetland (GEI Consultants Ltd.)

HDF Management Recommendations

- Conservation
- Protection
- Mitigation
- No Management Required
- Conservation - Non-participating Ownership
- Protection - Non-participating Ownership
- Mitigation - Non-participating Ownership

NOTES:

1. Coordinate System: NAD 1983 UTM Zone 17N.
2. Base features produced under license with the Ontario Ministry of Natural Resources and Forestry © Queen's Printer for Ontario, 2025.
3. Orthoimagery © First Base Solutions, 2025. Imagery taken in 2022.

Project 1901485

Humber Station, Town of Caledon, ON

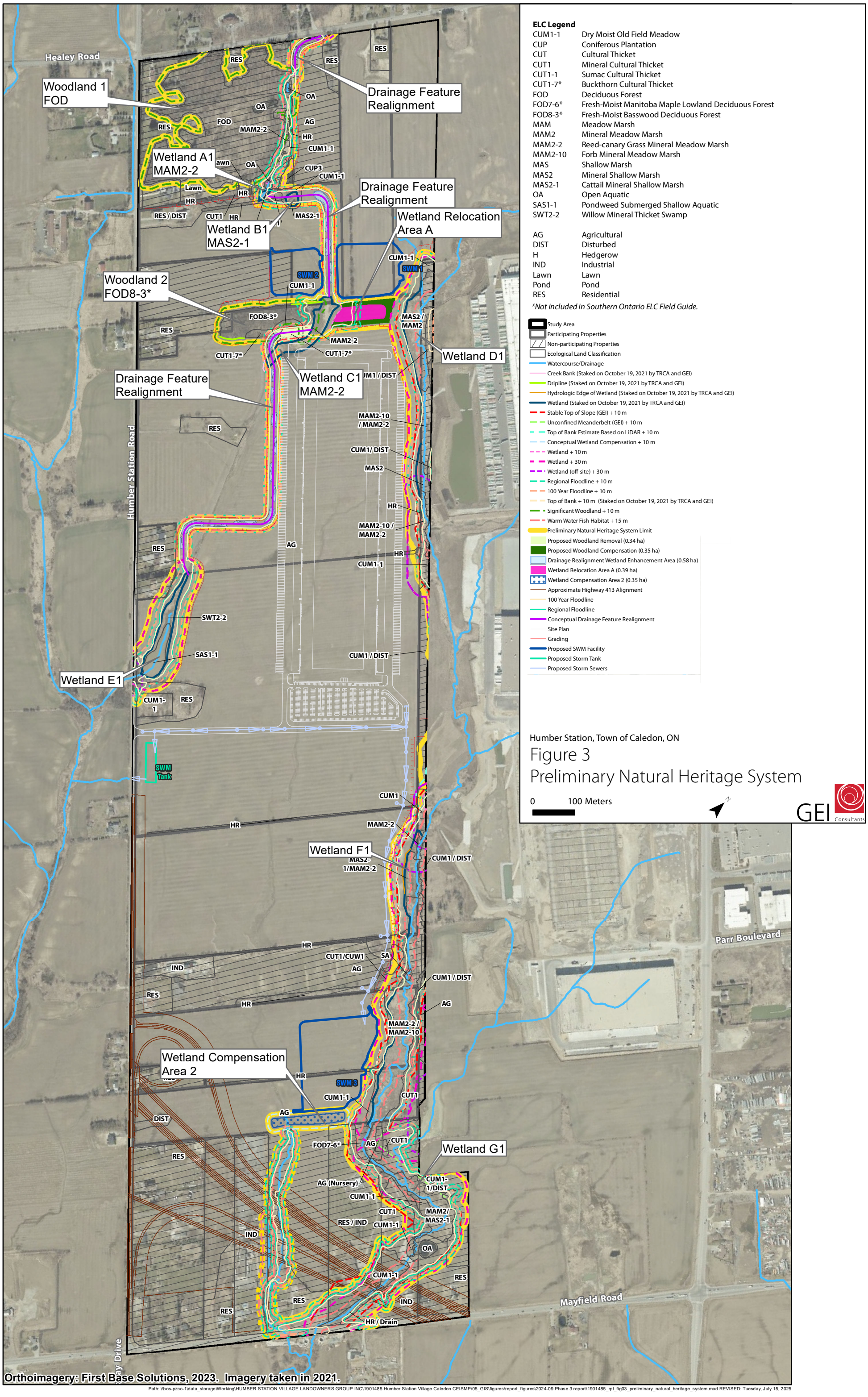
Figure 2
Pre-development Natural Heritage System (Existing Conditions)

0 100 Meters

1:8,000

GEI Consultants

Orthoimagery: First Base Solutions, 2023. Imagery taken in 2022.



ELC Legend

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MAM2-2	Reed-canary Grass Mineral Meadow Marsh
MAM2-10	Forb Mineral Meadow Marsh
MAS	Shallow Marsh
MAS2	Mineral Shallow Marsh
MAS2-1	Cattail Mineral Shallow Marsh
OA	Open Aquatic
SAS1-1	Pondweed Submerged Shallow Aquatic
SWT2-2	Willow Mineral Thicket Swamp
AG	Agricultural
DIST	Disturbed
H	Hedgerow
IND	Industrial
Lawn	Lawn
Pond	Pond
RES	Residential

**Not included in Southern Ontario ELC Field Guide.*

- Study Area
- Participating Properties
- Non-participating Properties
- Ecological Land Classification
- Watercourse/Drainage
- Creek Bank (Staked on October 19, 2021 by TRCA and GEI)
- Dripline (Staked on October 19, 2021 by TRCA and GEI)
- Hydrologic Edge of Wetland (Staked on October 19, 2021 by TRCA and GEI)
- Wetland (Staked on October 19, 2021 by TRCA and GEI)
- Stable Top of Slope (GEI) + 10 m
- Unconfined Meanderbelt (GEI) + 10 m
- Top of Bank Estimate Based on LiDAR + 10 m
- Conceptual Wetland Compensation + 10 m
- Wetland + 10 m
- Wetland + 30 m
- Wetland (off-site) + 30 m
- Regional Floodline + 10 m
- 100 Year Floodline + 10 m
- Top of Bank + 10 m (Staked on October 19, 2021 by TRCA and GEI)
- Significant Woodland + 10 m
- Warm Water Fish Habitat + 15 m
- Preliminary Natural Heritage System Limit
- Proposed Woodland Removal (0.34 ha)
- Proposed Woodland Compensation (0.35 ha)
- Drainage Realignment Wetland Enhancement Area (0.58 ha)
- Wetland Relocation Area A (0.39 ha)
- Wetland Compensation Area 2 (0.35 ha)
- Approximate Highway 413 Alignment
- 100 Year Floodline
- Regional Floodline
- Conceptual Drainage Feature Realignment
- Site Plan
- Grading
- Proposed SWM Facility
- Proposed Storm Tank
- Proposed Storm Sewers

Humber Station, Town of Caledon, ON

Figure 3
Preliminary Natural Heritage System

0 100 Meters

GEI Consultants

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Healey Road
Royal Pine
Woodland 1 FOD
Drainage Feature Realignment
Wetland A1 MAM2-2
Tatone
Drainage Feature Realignment
Wetland B1 MAS2-1
Royal Pine
Wetland Relocation Area A
Woodland 2 FOD8-3*
SWM 2
SWM 1
Humber Station Road
Wetland D1
Drainage Feature Realignment
Wetland C1 MAM2-2
Prologis
Clarkway Drive Tributary
Wetland E1
Prologis
SWM Tank
Wetland F1
Ballantry Homes
Parr Boulevard
Ballantry Homes
Clarkway Drive Tributary
Ballantry Homes
SWM 3
Wetland Compensation Area 2
Wetland G1
Clarkway Drive
Mayfield Road
Clarkway Drive Tributary

Study Area
Participating Properties
Non-participating Properties
Watercourse/Drainage
Preliminary Natural Heritage System Limit
Proposed Woodland Removal (0.34 ha)
Proposed Woodland Compensation (0.35 ha)
Drainage Realignment Wetland Enhancement Area (0.58 ha)
Wetland Relocation Area A (0.39 ha)
Wetland Compensation Area 2 (0.35 ha)
Approximate Highway 413 Alignment
100 Year Floodline
Regional Floodline
Site Plan
Grading Plan (Schaeffers, June 2025)
Proposed SWM Facility
Proposed Storm Tank
Proposed Storm Sewers

Humber Station, Town of Caledon, ON

Figure 4
Land Ownership Plan

0 100 Meters

GEI Consultants

Orthoimagery: First Base Solutions, 2023. Imagery taken in 2021.

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N

HUMBER STATION ROAD
HEALEY ROAD
COLERAINE DRIVE
SIMPSON ROAD
NIXON ROAD
PILLSWORTH ROAD
GEORGE BOLTON PARKWAY
SIMONA DRIVE
PARR BOULEVARD
George Bolton Parkway
West Humber River
THE CORE ROAD
MAYFIELD ROAD

MW1-17
Wetland B1
BH23-11A
BH23-11B
WL1-17
MW25-SWM1
SF2-17
Wetland D1
SF1-17
MW25-SWM2
MW2-17S
MW2-17D
MW103
WL2-17
BH1
MW3-17
Wetland D1
MW124
Wetland A1
MW108
BH12b
BH12
Wetland C1
BH9
PZS-CWT-2025
MW25-CR2
BH13
MW25-02
MW9(BH1)
SF5-17
BH15
MW168
MW25-3B
MW4-17D
MW4-17S
MW25-3A
Wetland E1
Wetland F1
MW5-17D
MW5-17S
Street A2
Wetland F2
MW160
MW25-1B
MW25-1A
MW161
BH18
BH23-7A
BH23-7B
MW8(BH2)
MW25-SWM3
SF6-17
BH23-2A
BH23-2B
Wetland G1
Property with recorded water supply well located at 12424 Humber Station is likely to be within the ZOI.
MW7(BH3)
BH23-1B
BH23-1A

0 220 440 660 880 m

Key Map

50
427

Legend

- Study Area
- Wetland (Staked on October 19, 2021 by TRCA and GEI)
- Wetland
- Watercourse/Drainage
- Proposed SWM Facility
- Waterbody
- Roads
- Proposed Street
- Roads
- Proposed SWM Facility
- Proposed SWM Tank
- Zone of Influence (148m)
- Zone of Influence (189m)
- Proposed Drainage Re-Alignment
- 500m Buffer of Proposed Streets
- Water Supply
- Arcadis IBI Monitoring Well
- Arcadis Shallow Piezometer
- DS Consultant Monitoring Well
- PNJ Monitoring Well
- Pinchin Monitoring Well
- RJB Monitoring Well

Figure 5

Zone of Influence for Short Term Depressurization

CEISMP - Phase 3 Characterization / Existing Conditions and Baseline Inventory
Bolton Residential Expansion Site Option 6 Lands

ARCADIS

Project #: 30258580

Date: July 2025

Z:\Projects\HS.CL Bolton Expansion\Maps\ Master Concept Plan\Current Plan\Concept Plan Feb 2 24_recover.dwg

Healey Road

Humber Station Road

George Bolton Parkway

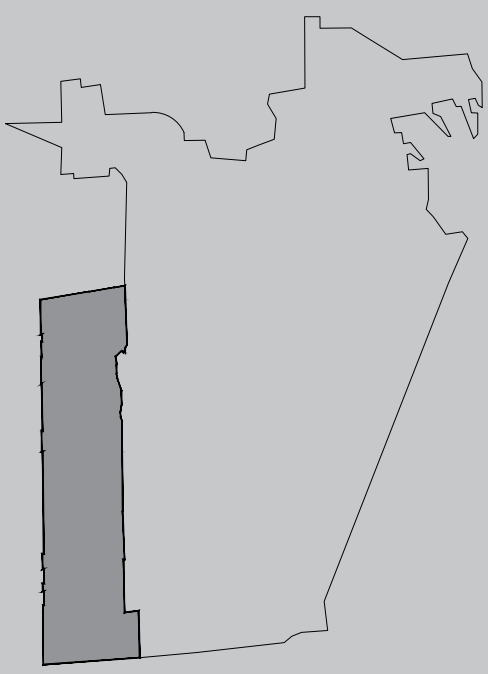
Mayfield Road

TOWN OF CALEDON

SCHEDULE C8
HUMBER STATION EMPLOYMENT AREA
LAND USE PLAN

Legend

- Bolton Settlement Area
- Secondary Plan Area
- Environmental Policy Areas
- Prestige Employment
- General Employment
- Conceptual Road Network
- Highway 413 Transportation Corridor
- Highway 413 Focus Area



Base Data Source: Town of Caledon

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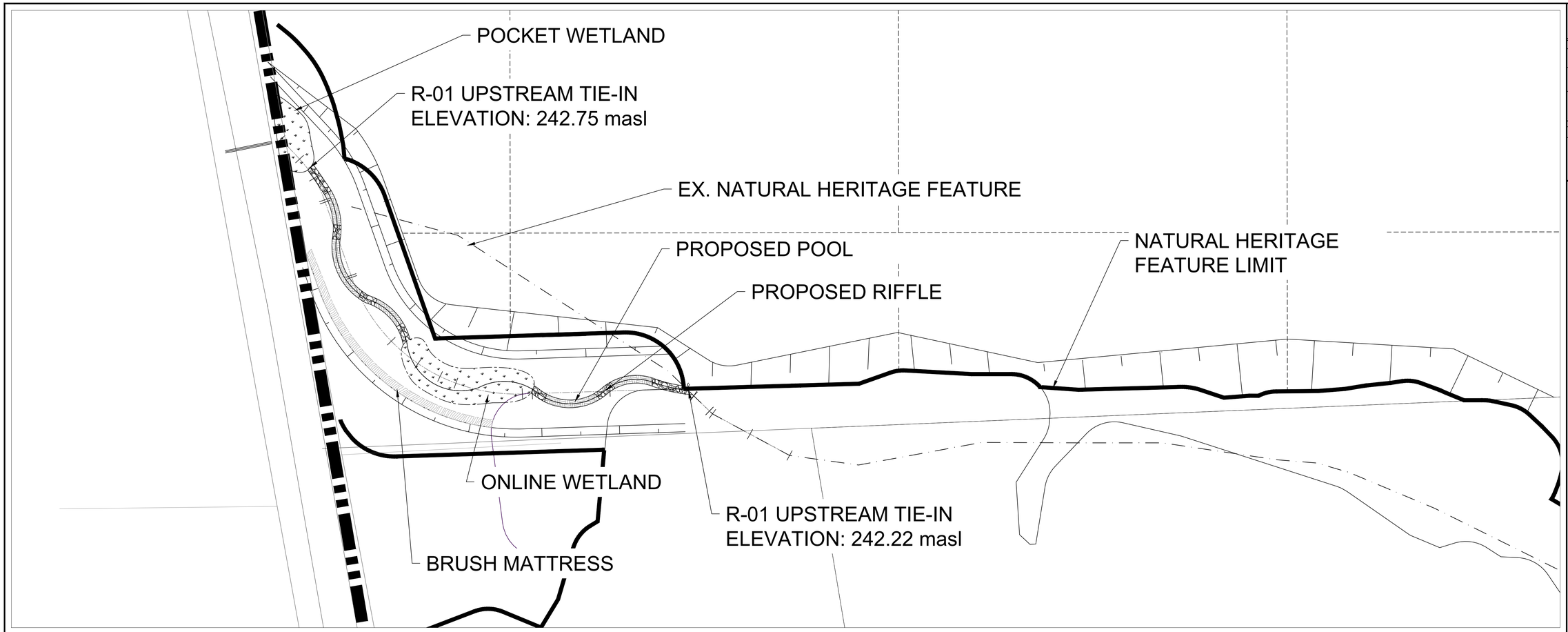
Appendix B

Fluvial



REACH 1 - PROPOSED PLAN VIEW

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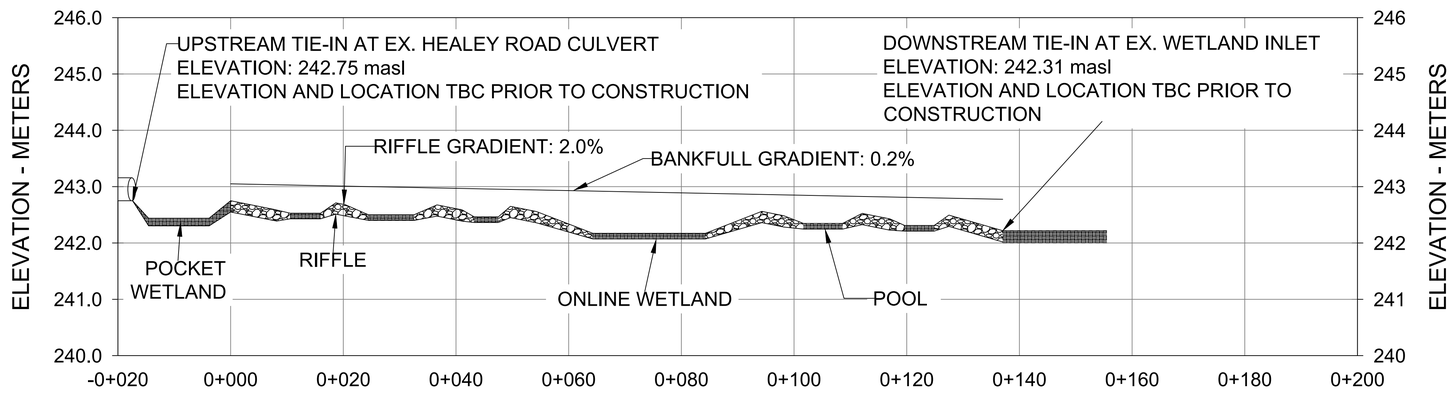

REACH 1 - PROPOSED PROFILE

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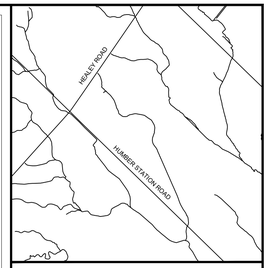

GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.
2. ACTIVITIES WITHIN THE WATERCOURSE SHALL BE IN ACCORDANCE WITH THE CONSTRUCTION TIMING WINDOW IDENTIFIED BY THE MECP AND CONSERVATION AUTHORITY.
3. ALL IN-WATER AND NEAR WATER WORKS WILL BE CONDUCTED IN THE DRY DURING THE TIMING WINDOW SPECIFIED.
4. CONSTRUCTION SHALL NOT COMMENCE UNTIL ALL UTILITY LOCATIONS HAVE BEEN REVIEWED AND ALL PERMITS AND APPROVALS HAVE BEEN RECEIVED BY THE CONTRACT ADMINISTRATOR.
5. A DETAILED ESC PLAN, INTENDED TO PREVENT ENTRY OF SEDIMENT INTO THE WATER COURSE AND NATURAL AREAS, SHALL BE PREPARED PRIOR TO CONSTRUCTION AND ADHERED TO FOR THE DURATION OF CONSTRUCTION. ANY DEVIATION FROM APPROVED PLANS MUST BE DESIGNED BY A QUALIFIED PROFESSIONAL.

N

No.	DATE	ISSUE/REVISION	INTIAL
1	8/28/24	CONCEPT - 30% DESIGN	LM

HUMBER STATION VILLAGE LOG

CHANNEL RE-ALIGNMENT

PLANVIEW AND PROFILE - REACH 1

GEI Consultants

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DRAWN BY: AS / LM	PROJECT No. 1901485	DRAWING No. G-01
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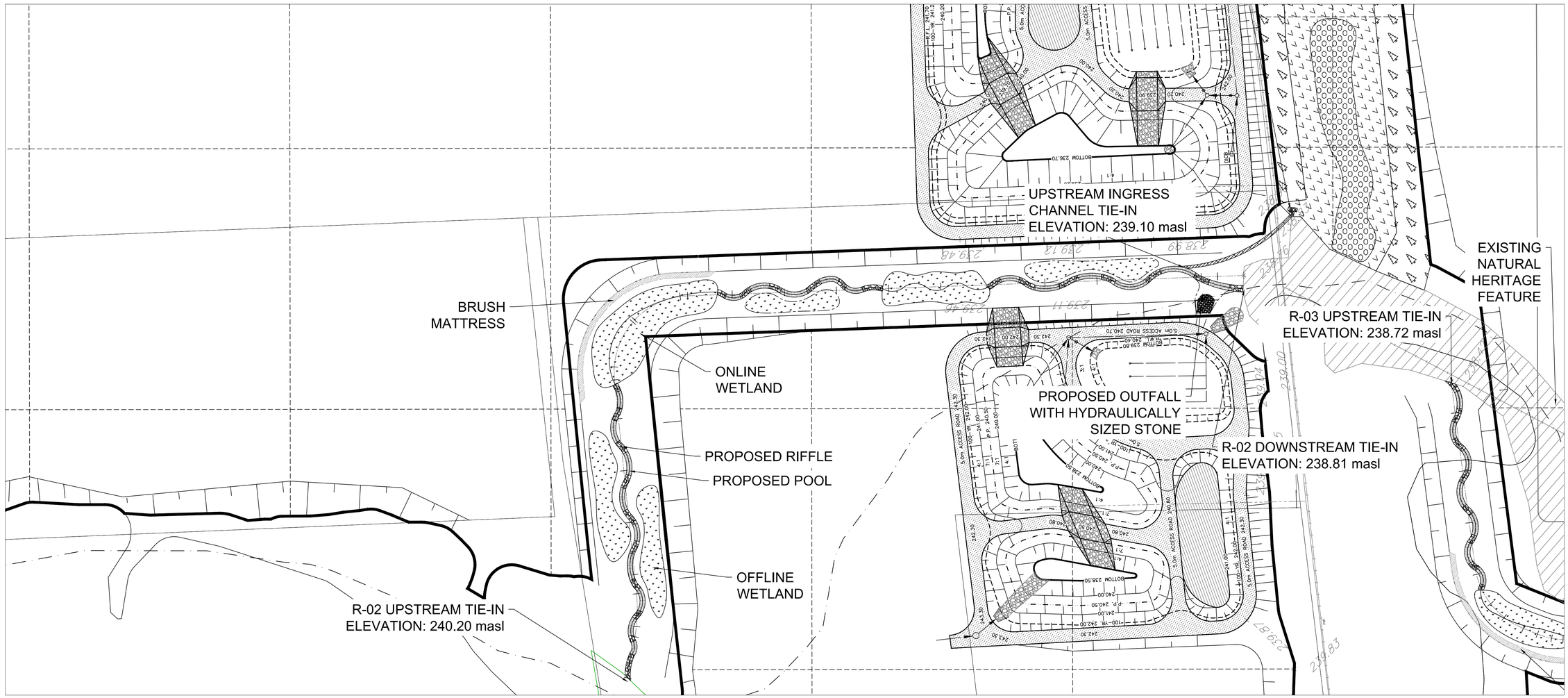

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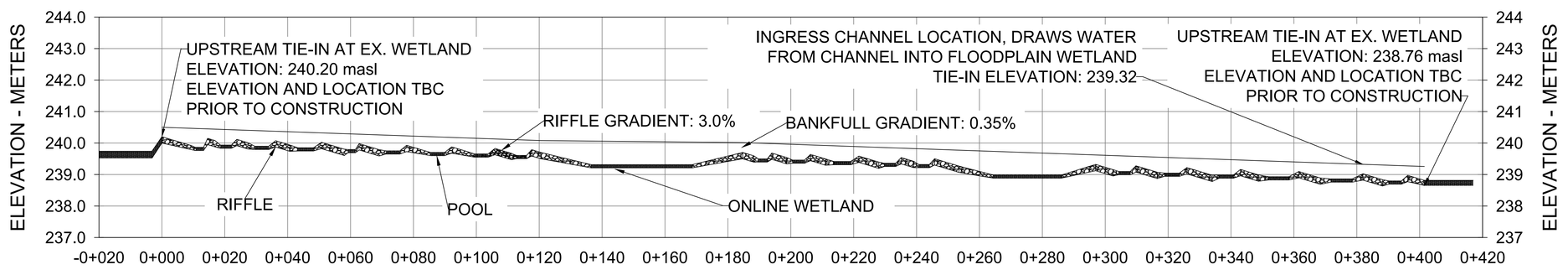

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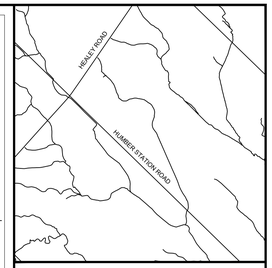

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HUMBER STATION VILLAGE LOG

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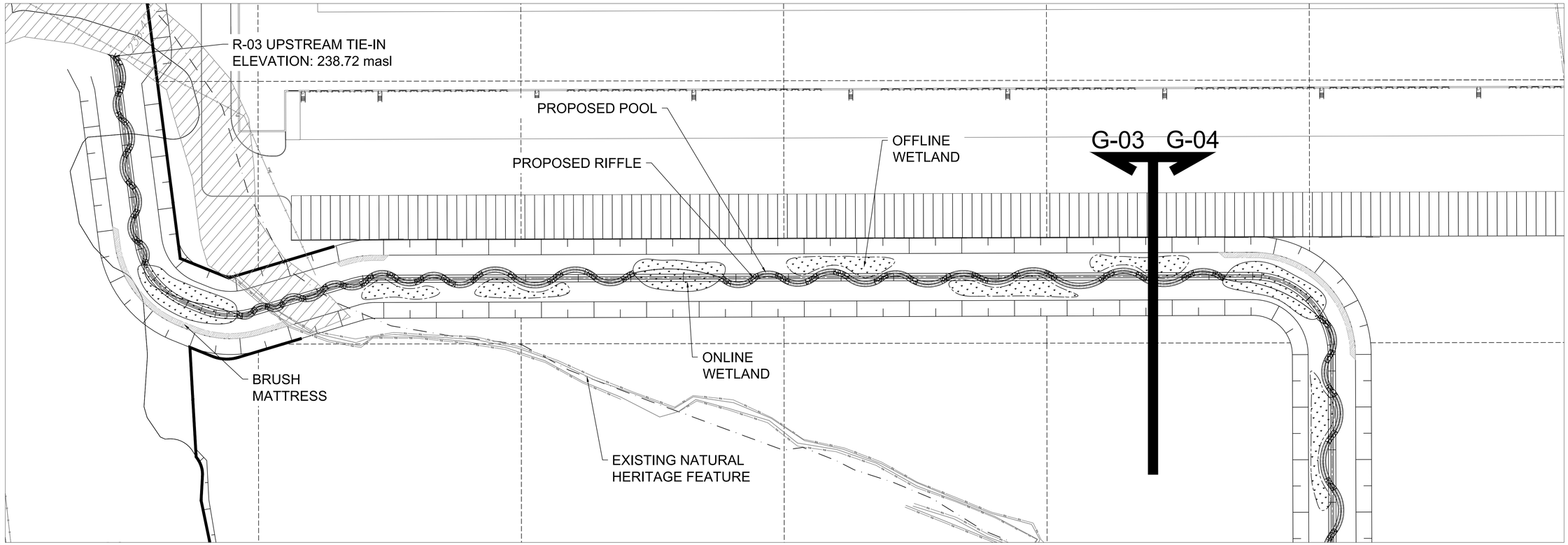

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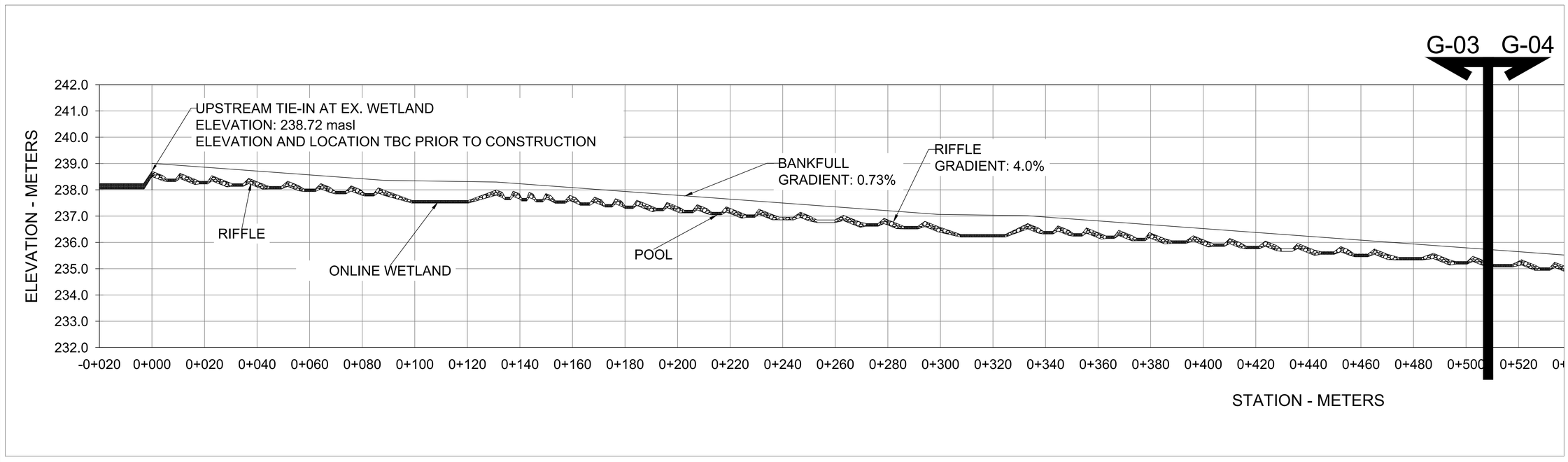

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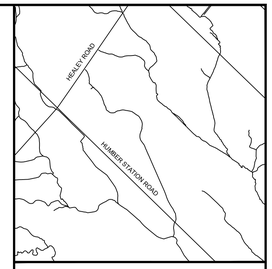

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HUMBER STATION VILLAGE LOG

CHANNEL RE-ALIGNMENT

PLANVIEW AND PROFILE REACH 3: PART 1

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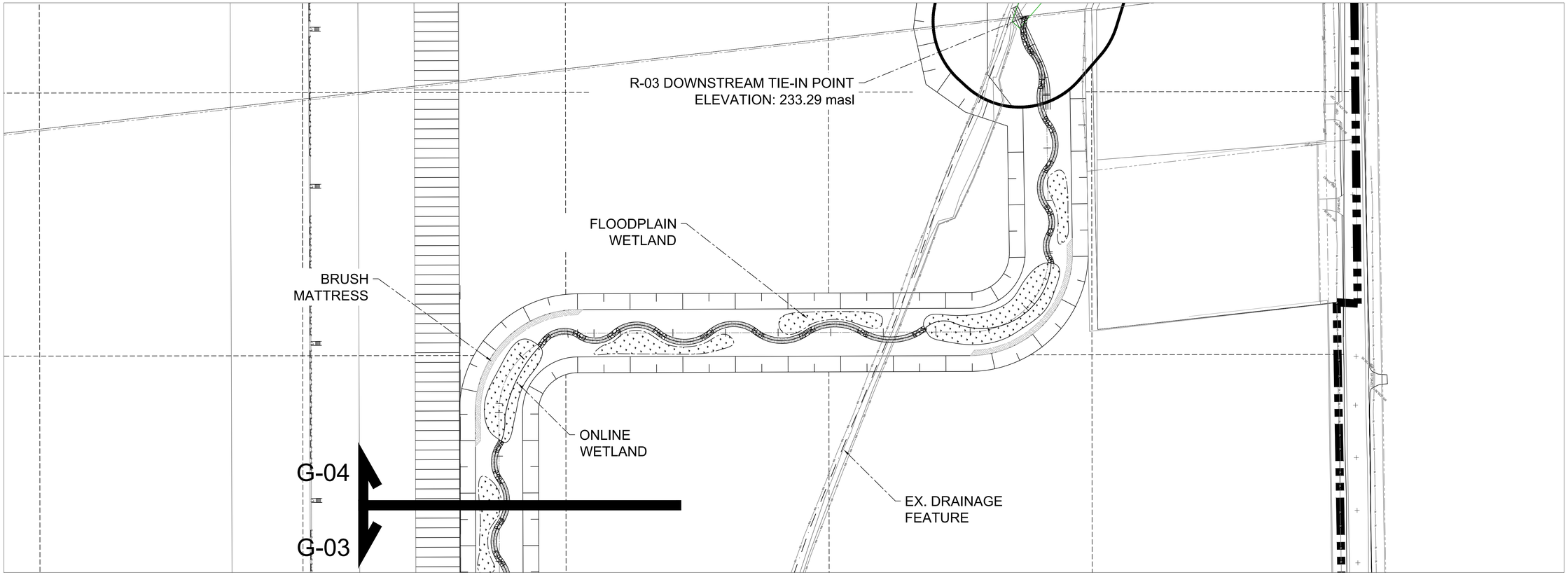

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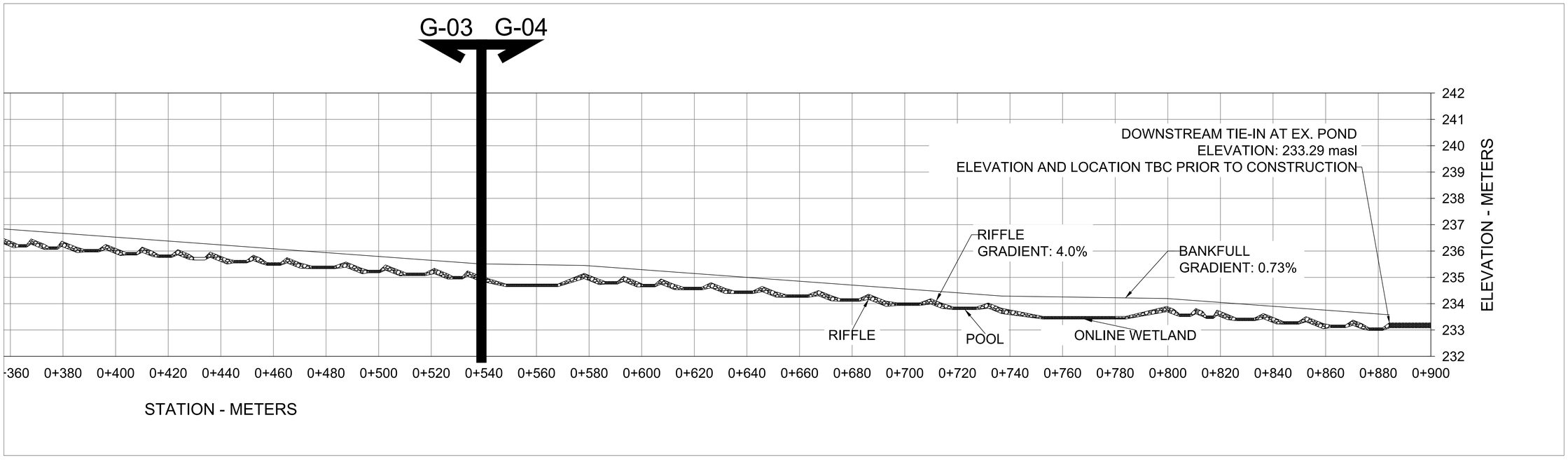

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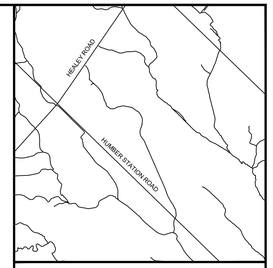

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1	8/28/24	CONCEPT - 30% DESIGN	LM

HUMBER STATION VILLAGE LOG

CHANNEL RE-ALIGNMENT

PLANVIEW AND PROFILE REACH 3: PART 1

GEI Consultants

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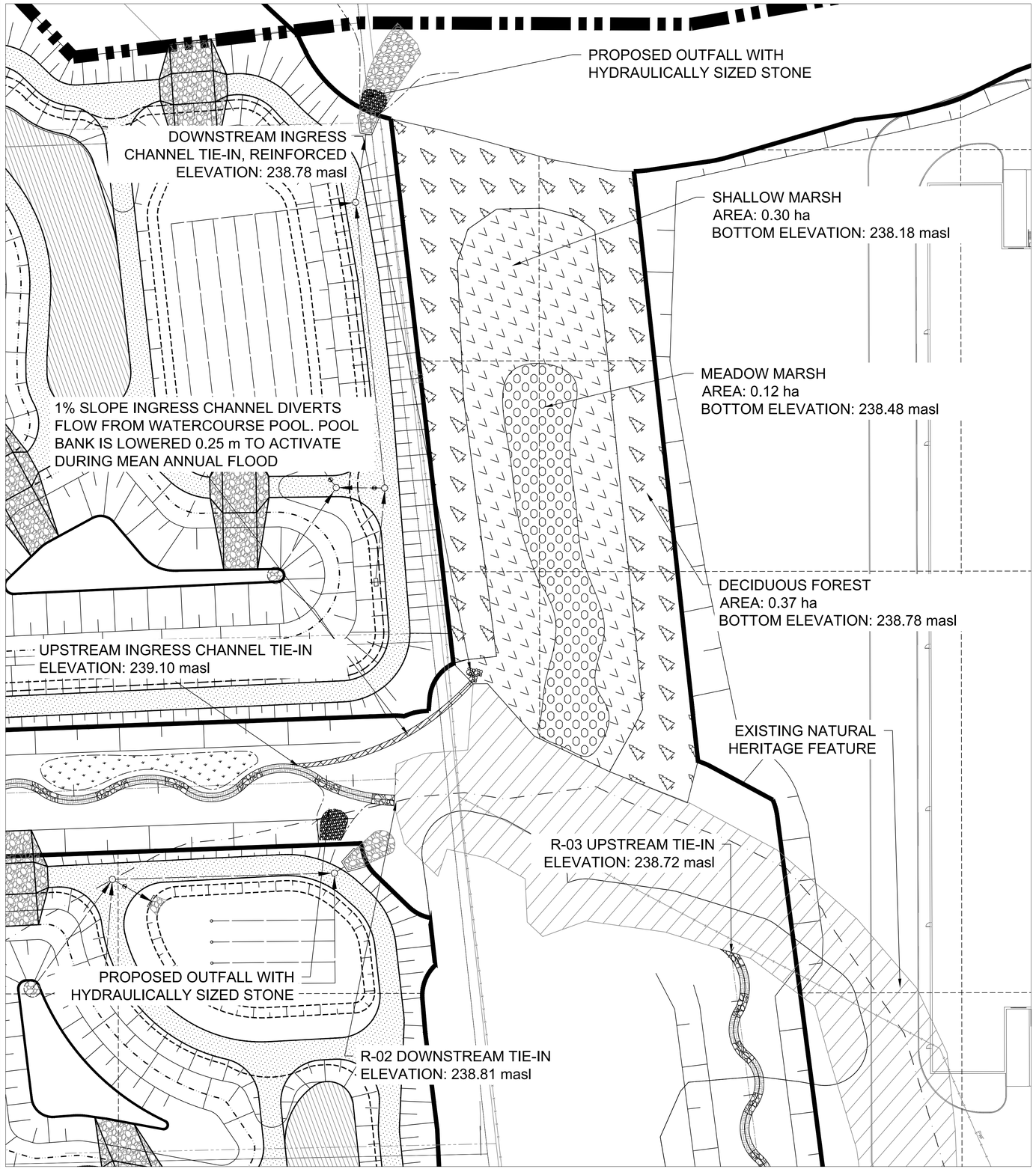

COMPENSATION WETLAND AREA 2

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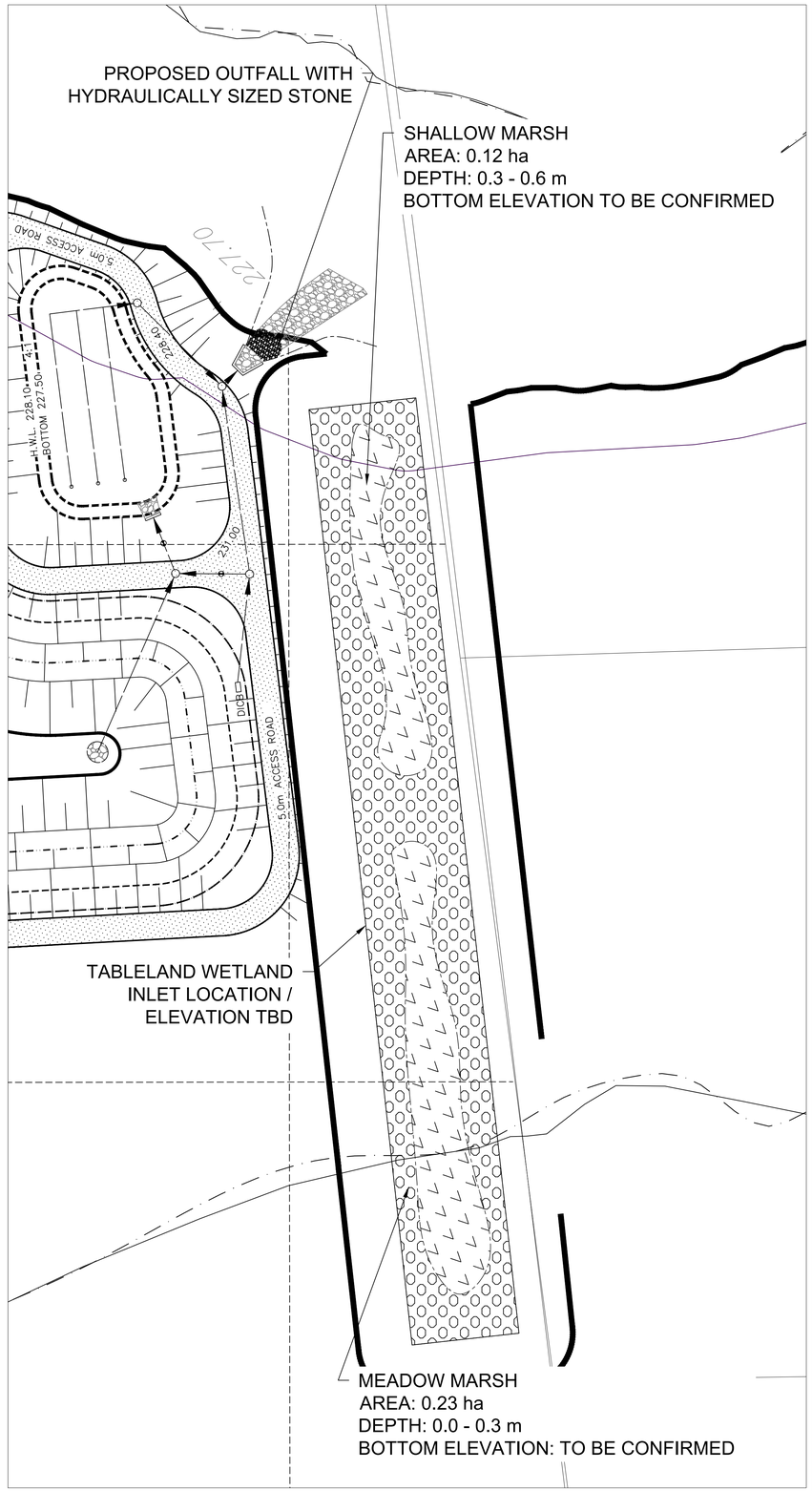
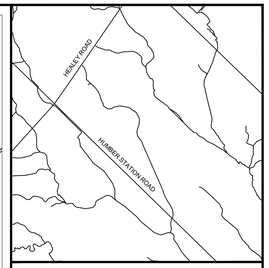


COMPENSATION WETLAND AREA 3

SCALE 1:500



GENERAL NOTES:

1. ALL DIMENSIONS ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.
2. ACTIVITIES WITHIN THE WATERCOURSE SHALL BE IN ACCORDANCE WITH THE CONSTRUCTION TIMING WINDOW IDENTIFIED BY THE MECP AND CONSERVATION AUTHORITY.
3. ALL IN-WATER AND NEAR WATER WORKS WILL BE CONDUCTED IN THE DRY DURING THE TIMING WINDOW SPECIFIED.
4. CONSTRUCTION SHALL NOT COMMENCE UNTIL ALL UTILITY LOCATIONS HAVE BEEN REVIEWED AND ALL PERMITS AND APPROVALS HAVE BEEN RECEIVED BY THE CONTRACT ADMINISTRATOR.
5. A DETAILED ESC PLAN, INTENDED TO PREVENT ENTRY OF SEDIMENT INTO THE WATER COURSE AND NATURAL AREAS, SHALL BE PREPARED PRIOR TO CONSTRUCTION AND ADHERED TO FOR THE DURATION OF CONSTRUCTION. ANY DEVIATION FROM APPROVED PLANS MUST BE DESIGNED BY A QUALIFIED PROFESSIONAL.

No.	DATE	ISSUE/REVISION	INTIAL
1	8/28/24	CONCEPT - 30% DESIGN	LM

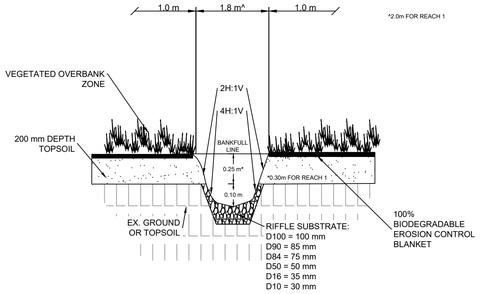
HUMBER STATION VILLAGE LOG

WETLAND PLANS

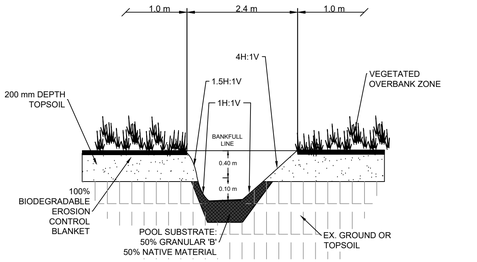
PLANVIEW

GEI Consultants

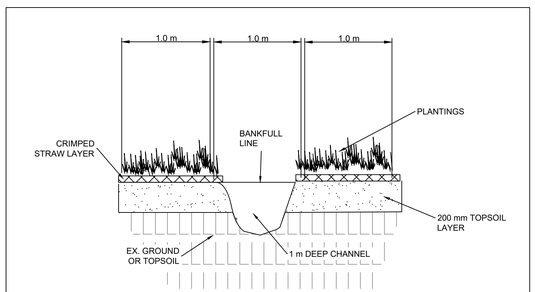
DESIGNED BY: LM	DATE: AUGUST 2024	CHECKED BY: AS
DRAWN BY: AS / LM	PROJECT No. 1901485	DRAWING No. G-05
SCALE: 1:500		



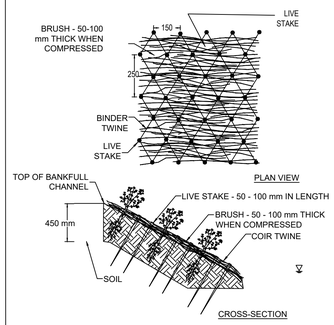
TYPICAL RIFFLE CROSS SECTION DETAIL
(N.T.S.)



TYPICAL POOL CROSS SECTION DETAIL
(N.T.S.)

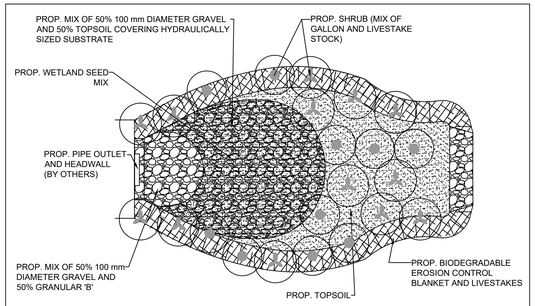


INGRESS CHANNEL CROSS SECTION DETAIL
(N.T.S.)

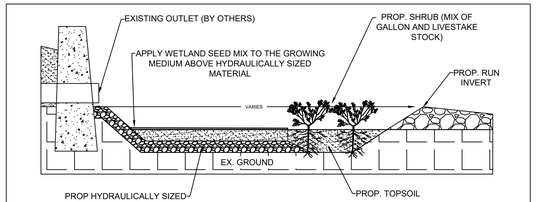


NOTES:
1. LIVE BRANCHES TO CONSIST OF RED OSIER DOGWOOD (Cornus stolonifera) AND SPICEBUSH (Lindera benzoin) APPROXIMATELY 1 m IN LENGTH AND 200 - 300 cm IN WIDTH.
2. BRANCHES TO BE PLACED ON BANK WITH BUTT END TOWARDS CENTRE OF CHANNEL AND PUSHED INTO SOIL BELOW LOW WATER LEVEL .
3. BRUSH MATTRESS TO BE INSTALLED WHILE BRANCHES ARE DORMANT.
4. BRANCHES TO BE KEPT MOIST AND COLD UNTIL INSTALLATION.
5. BRANCHES MUST BE FLEXIBLE ENOUGH TO CONFORM TO SLOPE SURFACE IRREGULARITIES.
6. POUND STAKES INTO BANK TO COMPRESS BRANCHES AGAINST BANK.
7. FILL VOIDS BETWEEN BRANCHES OF THE BRUSH MATTRESS WITH SOIL TO PROMOTE ROOTING.

BRUSH MATTRESS DETAIL
(N.T.S.)

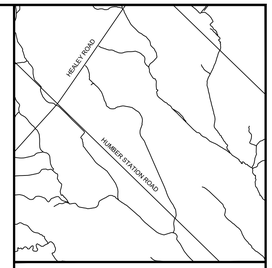


TYPICAL POCKET WETLAND DETAIL - PLANVIEW
(N.T.S.)



NOTES:
- SIZE AND DIMENSIONS OF OUTLET AND PLUNGE POOL MAY VARY.
- REFER TO PLANT LIST AND DETAILS FOR SPACING AND PLANTING INSTRUCTIONS.
- GENERAL PLANT IN A TRIANGULAR GRID TO MAXIMIZE PLANTING.
- MATERIAL DEPTHS MAY VARY.

TYPICAL POCKET WETLAND DETAIL - PROFILE
(N.T.S.)



GENERAL NOTES:

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No.	DATE	ISSUE/REVISION	INTIAL
1	8/28/24	CONCEPT - 30% DESIGN	LM

HUMBER STATION VILLAGE LOG

CHANNEL RE-ALIGNMENT

CHANNEL DETAILS

GEI Consultants

DESIGNED BY: LM	DATE: AUGUST 2024	CHECKED BY: AS
DRAWN BY: AS / LM	PROJECT No. 1901485	DRAWING No. G-06
SCALE: NTS		

Appendix C

Tables

Table 9. Natural Heritage System Implementation (Phasing) Plan

Unique ID	Action	Feasible Months	Comments
1	Install Erosion and Sediment Control Measures	Post-spring freshet to hard frost	Where vegetation removal is required for ESC measure installation, follow vegetation removal window for ESC installation
2	Install Tree Protection Fencing as per Arborist Report	Post-spring freshet to hard frost	
3	Tree removal and stockpile for reuse	December 1 to March 14	Bat exit survey if tree removal planned between March 15 and November 30; Includes ALL trees within the Subject Lands including CUT1/CUW1, and Arborist trees identified for removal. Assess feasibility to remove CUT1/CUW1 after Compensation Woodland is installed
4	Botanist flags native shrubs for live cutting within MAM, MAS and FOD8-3	Within 1 month of planned live cutting	
5	Take live cuttings of native species and prepare for storage	October, November, March	When plants are dormant
6	Take live cuttings of native species and install in retained NHS or created NHS	October, November, March	When plants are dormant
7	Vegetation (grass, flower, shrub) removal within development footprint, excluding to be removed wetlands	September 16 to March 31	Nest sweep surveys if veg. removal planned between April 1st and September 15; Includes CUT1/CUW1 planned for removal
8	Rough and fine grade Compensation Wetland Area 2, followed by installation of native vegetation with a cover crop.	Grading - Post spring freshet first hard frost Seed mix installation– Post spring freshet to June 30; September 1 to first hard frost	Compensation Wetland Area 2 is hydrologically supported by precipitation inputs alone. Therefore, ultimate grading and planting can occur together.
9	Rough grade Wetland Relocation Area A and transplant vegetation and hydric soil (mat) from partial removal of Wetland C1 into Wetland Relocation Area A. Should the wetland relocation Area A be larger than the area of partial removal of Wetland C1, stabilize this area with native seed mix and cover crop.	Grading - Post spring freshet first hard frost Vegetation salvage and translocation – Post spring freshet to June 30; September 1 to first hard frost	
10	Rough grading of Compensation Woodland (surrounds Compensation Relocation Area A) and stabilization (seed mix).	Post spring freshet to hard frost	Consider feasibility of fine grading and planting (tree, shrubs) at this stage, noting that Compensation Woodland surrounds Wetland Relocation Area A.
11	Amphibian and turtle wildlife rescue and relocation from within to be removed wetlands	Agency preferred window - March 15 - April 30; August 1 - October 1	Once wildlife rescue is completed, vegetation removal and rough grading (wetland removal) occur. Should vegetation removal occur ahead of September 15 then nest sweep surveys are required
12	Botanist flags area for wetland soil salvage within MAM and MAS where native species are dominant.	Late August to Early September	Survey when invasive species can be identified and excluded; Salvage soil from areas with <25% woody cover
13	Remove, stockpile, and cover salvaged wetland soil as per TRCA healthy soil guidelines	Mid-September to hard frost	

Unique ID	Action	Feasible Months	Comments
14	Vegetation removal of wetlands identified in Environmental Impact Study for removal.	September 16 to March 31	Wetland removal to occur after wetland compensation or wetland relocation area is installed. Should removal of HDF-3 occur during period when there is water within HDF-3, then fish rescue, isolation of HDF-3, and installation of coffer dam and pump around will be required prior to removal of HDF-3 (and its online wetlands) Nest sweep surveys if vegetation removal planned between April 1st and September 15
15	Rough grading of proposed drain realignment (HDF-3)	Post spring freshet to hard frost	Implement stabilization measures should fine grading and plant installation not follow rough grading Construct and stabilize new drainage feature realignment before connecting and removing old channel
16	Site preparation (till, topsoil quality and depth), fine grading and stabilization (100% vegetative cover from seed mix) of proposed drain realignment (HDF-3), and Compensation Wetland 1	Grading - Post spring freshet first hard frost Seed mix installation– Post spring freshet to June 30; September 1 to first hard frost	
17	Plant installation within proposed drain realignment (HDF-3), and Compensation Wetlands 1 & 2	Post-spring freshet to June 30; September 1 to first hard frost	Should under interim conditions site preparation and fine grading already have been completed for the Compensation Wetland 2 with a stabilization seed mix installed, mow the area ahead of woody planting installation and assess need for any overseeding
18	Fish rescue (if seasonal habitat present) and removal of HDFs' that are NOT contributing Redside Dace habitat	July 16 to March 14	Should removal occur when HDF is dry, no fish rescue is required
19	Site preparation (till, topsoil quality and depth), fine grading and plant installation of Compensation Woodland	Grading - Post spring freshet first hard frost Seed mix installation– Post spring freshet to June 30; September 1 to first hard frost	Should under interim conditions site preparation and fine grading already have been completed for the Compensation Woodland with a stabilization seed mix installed, mow the area ahead of woody planting installation and assess need for any overseeding
20	Site preparation (till, topsoil quality and depth) and planting of NHS buffer planting area	Post-spring freshet to June 30; September 1 to first hard frost	Should interim condition seed mix be present at time of NHS buffer planting in a given area, where no fine grading is needed mow the area and install ultimate seed mix followed by potted stock.
21	Fine grading and plant installation of Stormwater Management Pond Outfall	Grading - Post spring freshet first hard frost Seed mix installation– Post spring freshet to June 30; September 1 to first hard frost	
22	In water works for road culverts installation	Follow appropriate fisheries window	Should construction occur during period when there is water within watercourse/HDF, then fish rescue, isolation of watercourse/HDF, and installation of coffer dam and pump around will be required for road culvert installation

Table 10. Wildlife Construction Windows by Permitting Authority

Wildlife Window	Regulating Agency	Regulation/Policy	Construction Window	If Construction proposed within wildlife window?
Species at Risk Bats	Ministry of Environment Conservation and Parks	Ontario *Endangered Species Act*	Tree removal from December 1 through March 14	Bat Exit Surveys Required
Migratory Birds	Environment and Climate Change Canada	*Migratory Bird Convention Act*	Vegetation removal (grass, flowers, shrubs) September 16 to March 31	Nest Sweep Surveys Required
In Water Works for Fisheries	Department of Fisheries and Oceans/Ministry of Environment Conservation and Parks	*Fisheries Act*, Ontario *Endangered Species Act*	July 1 to September 15 (HDF-8) July 16 to March 14 (warm water fish habitat)	Requires formal application to DFO and MECP for authorized extension of window
Fish Salvage during in-water infrastructure works	Ministry of Natural Resources and Forestry	*Fisheries Act*	Fish removal with all HDFs where seasonal habitat is present at time of HDF removal Fish removal prior to culvert removal and replacement, where seasonal habitat is present	Should a given HDF removal be planned when standing water is present, fish rescue is required. Should HDF removal and/or culvert replacement occur when it is dry conditions, no fish rescue is required
Amphibian and Reptile Wildlife Salvage and Relocation	Ministry of Natural Resources and Forestry	Scientific Collectors Permit; Wildlife Care Committee Application	Amphibian and reptile salvage to occur between March 15 - April 30; August 1 - October 1	MNRF would consider extending window to October 31, depending on weather and site conditions

Table 11. Long Term Monitoring Plan and Comprehensive Adaptive Management Plan

Long Term Monitoring Plan							Comprehensive Adaptive Management Plan		
Performance Measure Indicator(s)/ Objective(s)	**Monitoring Parameter**	**Monitoring Target(s) or Threshold(s)**	**Methods/ Protocols/ Analyses**	**Monitoring Location, Frequency and Duration**			**Trigger**	**Response/ Measure of Success**	**Responsibilities for Monitoring and Cost***
				Pre-Construction	**During Construction**	**Post-Construction (Performance)**			
Landscape Architecture									
Compliance Monitoring	Plant Warranty Monitoring	Inspect each installed plant and applied seed mix for healthy growth	Landscape Designer/Architect, Ecologist or Botanist to inspect: a) immediately following installation that plant material planted matches Issued for Construction (IFC) Planting Plans and is healthy and; b) in Spring of the following year that each installed plant and seeded area has healthy growth	N/A	YES, during 2-year plant warranty period Retained Natural Heritage System Buffers Compensation Wetland 1, 2 Relocated Wetland A Compensation Woodland Realigned Drainage Feature	N/A	Plant / seed mix installed does not match the IFC drawings Poor health/dead of individual planted stock Poor germination coverage of cover crop and/or native seed mix	Landscape Designer/Architect, Ecologist or Botanist to advise landscape contractor on need for them to do soil amendments ahead of replanting Soil amendments – landscape contractor to carry out requested amendments including conduct topsoil and/or hydric soil testing, add/remove topsoil or hydric soil or mulch, tilling ahead of replanting Plant stock – Replace with like, or substitution subject to approval by project ecologist or landscape architect and vetted by Town. Reapply a cover crop and/or native seed mix. Cover crop and/or native seed mix may differ than that originally seeded, upon direction of the landscape architect/ecologist and as vetted by Town	Awarded Landscape Contractor to cover cost of vegetation replacements Land Developer to cover costs of ecological/ landscape architecture contract administration and landscape contractor progress payments
Erosion and Sediment Control									
To verify that all ESC measures have been implemented and are functioning according to specifications and requirements	In accordance with the Erosion and Sediment Control Guidelines for Urban Construction (TRCA 2019) erosion and sediment control inspections will be conducted to monitor the condition of the ESC measures, dewatering activities, and the receiving water body downstream of the work area, concurrently along with the construction inspections. The inspections will identify the potential of the release of debris, sediment, and other deleterious substances into the wetland, and will serve to inform any mitigation measures to be implemented	Prevent sediment from construction activities from entering natural heritage features and functions	On a weekly basis; and After every major rainfall event (greater than 10 mm	N/A	On a weekly basis; and After every major rainfall event (greater than 10 mm)	N/A	ESC measures observed to be insufficient measure for preventing sediment from entering NHS	Change ESC measures (i.e., type of silt fencing or number of silt fences) and increase frequency of monitoring until it is demonstrated that revised ESC measures in place are suitable for conditions present	Land Developer Group

Long Term Monitoring Plan							Comprehensive Adaptive Management Plan		
Performance Measure Indicator(s)/ Objective(s)	**Monitoring Parameter**	**Monitoring Target(s) or Threshold(s)**	**Methods/ Protocols/ Analyses**	**Monitoring Location, Frequency and Duration**			**Trigger**	**Response/ Measure of Success**	**Responsibilities for Monitoring and Cost***
				Pre-Construction	**During Construction**	**Post-Construction (Performance)**			
Terrestrial									
Ecological Land Classification	Document the vegetation communities in the final year pre-assumption	Increase in number of vegetation communities in post-NHS over pre-development NHS	Spring, summer, and fall vegetation surveys to be completed. Vegetation communities to be mapped and refined with each seasonal assessment. Vegetation community types identified using protocol outlined in Ecological Land Classification (ELC) for Southern Ontario (Lee at al. 1998). ELC completed to the finest level of resolution feasible. Species names generally follow nomenclature from the Database of Vascular Plants of Canada (Brouillet et al. 2010+) The provincial status of all plant species and vegetation communities to be based on NHIC (in year study occurs). Identification of potentially sensitive native plant species is based on their assigned coefficient of conservatism (CC) value, as determined by Oldham et al. (1995). This CC value, ranging from 0 (low) to 10 (high), is based on a species tolerance of disturbance and fidelity to a specific natural habitat. Species with a CC value of 9 or 10 generally exhibit a high degree of fidelity to a narrow range of habitat parameters	Document existing NHS ELC	N/A	Final year of post-construction monitoring ahead of assumption Post-Development NHS to be surveyed	N/A	N/A	Land Developer Group
Floristic Quality	Documents the floristic diversity within the post-construction NHS (new NHS). The quality of which will be gauged using the Floristic Quality Index (FQI). Additional floristic metrics such as wetness index and weediness index will also be calculated. These data can help identify vegetative responses to growing conditions, such as hydrology	FQI target	Summer and fall botanical inventories will be completed. Calculate floristic metrics within each ecosite or vegetation community, such as FQI, weediness index, and wetness index	Pre-Development Natural Heritage System Identify priority NHS construction areas to monitor and manage, where a) retained NHS is adjacent and contains Category 1 invasive species and b) early detection and rapid response for Category 1 invasives within the “under construction” NHS	N/A	Post-Development Natural Heritage System Continued monitoring and management within constructed NHS of Priority Category 1 invasive species until assumption. Town to take over invasive species management after assumption	N/A	N/A	Land Developer Group till assumption Town after assumption

Long Term Monitoring Plan							Comprehensive Adaptive Management Plan		
Performance Measure Indicator(s)/ Objective(s)	**Monitoring Parameter**	**Monitoring Target(s) or Threshold(s)**	**Methods/ Protocols/ Analyses**	**Monitoring Location, Frequency and Duration**			**Trigger**	**Response/ Measure of Success**	**Responsibilities for Monitoring and Cost***
				Pre-Construction	**During Construction**	**Post-Construction (Performance)**			
Invasive Species	Outlines what Category 1 invasive species are present (if any) and their general abundance and distribution. Based on species, abundance and distribution complete a risk assessment to evaluate whether to manage the species. Where management is planned, identify the management method as per the Ontario Invasive Plant Council Best Management practices.	Category 1 Invasive Species (i.e., Common Buckthorn, European Reed)	Pre-development NHS method – Field survey a georeferenced 50 x 50 m grid with each square assigned a unique identifier. The abundance level of each of the observed Category 1 invasive species is documented based on vegetation cover within each square using the ELC abundance categories (Lee et al. 1998): rare (0-10%), occasional (10-50%), abundant (50-90%), and dominant (>90%). Category 1 invasives to be assessed, as per "Invasive Exotic Species Ranking for Southern Ontario" (Urban Forest Associates Inc. 2002).		Under Construction NHS priority Category 1 invasive monitoring and management. Where planting occurs conduct early detect and rapid response for priority Category 1 invasive species.		Through monitoring identify priority Category 1 invasive species	Manage identified priority Category 1 invasive species	Land Developer Group
Retained Wetland Ecohydrology	Wetland Hydroperiod (monthly)	Hydroperiod suitable for wetland vegetation	Piezometers with continuous data loggers to record surface water and groundwater position. Barologger on site	During ice-free period: continuous datalogger measurements with monthly inspection and manual reading	During ice-free period: continuous datalogger measurements with monthly inspection and manual reading	During ice-free period: continuous datalogger measurements with monthly inspection and manual reading.	1a) Pre-construction hydroperiod is not provided during construction or post-development 1b) SAS1-1 standing water levels < 60 cm	Assess if hydrological inputs are affected by climate (e.g., high ET/temp/low precipitation) If not, identify opportunities for reducing/increasing hydrological inputs (e.g., rooftop, LID) to restore wetland hydrology	
Created Wetland (Wetland Compensation/Wetland Relocation) Ecohydrology	1) Wetland Hydroperiod (monthly) 2) Hydrological input/output 3) Wetland vegetation cover (50% or greater)	1) Hydroperiod suitable for wetland vegetation 2) Is volume of water entering and exiting wetland as modeled 3) Wetland vegetation covers majority of the wetland area	1) Piezometers with continuous data loggers to record surface water and groundwater position. Barologger on site 2) Water Level Loggers at Wetland Inlet and Outlet of Wetland Compensation Area 1 and 2 and Relocation Wetland A 3) visual assessment of wetland vegetation cover per 2022 OWES protocol	N/A N/A N/A	N/A N/A N/A	1) During ice-free period: continuous datalogger measurements with monthly inspection and manual reading 2) During ice-free period: datalogger measurements with monthly inspection and manual reading 3) Annual in July In the final year prior to assumption conduct breeding amphibian surveys. Compare pre-post development NHS to ascertain if amphibian biodiversity maintained or increased post-development	1) Hydrological inputs and/or storage not suitable for wetland establishment 2) Modeled flow volumes at inlet and outlet not provided and wetland vegetation not present within compensation wetland 3) Wetland vegetation cover < 50%	Assess if hydrological inputs are affected by climate (e.g., high ET/temp/low precipitation) Assess if there are issues with the constructed wetland itself through hydrological and soil quality investigation Identify where water is going, assess need for topographic revisions in wetland, supplement hydrological inputs (e.g., rooftop, LID), and/or soil quality improvements	Land Developer Group (until assumption)

Long Term Monitoring Plan							Comprehensive Adaptive Management Plan		
Performance Measure Indicator(s)/ Objective(s)	**Monitoring Parameter**	**Monitoring Target(s) or Threshold(s)**	**Methods/ Protocols/ Analyses**	**Monitoring Location, Frequency and Duration**			**Trigger**	**Response/ Measure of Success**	**Responsibilities for Monitoring and Cost***
				Pre-Construction	**During Construction**	**Post-Construction (Performance)**			
Breeding Amphibians	Call count surveys	Maintain or increase amphibian biodiversity post-development over pre-development conditions	Survey protocols to be based on the 'Marsh Monitoring Program' (Bird Studies Canada (BSC) 2014). Survey station locations (retained NHS and new NHS) to be conducted at night within the appropriate timing window from approximately 30 minutes after sunset until midnight. Each station to be surveyed three times (once in April, once in May and once in June) during optimal weather conditions (low wind levels, no heavy rain). Minimum night air temperatures at time of survey of 5°C, 10°C and 17°C were applied to each of the respective survey periods. Surveys to be conducted at least 15 days apart. All calls heard within a survey station are to be recorded, as well as any call observations outside of the survey station, including on adjacent lands.	Document pre-development anuran biodiversity in existing NHS	N/A		N/A	N/A	Land Developer Group
Species at Risk and Significant Wildlife Habitat (Bird)	Breeding Bird Survey	Bank Swallow (SAR) Eastern Wood Pewee (SWH)	Breeding bird surveys should be conducted following protocols set forth by the Ontario Breeding Bird Atlas (Cadman et al., 1998; Cadman et al., 2007). Surveys should be conducted between dawn and five hours after dawn with suitable wind conditions, no thick fog or precipitation (Cadman et al., 2007). Point count stations should be located adjacent to candidate/confirmed habitat within the Study Area. Surveys should be conducted at least 10 days apart.	Bank Swallow foraging habitat documented within non-participating lands and Wetland D1. Habitat to be retained. Confirmed Eastern Wood Pewee SWH documented within FOD located on non-participating lands. Habitat to be retained.	N/A	In final year ahead of assumption document location of retained NHS and created NHS Species at Risk and Significant Wildlife Bird Habitat	N/A	N/A	Land Developer Group
Significant Wildlife Habitat (Insects)	Insect Visual Occurrence Surveys	Monarch & Yellow-banded Bumblebee	Insect surveys, including Monarchs and yellow-banded bumblebee, do not currently have a set protocol in Ontario. Species detection is dependent on repeated visits during the appropriate flight times for a given species in suitable habitat. Three visual surveys/ area searches could be conducted within all suitable habitats present within the Study Area, with an emphasis on areas with common milkweed for monarch surveys.	Habitat documented in old field/meadows associated with Clarkway Drive Tributary valley. Habitat to be retained.	N/A	In final year ahead of assumption document location of retained NHS and created NHS Significant Wildlife Habitat (Insects)	N/A	N/A	Land Developer Group

Long Term Monitoring Plan							Comprehensive Adaptive Management Plan		
Performance Measure Indicator(s)/ Objective(s)	**Monitoring Parameter**	**Monitoring Target(s) or Threshold(s)**	**Methods/ Protocols/ Analyses**	**Monitoring Location, Frequency and Duration**			**Trigger**	**Response/ Measure of Success**	**Responsibilities for Monitoring and Cost***
				Pre-Construction	**During Construction**	**Post-Construction (Performance)**			
			Surveys should take place between mid-morning and noon or late afternoon to sunset with mostly sunny skies, suitable low wind conditions, no thick fog or precipitation. Temperatures should be between 22°C and 30°C such that insect activity is optimal. Survey periods should take place: • Early May to mid-June; • Mid-June to mid-July; and • Late July to late August.						
Significant Wildlife Habitat (Invertebrates)	1) Terrestrial Crayfish Chimney Surveys 2) Terrestrial Crayfish Occurrence Surveys	Terrestrial Crayfish	1) Targeted visual crayfish chimney surveys should be completed for retained wetlands with confirmed habitat (wetland C1 and D1) and Wetland Relocation Area A. Ideal timing for chimney surveys is April to Mid-June when the water table is highest. Chimney clusters and/or individual chimneys should be recorded with a GPS-unit to note geographic distribution. 2) Visual occurrences of terrestrial crayfish are less common, however at least two nocturnal surveys during spring rainfall are recommended; these should be targeted towards the retained portion of wetland C1 and Wetland Relocation Area A.	Documented confirmed habitat within wetland C1 and D1.	N/A	In final year ahead of assumption document location habitat within retained NHS and created NHS Significant Wildlife Habitat (Invertebrates)	N/A	N/A	Land Developer Group
Significant Wildlife Habitat (Mammals)*		Bat Maternity Colonies	Surveys should be completed following MECP survey guidelines as outlined in “Species at Risk Bats Note” (MECP, 2022), Bats and Bat Habitats: Guidelines for Wind Power Projects (MNR, 2011) and “Maternity Roost Surveys (Forests/Woodlands) (MECP, 2022). Habitat assessments should be completed during the leaf-off period. All trees and snags greater than or equal to 10 cm diameter-at-breast height (DBH) should be visually inspected using binoculars to document any cavities, leaf clusters, and loose or peeling bark that may or may not be present along the trunk or large branches. Areas with ≥10 cavities/ha determined to provide the greatest	Candidate bat maternity colony habitat is assumed within non-participating woodland communities. Candidate habitat to be retained.	N/A	In final year ahead of assumption document location of retained NHS and created NHS Significant Wildlife Habitat (Mammals)	N/A	N/A	*Non-Participating Landowner

Long Term Monitoring Plan							Comprehensive Adaptive Management Plan		
Performance Measure Indicator(s)/ Objective(s)	**Monitoring Parameter**	**Monitoring Target(s) or Threshold(s)**	**Methods/ Protocols/ Analyses**	**Monitoring Location, Frequency and Duration**			**Trigger**	**Response/ Measure of Success**	**Responsibilities for Monitoring and Cost***
				Pre-Construction	**During Construction**	**Post-Construction (Performance)**			
			potential bat maternity roost habitat in accordance with MNRF guidelines; these areas should then be targeted for acoustic monitoring. Bat acoustic monitoring devices should be deployed for at least 10 consecutive nights in June. These recordings should then be analyzed by experts to identify species occurrence.						
Aquatic (Fisheries)									
Contributing Fish Habitat	1) Erosion and Sediment Control (see ESC Section above) 2) Stormwater Management Facility Performance Monitoring (see Stormwater Management Pond and Surface Water Quality Sections below) 3) Warranty monitoring of vegetation (see Landscape Architecture Compliance Monitoring Section above)	Contributing Fish Habitat (Includes: Realigned Drainage Feature and Compensation Wetlands 1 and 2 and Wetland Relocation Area A	1) See Erosion and Sediment Control Section above 2) See Stormwater Management Pond and Surface Water Quality Sections below 3) See Landscape Architecture Compliance Monitoring Section above		1) See ESC Section above (On a weekly basis; and after every major rainfall event (greater than 10 mm)). Additional monitoring should include visual 2) N/A 3) Realigned Drainage Feature and Compensation Wetlands 1 and 2 during 2-year plant warranty period	1) N/A 2) All SWM Ponds and Realigned Drainage Feature – beginning one year post-installation (see Stormwater Management Pond and Surface Water Quality Sections below) 3) N/A	1) ESC measures observed to be insufficient measure for preventing sediment from entering NHS 2) Any exceedance of the relevant criteria (TSS and/or temperature thresholds). 3) Poor health/dead of individual planted stock; Poor germination coverage of cover crop and/or native seed mix	1) Change ESC measures (i.e., type of silt fencing or number of silt fences) and increase frequency of monitoring until it is demonstrated that revised ESC measures in place are suitable for conditions present 2) All discharge of pumped water into the natural environment should be halted, and other options for pre-treatment system should be explored 3) Ecologist/ Landscape architect to advise landscape contractor on need for them to do soil amendments ahead of replanting Soil amendments – landscape contractor to carry out requested amendments including conduct topsoil and/or hydric soil testing, add/remove topsoil or hydric soil or mulch, tilling ahead of replanting Plant stock – Replace with like, or substitution subject to approval by project ecologist of landscape architect Reapply a cover crop and/or native seed mix. Cover crop and/or native seed mix may differ than that originally seeded, upon direction of the landscape architect/ecologist	Land Developer Group

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Warmwater Fish Habitat	1) Aquatic Habitat Assessment (AHA) 2) Warranty monitoring of vegetation (see Landscape Architecture Compliance Monitoring above) 3) Surface water quality (general chemistry and temperature: see Water Resources Surface Water Quality section below)	Warmwater fish habitat	1) AHA: Visual assessment and mapping throughout drainage feature realignment to evaluate fish habitat conditions. The assessment should note: • Hydrology (e.g. flowing or standing water); • General watercourse morphology; • Wetted width and depth (at time of survey); • Any instream habitat (e.g. woody debris, aquatic vegetation, undercut banks); • Presence of obstructions to fish movement (e.g. culverts, debris dams); and • Riparian habitat. 2) See Landscape Architecture Compliance Monitoring Section above 3) See Water Resources Surface Water Quality section below)	Warmwater fish habitat was identified within HDF-3 and the Clarkway Drive Tributary.	1) N/A 2) Realigned Drainage Feature riparian vegetation monitoring during 2-year plant warranty period 3) See Water Resources Surface Water Quality section below)	1) Annually for 3 years post-construction for the realigned Drainage Feature 2) N/A 3) Continuous logging at 15-minute intervals during years 1, 3, and 5.	1) N/A 2) Poor health/dead of individual planted stock; Poor germination coverage of cover crop and/or native seed mix 3) Significant changes compared to baseline conditions	1) N/A 2) Replace poor stock with like, or substitution subject to approval by project ecologist of landscape architect, or, reapply a cover crop and/or native seed mix to ensure riparian vegetation is established 3) Design remediation to minimize quality and thermal impacts (ie: flow rates, permanent pool depth) and explore additional LID implementation where feasible.	Land Developer Group
Fluvial Geomorphology									
Evaluate performance of realigned drainage feature	Channel cross section	Channel adjustments	Survey of channel cross sections at minimum of 2 runs and 2 pools	N/A	N/A	Annually for 3 years post-construction	Adjustments of greater than 20% of the cross-sectional area	Review flows within the channel and identify need for mitigation or adjustments to the implemented design	Land Developer Group
	Lateral migration	Channel adjustments	Erosion pins installed at the outer bank of	N/A	N/A	Annually for 3 years post-construction	Adjustments of greater than 20 cm per year	Review whether erosion is localized or a site-wide issue, and identify need for mitigation or adjustments to the implemented design	Land Developer Group
	Substrate composition	Channel adjustments	Pebble counts	N/A	N/A	Annually for 3 years post-construction	Significant grain size adjustments (such as increase in siltation or loss of coarse materials)	Review flows within the stream and identify whether mitigation is required.	Land Developer Group
Water Resources **Surface Water Quantity**									
Evaluate potential changes in flow conditions.	Flow characteristics	Will be evaluated in relation to baseline conditions, with no specific targets set.	Flow measurements at designated locations.	Every 4 months for 1 to 2 years before construction begins.	Every 4 months until the buildout is complete.	Every 4 months at designated locations during years 1, 3, and 5.	Substantial flow changes to HDF or watercourses compared to the baseline.	Apply the findings to future developments to minimize long-term impact. Adjust outflows as needed and where feasible using storm flow rate controls.	Land Developer Group

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Water Resources Surface Water Quality									
Evaluate potential changes in water quality	Water Quality: General Chemistry	Will be evaluated in relation to baseline conditions, with no specific targets set.	Surface water sampling at designated locations. Quality parameters of dissolved oxygen, pH, water hardness, turbidity, total suspended solids and total phosphorus	Every 4 months for 1 to 2 years before construction begins.	Every 4 months until the construction is complete.	Every 4 months at designated locations during years 1, 3, and 5.	Significant changes in water chemistry in comparison to baseline	Apply the findings to future developments to minimize long-term impact. Adjust SWM to minimize quality and thermal impacts (ie: flow rates, permanent pool depth, additional LID implementation where feasible	Land Developer Group
	Water Quality: Temperature	Will be evaluated in relation to baseline conditions, with no specific targets set.	Temperature loggers at designated locations.	Continuous logging at 15-minute intervals for 1 to 2 years before construction begins.	Continuous logging at 15-minute intervals for 1 to 2 years until the construction is complete.	Continuous logging at 15-minute intervals during years 1, 3, and 5.	Significant changes in water temperature compared to baseline condition	Adjust SWM as feasible for thermal impacts (ie: flow rates, permanent pool depth, additional LID implementation where feasible	Land Developer Group
Stormwater Management Ponds									
Evaluate if SWM criteria meet TRCA, MOE and Town of Caledon Standards	SWM Pond Water Levels and flow	Verify if target release rates are met based on SWM Report	Flow loggers downstream of control structures to monitor flows	NA	Continuous logging at 15-minute intervals for 1 to 2 years before construction begins.	Continuous logging at 15-minute intervals during years 1, 3, and 5	Significant changes in flows in comparison to Town, TRCA and MOE criteria	Adjust SWM as feasible, modify control structure	Land Developer Group
Evaluate if SWM criteria meet TRCA, MOE and Town of Caledon Standards	SWM Pond water outflow temperature	General reference for water chemistry and temperature	Temperature loggers at pond outlet	NA	Continuous logging at 15-minute intervals for 1 to 2 years before construction begins.	Continuous logging at 15-minute intervals during years 1, 3, and 5	Significant changes in temperature in comparison to Town, TRCA and MOE criteria	Adjust SWM as feasible for quality impacts (ie: flow rates, permanent pool depth, additional LID implementation where feasible	Land Developer Group
Evaluate if SWM criteria meet TRCA, MOE and Town of Caledon Standards	SWM Pond Water Quality chemistry and temperature at outlet and inlet	General reference for water chemistry	Water quality parameters of dissolved oxygen, pH, water hardness, turbidity, total suspended solids and total phosphorus to be evaluated at the inlet and outlet	NA	Every 4 months until the construction is complete.	Every 4 months at designated locations during years 1, 3, and 5.	Notable differences in water chemistry compared to the criteria set by the Town, TRCA, and MOE	Adjust SWM as feasible for thermal impacts (ie: flow rates, permanent pool depth, additional LID implementation where feasible	Land Developer Group
Site Groundwater Quantity									
Confirm if Site water levels have been impacted by construction.	On-Site Groundwater levels (available on-site monitoring wells, existing off-alignment monitoring wells)	Groundwater levels decline 5 m below observed seasonally low recorded baseline groundwater level in select off-alignment monitoring wells (near perimeter of ZOI) during construction. Monitoring wells to monitor: MW4-17 D, MW5-17 D, MW25-1A, MW25-3A, MW25-CR1.	Manual measurements and continuous interval readings at select off-alignment monitoring well locations during preconstruction. Dataloggers employed at select locations in relation to George Bolton Parkway and Street A-2 during construction and for 1 year following construction.	Seasonal groundwater monitoring data (4 / year) should continue to be collected until the start of construction	Weekly manual measurements for the first month, and then biweekly to monthly afterwards. Continuous interval reading (1-hour interval) using a pressure transducer	Quarterly manual water level measurements and continuous interval readings at select on-site wells (that have not been destroyed during construction), and selected off-alignment wells for a period of 1-year following construction	**During Construction:** Water level decline > 5m during construction **Post- construction trigger**: Water levels do not return to 80% + of baseline	**During construction:** Confirm the magnitude of drawdown and assess for potential groundwater receptors that may be affected. Dewatering rates will be reduced or stopped. Additional waterproofing / water reduction construction methodology and techniques to be implemented in subsequent construction activities. Continue monitoring to confirm the recovery of drawdown beyond the expected ZOI.	Land Developer Group

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								Post-Construction: Upon completion of the 1-year post-construction monitoring program, an assessment will be made by to determine whether conditions have returned to acceptable levels and/or further monitoring is required, in consultation with the CA. Continue monitoring if deemed appropriate. Additional recharge facilities can be contemplated if required in consultation with the CA.	
Off-Site Groundwater Quantity and Quality									
Confirm if off-site water levels have been impacted by construction	Groundwater Level and Quality (nutrient and microbiology parameters) at nearby participating private wells	Upon receipt of resident complaint, or if Groundwater quality exceeds the ODWS and has degraded when compared to baseline quality as appropriate and to be determined on a case-by-case basis The results of the well monitoring program will be documented and a copy made available to the Region	Complete door-to-door private well survey within the estimated ZOI. Conduct a visual inspection of the well and photograph the well. Manual water level measurements using water level tape. Laboratory analysis for various parameters (nitrate, nitrite, phosphate, metals, total coliform, fecal coliforms, *E.Coli.).*	Once prior to construction	Quarterly monitoring or upon receipt of resident complaint	Quarterly manual water level measurements and continuous interval readings (datalogger to be installed) in impacted private wells for a period of 1-year following construction. At the end of the earthworks, a water level measurement and a water sample will again be collected from each of the monitored water supply wells to confirm the post-development water quality.	Upon receipt of resident complaint **During construction** - Confirm well water level and/or quality impacts below usable levels. Confirm whether construction activities are the cause of impacts to the water wells **Post-construction** - Groundwater levels do not return to an acceptable level for domestic use. Groundwater quality exceeds the ODWS and has degraded when compared to baseline quality as appropriate and to be determined on a case-by-case basis	**During construction** - If impacts are identified, provide temporary water supply to impacted residents **Post construction** - Upon completion of the 1-year post-construction monitoring program, an assessment will be made the consultant to determine whether conditions have returned to acceptable levels and/or further monitoring is required, in consultation with the Region and / or CA. Land Developer Group to determine solution to supplement impacted residents' potable water supply as necessary	Land Developer Group
Site Groundwater Quality									
Characterization of on-site groundwater quality and confirm that groundwater quality has not been degraded because of construction	General chemistry indicators: including field chemistry parameters (temperature, pH, DO, turbidity) Select Provincial Water Quality Objectives (PWQO) (applicable metals, O&G) and Peel Storm Sewer Use By-Law municipal sewer	No net degradation of groundwater quality relative to relevant criteria	Sampling from select monitoring wells. Laboratory samples to be stored in ice-chilled coolers and submitted to a CALA-certified laboratory under chain-of-custody documentation on same day as sample collection. Field chemistry parameters (temperature, pH, DO, turbidity) collected with appropriate calibrated instrument(s) (e.g., YSI). Sampling to occur from same well	Once prior to construction	Semi-annually	Yearly water quality sampling at selected on-site wells (that have not been destroyed during construction), and off-alignment wells (TBD) for a period of 1-year following construction	**During Construction**: Exceedance of PWQO or sewer bylaw when compared to baseline condition	**During Construction:** If changes in groundwater quality are identified through. monitoring, determine if pumping or other construction activity is the cause of change in groundwater quality. Determine if impacts to groundwater receptors may occur.	Land Developer Group

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				Pre-Construction	**During Construction**	**Post-Construction (Performance)**			
	use by law, if applicable		each monitoring year, except in cases where wells have been decommissioned due to construction				**Following Construction**: Exceedance of Sewer Use bylaw PWQO when compared to applicable baseline conditions	Add appropriate pre-treatment technology to the discharge system. **Following Construction**: Confirm whether construction activities are the cause of impacts to the water wells. Continue monitoring if deemed appropriate.	
Dewatering Effluent Water Quality									
Confirm dewatering effluent water quality and confirm that quality is suitable for discharge to intended receiver.	TSS, DO, pH, EC, turbidity, metals, VOCs, PHCs and inorganics	Groundwater quality meets criteria relevant for intended receiver	Unfiltered sampling from a controlled dewatering discharge port to be collected for field and laboratory analysis. Field chemistry parameters (temperature, pH, DO, turbidity) collected with appropriate calibrated instrument(s) (e.g., YSI). Laboratory samples to be stored in ice-chilled coolers and submitted to a CALA-certified laboratory under chain-of-custody documentation on same day as sample collection.	Not applicable	During active dewatering, Daily monitoring: TSS Weekly monitoring: DO, pH, EC, turbidity, metals, VOCs, PHCs and inorganics Dewater to a well-vegetated area, 30 m away from a watercourse or wetland, and use a filter bag along with appropriate sediment barrier, such as silt socks/coir logs/straw bales	Not applicable	**During Construction**: pH between 6.5 and 8.5 Turbidity – 8 NTU (TSS at 25 mg/L). Any exceedance of the relevant criteria.	**During Construction:** All discharge of pumped water into the natural environment should be halted, and other options for pre-treatment system should be explored	Land Developer Group